UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

ADAM KANUSZEWSKI and ASHLEY KANUSZEWSKI, as parent-guardians and next friend to their minor children, D.W.L., R.F.K., and C.K.K.;

SHANNON LAPORTE, as parent-guardian and next friend to her minor children, M.T.L. and E.M.O.;

and

LYNNETTE WIEGAND, as parent-guardian and next friend to her minor children, L.R.W., C.J.W., H.J.W., and M.L.W.

Plaintiffs

v.

ELIZABETH HERTEL,
sued in her official capacity;

DR. SANDIP SHAH,
sued in his official capacity;

DR. SARAH LYON-CALLO,
sued in her official capacity;

MARY KLEYN,
sued in her official capacity; and

DR. ANTONIO YANCEY,
sued in his official capacity

Defendants

Case No.: 18-cv-10472

Hon. Thomas L. Ludington,
District Court Judge

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PLAINTIFFS' MOTION FOR SUMMARY JUDGMENT

NOW COME Plaintiffs, by counsel, and hereby move for summary judgment pursuant to Rule 56 of the Federal Rules of Civil Procedure due to a lack of a material question of fact and the "strict scrutiny" constitutional standard of review. See *Kanuszewski v. MDHHS*, 927 F.3d 396 (6th Cir. 2019). Concurrence to the relief sought was requested and was not provided by the time of filing. E.D. Mich. LR 7.1(a). A brief in support of the motion is concurrently filed.

Date: February 22, 2021

RESPECTFULLY SUBMITTED:

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BRIEF IN SUPPORT OF
PLAINTIFFS' MOTION FOR SUMMARY JUDGMENT

TABLE OF CONTENTS

QUESTION(S) PRESENTED

Should summary judgment be granted to Plaintiffs?

Answer: Yes

MOST RELEVANT AUTHORITY

FRCP 56

Kanuszewski v. MDHHS, 927 F.3d 396 (6th Cir. 2019)

INTRODUCTION

Our notions of liberty are inextricably entwined with our idea of physical freedom and self-determination. *Cruzan v. Director, Mo. Dep't of Health*, 497 U.S. 261, 287 (1990) (O'CONNOR, J., concurring). Our Constitution protects the right of the people to be "secure in their persons" from government intrusion, even when the government agent is wearing a lab coat.

This case is a legal challenge to various "biobanking" facets of Michigan's Newborn Screening Program. This case is not solely about blood. Rather, it is a challenge to the policies and practices that cause, without sufficient parental informed consent, the retention, storage, and non-consensual use of newborn infants' physiological and biological materials containing personal and deeply private medical and genetic information. Defendants have impinged upon the infants' and their parents' personal autonomy, control, and privacy by either replacing the government's self-made judgment for the parents' self-determination or simply never actually asking for consent with sufficient clarity so competent parents could make a fully informed choice about the same. The Constitution protects against the same. Summary judgment is warranted.

THE PARTIES

Plaintiffs are four parents of nine minor children who have been involuntarily subject to the Michigan Newborn Screening Program, the State's intra-department program known as the Michigan BioTrust for Health, and have had their blood spots retained, stored, and made available for use (at any time and without notice) with/by the Michigan Neonatal Biobank.

Child (Plaintiffs)	Parents (Plaintiffs)	Birth Year
D.W.L.	Adam and Ashley Kanuszewski	2008*
R.F.K.	Adam and Ashley Kanuszewski	2013
C.K.K.	Adam and Ashley Kanuszewski	2016
M.T.L.	Shannon Laporte	2008*
E.M.O.	Shannon Laporte	2017
L.R.W.	Lynnette Wiegand	2011
C.J.W.	Lynnette Wiegand	2013
H.J.W.	Lynnette Wiegand	2014
M.L.W.	Lynnette Wiegand	2017

** born before BioTrust program existed*

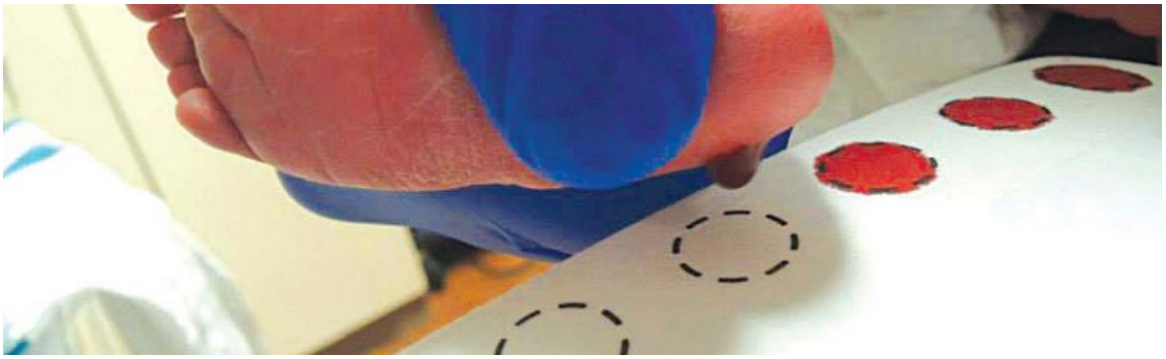
Defendant Elizabeth Hertel is the current (and now third for this case) director of the Michigan Department of Health and Human Services ("MDHHS"), and has supervisory control over the entire Department including all facets of the Michigan Newborn Screening Program. She is sued in her official capacity. Defendant Dr. Sandip Shah is the director of the Bureau of Laboratories within MDHHS and co-program manager of the Newborn Screening Program. He is sued in his official capacity. Defendant Dr. Sarah Lyon-Callo is the director of the Bureau of Epidemiology and

Population Health within MDHHS. She is sued in her official capacity. Defendant Mary Kleyn is the section manager of the Newborn Screening Program within MDHHS. She is sued in her official capacity. Lastly, Dr. Antonio Yancey is associate vice president of research operations with Wayne State University and the director of the Michigan Neonatal Biobank, a non-profit corporation operating under the authority and direction of the MDHHS. He is sued in his official capacity. Each Defendant directs, controls, and/or manages the Newborn Screening Program.

FACTS

I. The newborn screening program process.

Let us start off with a clear understanding of the Michigan Newborn Screening Program process. After an infant is born, a medical staffer from the hospital involuntarily uses a skin-piercing device to breach the outside skin of each infant's foot to extract five or six blood drops on to a Guthrie or dried blood spot ("DBS") card forming "blood spots." **Exhibit EE.** This is sometimes called a heel-prick test.



Parents are charged (currently $137.50) by the State and no consent is ever sought prior to undertaking this involuntary blood draw. See MCL 333.5431 (**Exhibit B**). The hospital then hands over the extracted samples, along with certain personal/private information collected without the knowledge or consent of patient/parent (see **Exhibit Q**), to a state-hired courier company who takes the blood spots to a governmental testing facility. There, state employees perform a number of medical screening tests. **Exhibit EE.** This includes testing over 160 biomarkers and in-blood compounds. **Exhibit H, p. 2.** As part of this medical testing process, these technicians withdraw, by scientific extraction, the deeply-private personal medical information of each infant.[1] The extracted data is indefinitely saved to and stored in the state government's files and databases, again, without informed parental consent. **Exhibit OO, Shah Dep., pp. 46-47** (explaining the LIMS system).

Once that is completed, the unneeded and unused blood spots could simply be destroyed. Instead, each Guthrie/DBS card is cut apart for indefinite storage in two separate facilities. **Exhibit EE; Exhibit MM, Yancey Dep., pp. 15-17.** One sample is sent to a government-operated warehouse in Lansing operated by an intra-department program known as the Michigan

[1] Examples of this data is available for the Court's *in-camera* review but not being submitted on the record.

BioTrust for Health operated by a MDHHS employee. The State Defendants keep this spot from the others held in the Biobank for "personal use" by parents, though it is unclear for what purpose. ***Id.*** However, Defendants never explicitly tell parents any of that. The other remaining blood spots are sent to the Biobank in Detroit. **Exhibit GG; Exhibit MM, Yancey Dep., pp. 12-13.** The Biobank, operating under the directorship of Defendant Dr. Antonio Yancey (**Exhibit MM, Yancey Dep., p. 5**), never obtains permission or has consent from parents to transfer the samples from the State Defendants to the Biobank. **Exhibit X, ¶4; Exhibit Y, ¶4; Exhibit Z, ¶4.** Prior to being stored in the Biobank, the individual now-cut apart Guthrie/DBS cards are assigned a code for identification at the Biobank while the master cross-index is kept by the State Defendants. **Exhibit HH.** MDHHS calls this separation of the blood spots from their identifying information stored with the State as "honest brokering."

Literally *millions* of non-consensually seized blood samples are indefinitely kept, after the completion of the newborn screening medical tests, at both the Biobank in Detroit and also at a MDHHS-operated warehouse in Lansing.[2] Regardless of the parent's choice, the Biobank

[2] Dr. Yancey had no idea of the number of samples. **Exhibit MM, Yancey Dep., p. 60.** However, the Biobank's own website dated in 2017 claims to have "nearly four million" samples. **Exhibit II**. On another part of its website, the claims the "inventory

stores the blood spots indefinitely until a parent *later* affirmatively and additionally seeks destruction.[3] **Exhibit E.** At the Biobank, the blood spots are stored until such time as they can be sold to researchers as part of for-profit or public-based science research projects. **Exhibit O; Exhibit MM, Yancey Dep., p. 17.** Consent is also never sought when a sample is selected and pulled for use in a scientific study. **Exhibit MM, Yancey Dep., pp. 40, 42-45.** For example, none of the parents of the many infants (or the infants when later reaching the age of majority) were ever contacted to gain their consent for any of the research projects that used the children's blood and the deeply-private medical and genetic information/data contained therein. **Exhibit LL.** Dr. Yancey claims everything is accomplished through the State Defendants**. Exhibit MM, Yancey Dep., pp. 21.** However, Dr. Yancey conceded he is working in "joint concert[4] with [the State Defendants] to put

---

includes over five million residual newborn screening." **Exhibit JJ**. Either way, it is a lot of blood samples, including all the infants in this case.

[3] The State Defendants claim they have created a process to destroy the blood samples stored at the Biobank. However, neither the State nor the Biobank sufficiently tell parents that such an option even exists. And even if they were told at +12 hour birth timeframe, who would honestly remember anyway. It is believed that such ask-when-they-are-foggy is an intentional false consent process sought to prevent parents from truly knowing of the full scope of the process and to be informed enough of the risks, benefits and alternatives to such actions by the State and the Biobank.

[4] It is Plaintiffs' position that Dr. Yancey is already a state actor sufficient under 42 U.S.C. § 1983 when being a vice president at Wayne State University as the directorship ties to his position at the university. **Exhibit MM, Yancey Dep., pp. 6-7.** However, to the extent he is treated as a private party, private persons, jointly engaged with state officials in the prohibited action, are acting 'under color' of law for purposes of § 1983. *Adickes v. S.H. Kress & Co.*, 398 U.S. 144, 152 (1970). "[T]o act 'under color of' state law for § 1983

material [blood spots] into the storage facility for long-term storage." ***Id.* at 23, 33.**

Against this entire backdrop, the parents were never asked for or themselves provided informed consent, i.e. consent granted after being sufficiently informed of the risks, benefits and alternatives. Michigan law has no or little legal protections in place for these stored blood samples. Even law enforcement is intermittently using the blood samples for criminal investigations, prosecutions, and crime victim identification. **Exhibit K.** There is the constant ongoing threat of misuse of the blood spots, the private medical and genetic information extracted or that is extractable, and of future discrimination, **Exhibit PP,** whether intentional or accidental, **Exhibit W**.

II. An idea that stated in the 1960s

Michigan was first introduced to newborn screening in 1965 when laboratory technology became available to identify newborns with phenylketonuria (PKU). **Exhibit C, p. 8.** From the success of newborn "screening"[5] for PKU, other medical screening tests were added. Today

purposes, it is enough that [the defendant] is a willful participant in joint action with the State or its agents. Private persons, jointly engaged with state officials in the challenged action, are acting `under color' of law for purposes of § 1983 actions." *Dennis v. Sparks*, 449 U.S. 24, 27-28 (1980).

[5] As its name suggests, newborn screening is a *screening* program in which an abnormal result does not necessarily identify the presence of disease. It merely indicates an increased risk that the child has the condition, necessitating confirmation through diagnostic testing. **Exhibit CC, p. 735**.

there are more than fifty. **Exhibit J.** However, in many prior years, once the screening tests were completed, any remaining samples were destroyed after seven years. **Exhibit E.** No one knows why seven. That changed starting in July 1984, when the State sua sponte began, without parental knowledge or any parental consent, indefinitely retaining excess blood spots as part of the newborn screening program. **Exhibit C, p. 26.**

As is often the case, science outpaced the law. In the 1990s, the Human Genome Project had gained considerable international attention and caused concerns for genetic privacy and potential discrimination. Then-Governor John Engler announced plans in the 1997 State of the State Address to appoint the Governor's Commission on Genetic Privacy and Progress to recommend ways to protect genetic privacy, prevent discrimination, and maximize the beneficial uses of new medical knowledge resulting from new discoveries from scientific developments, like the Human Genome Project. **Exhibit A.** The Commission included individuals that will reappear later in this case including law professor Edward B. Goldman and then-fellow and now-law professor Sonia M. Suter. ***Id.***

As part of its report, the Commission recognized that the "informed consent doctrine" mandates that health care professionals may not perform medical tests or do studies involving patients without first informing them of

the nature of the procedure—including its "risks, benefits and alternatives." ***Id.* at 32.** The law's "notion of bodily integrity has been embodied in the requirement that informed consent is generally required for medical treatment." *Cruzan*, 497 U.S. at 269. Personal autonomy is the "right to determine what shall be done with his own body." *Id.* The Commission correctly explained that "[o]ne important way to provide [patient autonomy] protection is through an informed consent… [and] is an important way to protect individuals' privacy." **Exhibit A, p. 32**.

However, the Commission then problematically ignored the principles when it went on to expound, without objection, that the newborn screening program "is mandated under state law [and thus] parental consent is not required." ***Id.* at 36.** It also explained that "[t]he [S]tate has developed informational booklets describing newborn screening; however, these are not always available to or read by parents." ***Id.***

Nevertheless, the Commission surprisingly then recommended—despite its discussion on informed consent—that "parental consent not be required for newborn screening for diseases" but parents be "given an opportunity to opt out of having their newborn's screening test card used in future research." ***Id.* at 38.** It did not explain what it meant by "research." The

Commission also recommended that newborn screening blood spots be retained indefinitely. ***Id.*** In short, informed consent was only lip service.

III. Section 5431 as it exists today is problematic.

The Legislature took note of the Commission's suggestions and amended Section 5431 of the Public Health Code to what we have today. **Exhibit B** (MCL 333.5431). A health professional, under threat of criminal prosecution (**Exhibit T, ¶15**), is required to "administer or cause to be administered" certain medical tests on newborn Michigan infants. MCL 333.5431(1), (5). Conscripted healthcare professionals involuntarily extract blood from Michigan newborns usually 12-36 hours post-birth by piercing the skin of the newborns and extracting a part of the newborns' tiny bodies in the form of six blood spots.

The State and the State Defendants have renounced[6] the legal need for any informed consent from parents before doing this. MCL 333.5431(2); see also MCL 333.17520(1). Moreover, the State Defendants demanded that

[6] There is difficulty correctly categorizing what the Legislature legally did here. Informed consent is a decision of a person or patient. In one sense, Michigan waived the need for informed consent. But this likely fails because a government cannot waive a constitutional right for or on behalf of a citizen. In another sense, the State in a *parens patriae* role granted consent, without deference or concern to parents, to undertake medical testing. But competent parents, not governmental officials, have a fundamental right to speak for and are empowered to make decisions for their minor children in matters of medical treatment. *Parham v. J.R.*, 442 U.S. 584 (1979); *Pierce v. Society of Sisters*, 268 U.S. 510, 535 (1925). It is unclear how the State could effectuate this.

they, and not the birthing or primary care doctors, conduct these medical screening tests in government laboratories. The tests involve extracting deeply private medical and genetic information/data from the extricated blood spots to test for the existence of certain non-communitive heredity-based diseases existing in a small minority of the general Michigan population.[7] State Defendants also required personal data about the infant and the birth mother be disclosed without any consent. Defendants never obtain consent from the infants (obviously, given their age) or their parents prior to searching and seizing the infants' blood spots, keeping the samples indefinitely, or extracting and storing the personal data from the blood.

Despite statutory changes in the 2000s, the same problems existed as before the amendments—lack of sufficient parental knowledge of the program. And the lack of sufficient knowledge means a lack of informed consent. For example, the informational brochures regularly trumpeted in this case by Defendants describing newborn screening are not and were not made available to parents. **Exhibit X, ¶4; Exhibit Y, ¶4, and Exhibit Z, ¶4.** It has been conceded by one Defendant that a lack of receipt of the brochure

[7] From 1965 to 2015, there were 7,015,925 recorded live births. http://www.mdch.state.mi.us/osr/natality/Tab4.3.asp. The program has claimed to have flagged diagnosed diseases approximately 5,700 newborns, or eight one hundredths of one percent (0.008%) of the births in Michigan during that period. Diseases are clearly not rampant, wide-spread, or unbridled.

minimally means a lack of informed consent. **Exhibit OO, Shah Dep., p. 23.** Each Plaintiff-Parent here was never informed about the "risks, benefits and alternatives" of participating in post-testing portion of either newborn screening (i.e. the transfer of the spots to a private, third party entity), the storage of their infants' medical data, or the post-screening uses of their infants' blood spots (medical research by non-State of Michigan researchers for a fee). **Exhibit T, ¶¶2, 4, 6, 9, 10, 11, 13.** All Plaintiff-Parents aver that if they were fully informed of fully scope of this program, including all the risks, benefits and alternatives, none would have consented. **Exhibit X; Exhibit Y; Exhibit Z.** This has happened countless times over.

Critically, not every parent asked for their informed consent. Keeping in chronological order relative the expansion of various facets of the newborn screening program, infant MTL (Laporte) and infant DWL (Kanuszewski) were then born in 2008. At that time, Defendants never sought any consent of any kind from any parent (including the parents of M.T.L. or D.W.L.) as to either extraction of newborn blood samples (the initial draw) or for retention, storage, or future use of the blood samples.[8] **Exhibit HH, p. 2.** It was only

[8] Continuing with the tradition started in 1984, after the screening tests were complete, the State simply kept the unused samples for itself without notice or consent of parents.

later, after the creation of the BioTrust, that these pre-2010 blood spots were sent to the Biobank for indefinite storage. See *infra*.

IV. The Biobank is formed.

Realizing that there was an opportunity to begin capitalizing on these excess blood spots (like M.T.L.'s and D.W.L.'s spots and millions of others), a working group was formed to create a government-affiliated non-profit entity outside the normal strictures of state government hierarchy and oversight. **Exhibit F**. The "Michigan Neonatal Biobank" was formed. **Exhibit G.** It is headed up by a Board of Directors whose role and authority are unclear and really only ritualistic because Dr. Shah and Dr. Lyon-Callo control the Biobank's policies, operations, and directives, **Exhibit NN, Lyon-Callo Dep., pp. 17-18.** The Board's chairman is Edward B. Goldman—the same person serving as chairman of the Governor's earlier discussed Commission.

The Biobank's institutional goal, undertaken at the request of MDHHS, was to organize stored blood spots and actively market the availability of "linked data" from other databases operated by MDHHS to "greatly increase the value of the dried blood spots" and enjoy the "user fees" such would generate. **Exhibit F, pp. 2, 8**; see also **Exhibit O** (Biobank price list); **Exhibit KK** (confirming available data linking from government health-related

databases); **Exhibit H.** The business plan called for working with another Tech Town[9] company who is "the leader in supplying biological samples to large pharmaceutical companies and the biotechnology industry" with the goal of generating "a significant revenue stream of several million dollars for both parties." ***Id.* at 21**. The goal from the beginning was to make money by developing sellable products for academic and commercial researchers using the excess blood spots of newborn infants. ***Id.* at 25.** Such was even being sought up through the commencement of this lawsuit. **Exhibit P.** As marketed, the Biobank is a "rare archive" of infant blood samples from "nearly every child born in Michigan since 1985." **Exhibit H.** Again, at no point were parents consulted and the (now) adults from the infant samples stored in the mid-1980s were also not consulted. Today, there are literally *millions* of blood spots stored and ready for potential use or sale by Defendants.

Currently, the Biobank is responsible for receiving, cataloging, and storing excess newborn blood spots. Only upon the direction of the State Defendant does the Biobank distribute spots to third parties. **Exhibit NN, Lyon-Callo Dep., pp. 56-58.**

[9] See **Exhibit GG.** Tech Town is an office complex near Wayne State University originally founded to support tech-based spinoffs from the university, it now provides facilities and support services for technological-based businesses and entities. See https://techtowndetroit.org/who-we-are/

V. The Texas case changes things.

Then a watershed event happened. In 2009, a lawsuit challenged Texas' retention and storage of blood spot samples. **Exhibit N**. In December 2009, Texas announced, as the result of a federal lawsuit settlement, it would destroy more than five million blood samples collected from Texas newborn infants without parental consent under its newborn screening program. **Exhibit M**. Michigan rightfully panicked because its newborn screening program was strikingly similar to Texas' program. *Beleno v. Lakey*, 306 F. Supp. 3d 930 (W.D. Tex. 2009).

As the lawsuit progressed, Defendants started changing its long-stand practices. When no consent was obtained from parents before keeping bloodspots retained from extracts dating July 1984 through May 1, 2010, Defendants assert today that "alternative consent" was obtained from an internal MDHHS committee known as Institutional Review Board. **Exhibit NN, Lyon-Callo Dep., pp. 20-21; Exhibit HH, p. 2.** It is Plaintiffs' position that this "IRB" does not have (and never had) any legal authority to waive consent in the place of parents—it is simply a made-up proposition.[10]

[10] Traditionally, an IRB is "appropriately constituted group that has been formally designated to review and monitor biomedical research involving human subjects." https://www.fda.gov/regulatory-information/search-fda-guidance-documents/institutional-review-boards-frequently-asked-questions. It never is, was, or has been a substitute for obtaining alternative informed consent or waiving consent on behalf of others.

This supposed new assent process began under an intra-department program called the BioTrust for Health (the "BioTrust"). Launched in June 2009 after the formation of the Biobank, it was MDHHS' appointed overseer as to the storage and use of retained blood spots held at the Biobank. **Exhibit C, p. 25; Exhibit NN, Lyon-Callo Dep., p. 12; Exhibit OO, Shah Dep., p. 7, 9.** The BioTrust is directed by and under the responsibility of Dr. Shah and Dr. Lyon-Callo. **Exhibit NN, Lyon-Callo Dep., pp. 8, 9, 11; Exhibit OO, Shah Dep., p. 19.**

It is also during this time that Defendants, under the flag of the BioTrust, purports to implement a quasi "opt-in" and later "pull-out" process starting October 1, 2010. **Exhibit FF.** This concept consists of indefinitely storing all blood spots without first asking for consent to store but the later use of the stored spots would be upon assent of parents. If a parent does not want the blood spot stored, they must later petition for it at a later date. At no point are parents told about the third-party Biobank, biobanking, and outside fourth-party researchers.

The BioTrust restructuring also created a complicated administrative maze of boards, committees, and entities decentralizing control and decision-making as to what was happening or who was in charge of the

program for the retention, storage, or future use of the blood samples.[11] **Exhibit D.** Moreover, the BioTrust has never been totally honest with the public. For example, it explains in a FAQ on its website that—

> Do law enforcement officials or insurance companies have access to the BioTrust?
>
> *No. The BioTrust has been designated a medical research project by the MDHHS Chief Medical Executive. Under state law, the samples, data and other information included as part of this medical research project are protected and are not subject to forced disclosure to third parties*.

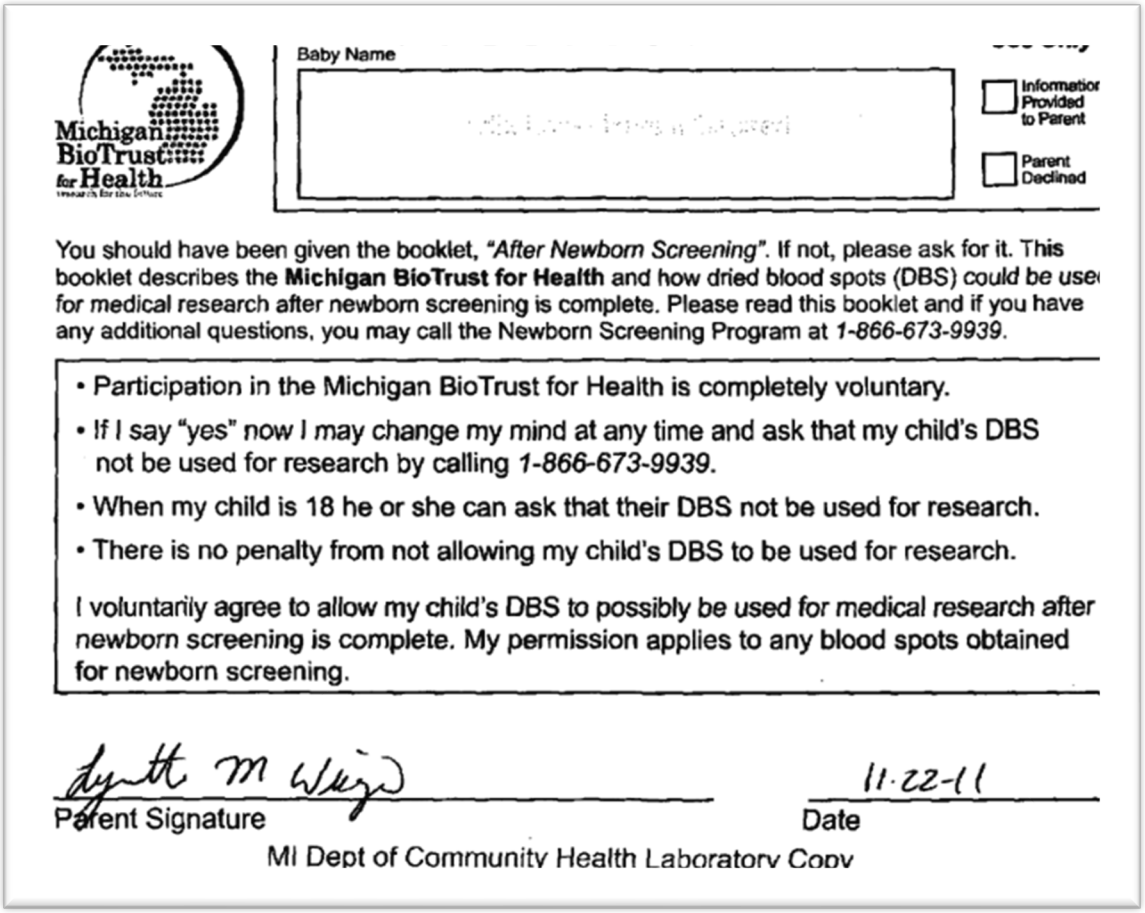
Exhibit J. But we know that is not simply not true. **Exhibit K; Exhibit L, p. 3**; see also **Exhibit NN, Lyon-Callo Dep., p. 69.**

VI. The new "consent" process.

Starting October 1, 2010, Defendants began what it calls its consent process.[12] The remaining seven infants were born after 2010 were subject to some form of this process; the pattern of events are the same. Approximately 12 hours after the birth of child, a hospital worker approaches a parent (usually the exhausted, still-hospitalized mother) and presents a single page form. Here is a sample from 2011—

[11] For example, in the deposition of Dr. Yancey, the director the Biobank, Dr. Yancey has no idea who owned or controlled the blood spots that were under his charge.

[12] For samples taken before May 2010—like MTO's and DWL's, Defendants self-proclaim that "consent" was "magically" waived via a decision by the MDHHS Institutional Review Board. **Exhibit HH, p. 2.** Yet, it has no authority to provide such consent. No parent (or minor turned adult) provided consent.



Michigan BioTrust for Health

Baby Name

☐ Information Provided to Parent

☐ Parent Declined

You should have been given the booklet, *"After Newborn Screening"*. If not, please ask for it. This booklet describes the **Michigan BioTrust for Health** and how dried blood spots (DBS) could be used for medical research after newborn screening is complete. Please read this booklet and if you have any additional questions, you may call the Newborn Screening Program at *1-866-673-9939*.

- Participation in the Michigan BioTrust for Health is completely voluntary.
- If I say "yes" now I may change my mind at any time and ask that my child's DBS not be used for research by calling *1-866-673-9939*.
- When my child is 18 he or she can ask that their DBS not be used for research.
- There is no penalty from not allowing my child's DBS to be used for research.

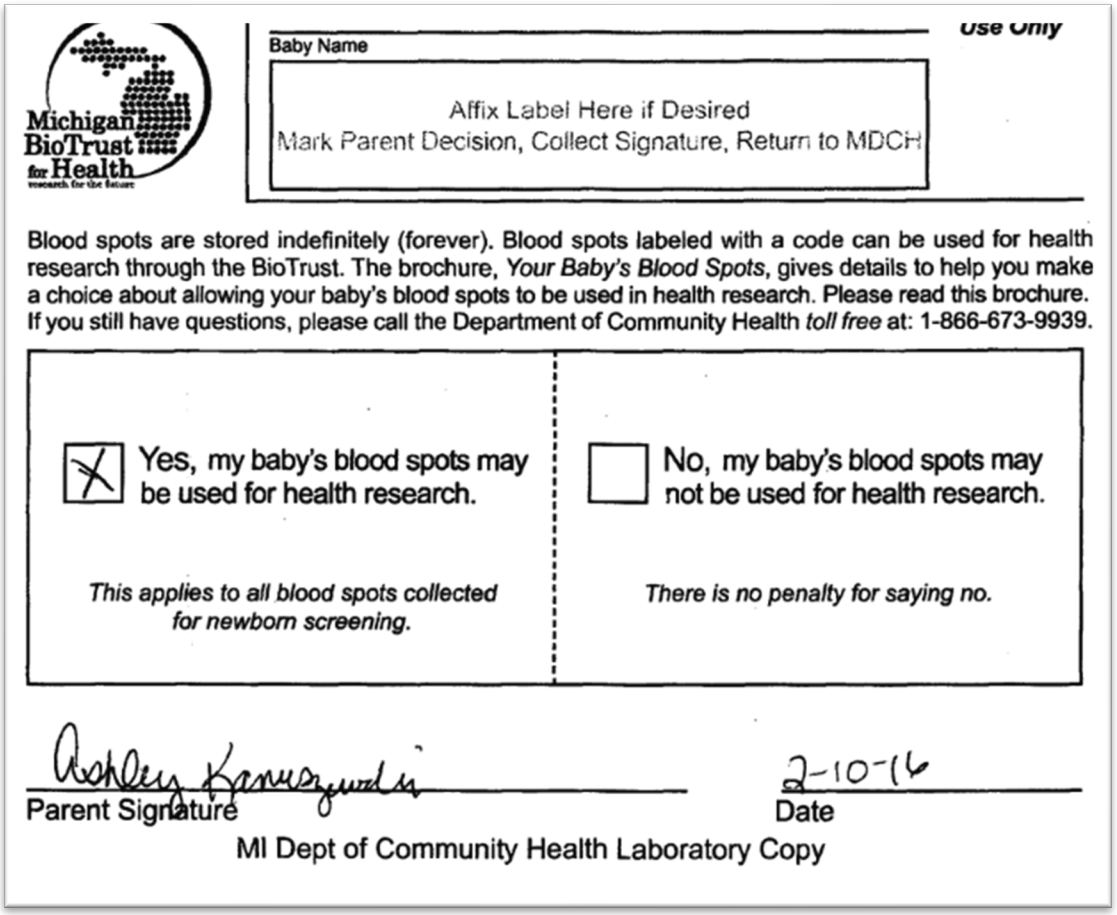
I voluntarily agree to allow my child's DBS to possibly be used for medical research after newborn screening is complete. My permission applies to any blood spots obtained for newborn screening.

Parent Signature

11-22-11
Date

MI Dept of Community Health Laboratory Copy

There is no mention of the Biobank; no mention of the significant revenue stream of several million dollars; no mention of development of sellable products for academic and commercial researchers. It merely provides that it will "possibly" to "be used" ***by the State*** "for medical research." Over time, the form changed without the State Defendants going back for updated consent from prior infants or parents. For example, in 2016, the form changes to—



Michigan BioTrust for Health

Use Only

Baby Name

Affix Label Here if Desired
Mark Parent Decision, Collect Signature, Return to MDCH

Blood spots are stored indefinitely (forever). Blood spots labeled with a code can be used for health research through the BioTrust. The brochure, *Your Baby's Blood Spots*, gives details to help you make a choice about allowing your baby's blood spots to be used in health research. Please read this brochure. If you still have questions, please call the Department of Community Health *toll free* at: 1-866-673-9939.

☒ Yes, my baby's blood spots may be used for health research.

This applies to all blood spots collected for newborn screening.

☐ No, my baby's blood spots may not be used for health research.

There is no penalty for saying no.

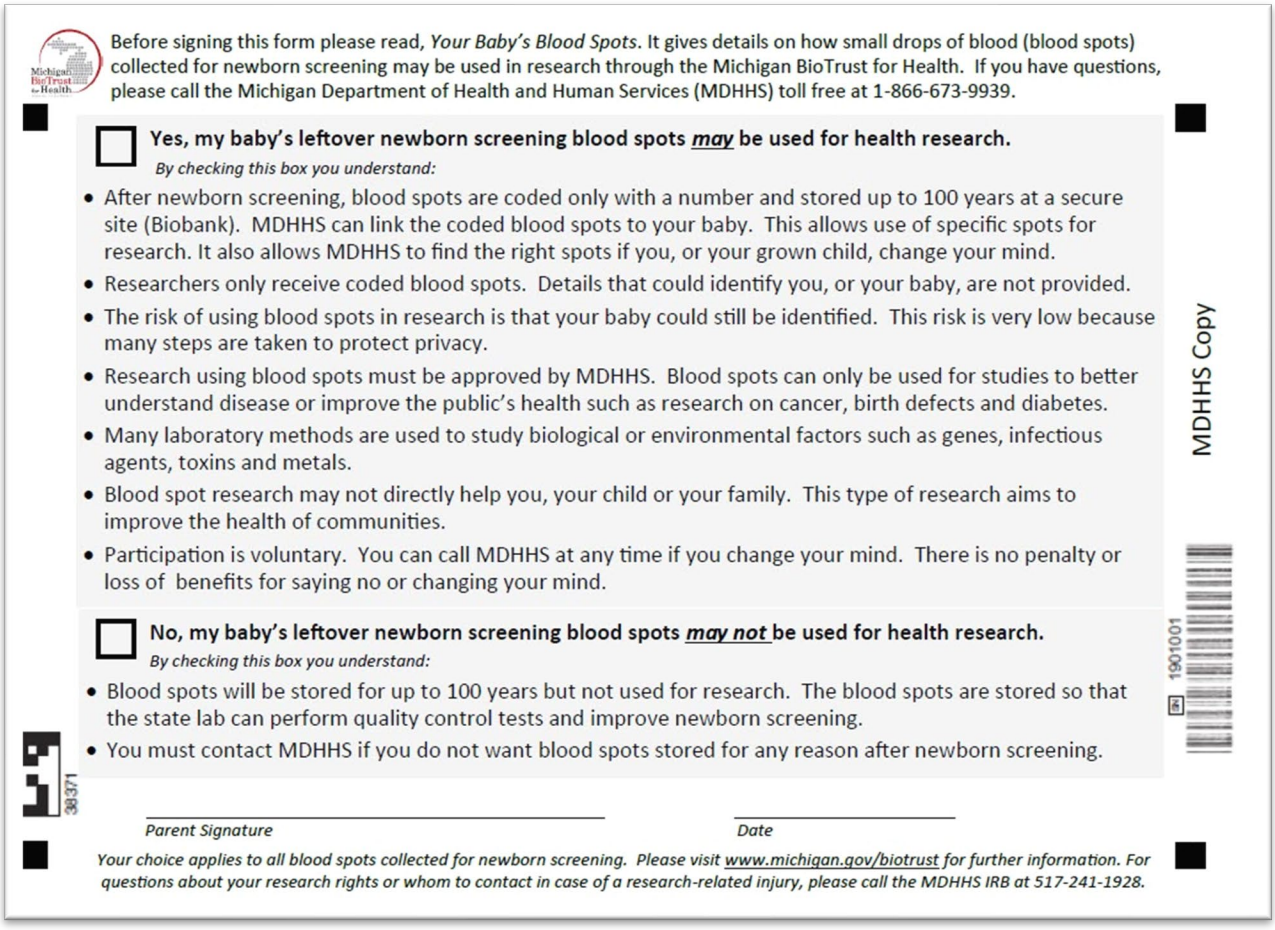
Parent Signature

2-10-16
Date

MI Dept of Community Health Laboratory Copy

This time it is not for *medical* research but for "***health*** research." Why the change is unclear and unexplained. But, like before, there is no mention of the Biobank; no mention of the significant revenue stream of several million dollars; and no mention of the development of sellable products for academic and for-profit commercial researchers.

In 2017, the form changes again.



Before signing this form please read, *Your Baby's Blood Spots*. It gives details on how small drops of blood (blood spots) collected for newborn screening may be used in research through the Michigan BioTrust for Health. If you have questions, please call the Michigan Department of Health and Human Services (MDHHS) toll free at 1-866-673-9939.

☐ **Yes, my baby's leftover newborn screening blood spots *may* be used for health research.**

By checking this box you understand:

- After newborn screening, blood spots are coded only with a number and stored up to 100 years at a secure site (Biobank). MDHHS can link the coded blood spots to your baby. This allows use of specific spots for research. It also allows MDHHS to find the right spots if you, or your grown child, change your mind.
- Researchers only receive coded blood spots. Details that could identify you, or your baby, are not provided.
- The risk of using blood spots in research is that your baby could still be identified. This risk is very low because many steps are taken to protect privacy.
- Research using blood spots must be approved by MDHHS. Blood spots can only be used for studies to better understand disease or improve the public's health such as research on cancer, birth defects and diabetes.
- Many laboratory methods are used to study biological or environmental factors such as genes, infectious agents, toxins and metals.
- Blood spot research may not directly help you, your child or your family. This type of research aims to improve the health of communities.
- Participation is voluntary. You can call MDHHS at any time if you change your mind. There is no penalty or loss of benefits for saying no or changing your mind.

MDHHS Copy

☐ **No, my baby's leftover newborn screening blood spots *may not* be used for health research.**

By checking this box you understand:

- Blood spots will be stored for up to 100 years but not used for research. The blood spots are stored so that the state lab can perform quality control tests and improve newborn screening.
- You must contact MDHHS if you do not want blood spots stored for any reason after newborn screening.

1901001

38371

Parent Signature *Date*

Your choice applies to all blood spots collected for newborn screening. Please visit www.michigan.gov/biotrust for further information. For questions about your research rights or whom to contact in case of a research-related injury, please call the MDHHS IRB at 517-241-1928.

This time the form undoubtedly has more details, but, characteristically, still is vague and misleading. It speaks of research "through the Michigan BioTrust for Health"—an entity that conducts no research. There is one vague reference to the "(Biobank)" while no mention of the significant revenue stream of several millions of dollars; and no mention of the development of sellable products from the excess samples for academic and commercial researchers outside of uses by the State laboratory.

Interestingly, there is not an option to simply just never retain samples after newborn screening testing is complete. Why not has never been explained.

In a study by Dr. Elizabeth R. Eisenhauer, eight in ten decisions to donate blood spots were uninformed as mothers, as the consenter, lacked knowledge of biobanking research, misunderstood about the entity conducting the search, and what was patient autonomy. **Exhibit AA.** The study matches with the actual experience suffered by the Plaintiff-Parents in this case. It makes real-world sense. As the Court can undoubtedly realize, these mothers are exhausted, depleted, and in some instances still heavily medicated from childbirth. The hospital worker presents a form which seeks "consent" to whether the samples can be used for post-testing. As noted above, the language form-to-form is different over the years. In reality, the scope and understanding post-testing blood retention, storage, and uses is largely veiled in a shroud of secrecy and vague language. No follow up ever occurs. And at no point do Defendants attempt to later contact the infants (if now at the age of majority) or their parents to seek their consent to participate in a particular authorized study which will use their blood spots or the data therefrom. **Exhibit NN, Lyon-Callo Dep., pp. 51-54.**

VII. This case commenced and the Sixth Circuit ruled.

This case was initiated three years ago by the four parents of nine

children. This Court granted dismissal on the pleadings. In a published decision, the Sixth Circuit affirmed in part and reversed in part, and set various important standards that is now the law of the case. *Kanuszewski v. MDHHS*, 927 F.3d 396 (6th Cir. 2019). After discovery was completed, this motion now follows.

STANDARD OF REVIEW

A motion for summary judgment should be granted if the "movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." FRCP 56(a). The focus must be "whether the evidence presents a sufficient disagreement to require submission to a jury or whether it is so one-sided that one party must prevail as a matter of law." *Anderson v. Liberty Lobby*, 477 U.S. 242, 251-252 (1986).

ARGUMENT

Section 1983, 42 U.S.C. § 1983, creates a private right of action against state officials and private joint concert actors who deprive individuals of constitutional rights under color of state law.. *Barker v. Goodrich*, 649 F.3d 428, 432 (6th Cir. 2011); *Dennis*, 449 U.S. at 27-28. Plaintiffs allege Fourth and Fourteenth Amendments violations by Defendants.

I. Search and Seizure (Fourth Amendment)

The Fourth Amendment mandates that the Government shall not violate "[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures." U.S. Const. amend IV. The Fourth Amendment's "basic purpose… is to safeguard the privacy and security of individuals against arbitrary invasions by governmental officials." *Camara v. Mun. Court of City & Cnty. of S.F.,* 387 U.S. 523, 528 (1967). "Searches conducted without a warrant are *per se* unreasonable under the Fourth Amendment—subject only to a few 'specifically established and well-delineated exceptions.'" *Coolidge v. New Hampshire*, 403 U.S. 443, 454-455 (1971).

A. The initial blood draw is not in play at this posture.

The Fourth Amendment's right to be "secure in their persons" from government intrusion includes medical testing upon and the deeply-private medical and genetic information/data extracted from our children absent consent. *Dubbs v. Head Start, Inc*., 336 F.3d 1194, 1214 (10th Cir. 2003). It is Plaintiffs' position that the initial extraction of blood samples from infants without parental informed consent and without a warrant violates the Fourth Amendment. However, that issue cannot be pursued in the context and posture of this case due to immunities and limitations imposed by

Kanuszewski. However, the Sixth Circuit permitted separate Fourth Amendment claims premised on post-testing and biobanking, including that Defendants' ongoing storage and future uses of the blood samples might be unconstitutional regardless of whether Defendants' completed actions of drawing and screening the children's blood for disease were constitutional." *Kanuszewski*, 927 F.3d at 424. This theory "is analytically distinct from the question… of whether drawing the children's blood and screening it for diseases violated the children's Fourth Amendment right." *Id*. Even "if drawing and screening the blood was constitutional, it may still have become an illegal seizure if Plaintiffs suffered a further, unlawful, deprivation of their interests at some later point." *Id.* The *Kanuszewski* Court held that "it is necessary to consider whether the duration is reasonably needed to effectuate those purposes justifying the seizure" of the blood sample in the first place. *Id.* at 425.

B. The process starts with a heel-prick test.

Twelve to thirty-six hours after the infants' births, heel prick tests are undertaken. Five or six blood spots per infant are extracted. This is done without any consent—informed or otherwise—from parents. The blood spots, together with a host of personal information about the infant and the birth mother (**Exhibit Q**), is then transmitted to the State Defendants.

Medical tests are run on the blood taken by the search from the infants' bodies. This medical testing processes extract deeply-private medical and genetic information/data regarding each infant. When combined together with the data transmitted from the hospital (**Exhibit S**), Defendants records and keeps that expropriated information in the government's files and databases. After the testing is completed at the State Laboratory, the remaining infants' blood spots are retained and most are then transferred to the Biobank.[13] The State and its officials still fully retain the personal and deeply-private medical and genetic information/data in government databases indefinitely. Later, those samples are transferred to the Biobank to be made available to for-profit and academic researchers who need to access to personal and deeply-private medical and genetic information/data for projects each are working on.

C. Two search/seizure challenges are made.

The Fourth Amendment protects privacy. *Cardwell v. Lewis*, 417 U.S. 583, 589 (1974). The infants, not convicted of crimes, not having an individualized suspicion of a disease (let alone a commutable one), undoubtedly have a privacy interest related to the seizure of their blood

[13] Notwithstanding, one spot is kept by the BioTrust through it is not clear why. **Exhibit HH, p. 2.**

(which contains deeply-private medical and genetic information/data extracted from their blood, even in the hours after their birth) from agents of the government. See *Missouri v McNeely,* 133 S. Ct. 1552 (2013) ("any compelled intrusion into the human body implicates significant, constitutionally protected privacy interests"); *Chandler v. Miller*, 520 U.S. 305 (1997) (noting in *Skinner* that "collection *and testing* constitutes a search subject to Fourth Amendment"). The Fourth Amendment's touchstone is reasonableness. *Brigham City v. Stuart*, 547 U.S. 398, 403 (2006). "The Fourth Amendment does not proscribe all state-initiated searches and seizures; it merely proscribes those which are unreasonable." *Florida v. Jimeno*, 500 U.S. 248, 250 (1991). Plaintiffs now raise two distinct, post-testing challenges.

a) Data retention is unreasonable.

The first challenge is whether ongoing retention of the deeply-private medical and genetic information/data in the State's files and databases, which is outside the needs of newborn screening program and without consent, violates the Fourth Amendment's prohibition on unreasonable searches and seizures. The answer is yes. This portion assumes an invasion of an infant's body for samples of blood to test for metabolic variables to detect a possible heath issue is a search and MCL 333.5431 is government

providing consent in a *parens patriae* role. The government extracts deeply-private medical and genetic information/data from the newborn screening tests. Then, however, the State Defendants place the same into the government's medical databases ***indefinitely*** for unlimited future access to the infants' private medical data. There is no statutory authorization to do so; it exceeds the scope of statutory *parens patriae* consent; and no consent of the parents was first obtained.[14]

What started in the hours after the infants' birth as a now-unchallengeable[15] search of blood for evidence of a particularized (and limited) list of diseases has now resulted in a permanent extension of the seizure and unlimited searchability of the infants' medical data to an indefinite duration upon demands of Defendants rather than the informed

[14] The undersigned is appalled by the purported concept of statutory *parens patriae* consent and analytically struggles to reasonably and personally believe that our Supreme Court would ever find that a government can grant itself consent to conduct a search for a minor citizen in a *parens patriae* role when competent parents are available to make that decision for their own child. The Fourth Amendment itself protects from such legal fiction however it is the only logical conclusion from *Kanuszewski* when federal courts will not remedy one-time but unlawful searches that have continuing threat of harm of privacy interests. However, not infrequently the ordinary requirements of the Fourth Amendment are modified to deal with special circumstances. *Tarter v. Raybuck*, 742 F.2d 977, 981-982 (6th Cir. 1984).

[15] The Sixth Circuit failed to heed the words of Thomas Jefferson that "the time to guard against corruption and tyranny is before they have gotten hold of us. It is better to keep the wolf out of the hold, than to turs to drawing his teeth and talons after she shall have entered." Thomas Jefferson, *Notes on the State of Virginia*.

desires of parents.[16] Because, by retention of the blood spots and medical data extracted, Defendants are now always able to immediately access the private medical information of infants when such was solely obtained for an *unrelated* narrowly-limited purpose. This scheme of a never-ending seizure and searchability—analogous to a general warrant[17] of infinite duration—is not reasonable under the Fourth Amendment.

As such, the indefinite retention of the personal physiological information extracted from infants via newborn screening medical tests is beyond any reasonable scope needed in conducting the search on an infants' blood for fifty-five (55) diseases to determine potential presence. In the absence of consent (see *infra*), such violates the Fourth Amendment.

b) Ongoing storage of the samples for further use by the State for sale to third-party researchers is an unreasonable search/seizure.

This second legal challenge relates to once the medical screen testing on the search is complete. The question is whether the Fourth Amendment prohibits, as unreasonable, the retention of the blood samples after the blood spots have been fully screened for diseases and Defendants' transfer of the

[16] Even when someone seeks to administrative destroy the stored blood spots, Defendants still retain all the procured medical data of the infants during the medical testing process. **Exhibit NN, Lyon-Callo Dep., p. 65.** As such, deeply-private medical and genetic information/data is never removed by the State, ever. Such is an invasion of privacy rights and interests.

[17] *Ashcroft v. al-Kidd*, 131 S. Ct. 2074, 2084 (2011)

samples to the Biobank for ongoing storage of the samples for further use by the State and/or for sale to third-party researchers. This claim is analytically distinct from the question of whether drawing the children's blood and screening it for diseases violated the children's Fourth Amendment right. *Kanuszewski*, 927 F.3d at 424. Such retention is unreasonable because additional testing of samples authorized by Defendants (to the third-party researchers) to further obtain physiological data is a *further* invasion the infants' privacy interests that is not reasonable. *Skinner v. Railway Labor Executives' Ass'n*, 489 U.S. 602, 616 (1989).

Moreover, a search or seizure constitutionally permissible initially may become a later impermissible if the later uses are unreasonable. To evaluate the constitutionality, it is necessary to consider whether the ongoing retention is "reasonably needed" to effectuate those purposes justifying the seizure for newborn testing. *Kanuszewski*, 927 F.3d at 425 (citing *United States v. Sharpe*, 470 U.S. 675, 685 (1985)). Here, the health of the infant, found to have cleared all sought for diseases by the screening, does not really justify the State Defendants in taking any actions with respect to the blood samples after it has finished screening the samples for diseases. The original and stated goal of the Biobank was to generate a significant revenue stream of millions of dollars by developing pipeline of sellable products for academic

and commercial researchers. **Exhibit F, pp. 21, 25.** Indefinite seizure of the samples for such purposes is unreasonable. *Kanuszewski*, 927 F.3d at 425.

Moreover, Plaintiffs have an extraordinary interest in keeping secure their medical and personal privacy from the State and the State's third-party "customers" of such data. When the State provides the infants' blood samples to the Biobank, who in turn provides them to third-party for-profit and academic researchers for a fee, the infants' medical and personal privacy is both invaded and eviscerated.[18] Defendants' need to invade this privacy is not connected with the reason for the initial extraction—to screen for newborn metabolic abnormalities. In other words, all newborn screening could be fully and completely accomplished without any need for biobanking or the post-screening long-term storage, retention, or uses (sale) of their children's blood spots containing deeply-private medical and genetic

[18] Defendants will suggest that they use an "honest broker" method which separates the identities of specimen's owner from the specimen. But that is foolhardy. With publicly available genetic databases and advances in medical testing, that privacy protection is illusory. Heather Murphy, *Why a Data Breach at a Genealogy Site Has Privacy Experts Worried*, THE N.Y. TIMES, Aug 1, 2020, *available at* https://www.nytimes.com/2020/08/01/technology/gedmatch-breach-privacy.html; Michael Barbaro, *There's No Going Back*, THE N.Y. TIMES (PODCAST), Dec 27, 2019, *available at* https://www.nytimes.com/2019/12/27/podcasts/the-daily/genetic-privacy-dna.html; Heather Murphy and Mihir Zaveri, *Pentagon Warns Military Personnel Against At-Home DNA Tests*, THE N.Y. TIMES, Dec 24, 2019, *available at* https://www.nytimes.com/2019/12/24/us/military-dna-tests.html. Moreover, promises of confidentiality are like pie crusts—easily made, easily broken (or forced broken). See Kashmir Hill and Heather Murphy, *Your DNA Profile is Private? A Florida Judge Just Said Otherwise*, THE N.Y. TIMES, Feb 5, 2019, *available at* https://www.nytimes.com/2019/11/05/business/dna-database-search-warrant.html; **Exhibit L**.

information/data. Once the testing was complete of the sample, the appropriate thing to do to both protect privacy and fulfill desired newborn testing would be to immediately destroy both the samples and all the data obtained therefrom upon completion of testing.[19] The State does not medically treat or provide medical care to the indicated infants if, in the exceedingly rare instance, a metabolic abnormality is detected. So, there is simply no need to keep the blood spots or the extracted private medical data when balanced against privacy interests of the infants and their parents.[20] Interestingly, if a parent honestly decides that he or she does not want his or her child's spots to be used for medical or health research, what interest, if any, does the State have in still indefinitely retaining those spots? The answer appears to be none.

D. Non-existing and insufficient consent

Defendants will inevitably argue parental consent was granted. This is universally untrue. As for infant MTL (Laporte) and infant DWL

[19] Arguably, the State could suggest that a slightly longer period may be necessary to communicate the same to the infants' parents and medical care professionals who have been flagged as a potential positive. That would seemingly not be unreasonable. However, once the medica professional(s) and parents have been provided with the flagged test results, there is no need for the State to retain such in their own databases and records. Timely ***automatic*** destruction—not indefinite retention—is the correct step absent informed parental consent.

[20] Moreover, if "Defendants conduct research on children's stored blood samples and seek to derive profit from the children's samples by selling them to third parties…, then their ongoing, indefinite seizure of the samples is unreasonable."

(Kanuszewski), each were born before the May 2010 consent process was initiated. No consent was ***ever*** sought from them or their parents to participate in biobanking or the post-screening long-term storage, retention, and/or sale. E.g. **Exhibit HH, p. 2.**

For the remaining five infants other than MTL (Laporte) and infant DWL (Kanuszewski), informed consent was also not obtained as any consent claimed by Defendants to have been obtained was deficient. The biobanking systems utilized here are not actually a true opt-in process. Regardless of whether a parent checks "yes" or "no," Defendants still retain the blood spots that contain the infants' deeply-private medical and genetic information/data. It is a combination opt-in and pull-out model of consent. That is insufficient.

In the Fourth Amendment context, when the government seeks to justify the lawfulness of a search or seizure, it has the burden of proving that "the consent was, in fact, freely and voluntarily given." *Schneckloth*, 412 U.S. at 222. Not just any type of consent will suffice. *United States v. Worley*, 193 F.3d 380, 386 (6th Cir. 1999). Instead, it must be "unequivocally, specifically, *and intelligently given*" and is "uncontaminated by any duress and coercion." *Id.*; see also *United States v. Scott*, 578 F.2d 1186, 1188-1189 (6th Cir. 1978). It cannot be by mere acquiesced to government authority. *Bumper v. North Carolina*, 391 U.S. 543, 548 (1968).

Here, the various consent forms—when combined with the known practice of insufficient information by unprovided brochures or discussion with the doctor as to the risks, benefits and alternatives—for the five infants born after May 2010 fail to meet the standard recounted in *Worley*. Moreover, the affidavits attest the understanding of the parents at the time was also insufficient to result in unequivocal, specific, and intelligently given consent. **Exhibits X, Y, Z.** One of the parents was not even of conscious mind when the alleged consent was obtained. **Exhibit Z, ¶11.**

The burden is upon Defendants to demonstrate that a voluntary relinquishment of constitutional rights occurred by Plaintiffs. *Tarter v. Raybuck*, 742 F.2d 977, 980 (6th Cir. 1984). There is a presumption against any waiver of constitutional rights. *Id.* Given that the burden is on Defendants to prove sufficient consent (i.e. waiver) against the presumption of non-waiver, discovery had revealed that their burden cannot be met.[21] The forms as their only evidence—noting their evolvement over time—fail to unequivocally, specifically, and intelligently provide consent in such

[21] "[T]he plain language of Rule 56[] mandates the entry of summary judgment... against a party who fails to make a showing sufficient to establish the existence of an element essential to that party's case, and on which that party will bear the burden of proof at trial." *Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986).

circumstances.[22] As such, summary judgment is warranted in favor of Plaintiffs.

II. Substantive Due Process (Fourteenth Amendment)

"Parents," as plaintiffs[23], "possess a fundamental right to make decisions concerning the medical care of their children… which… naturally include the right to direct their children's medical care." *Kanuszewski*, 927 F.3d at 418. This means parents, instead of Defendants or the government, have the right to make decisions—i.e. provide consent—to direct the medical care of their children. The Sixth Circuit emphasizes the "importance of notifying parents as to any medical procedures that may have been conducted on their children and the importance of uniformity and consistency in how parents are notified." *Id.* at 421 fn.14. Michigan's newborn screening program hopelessly fails. Without securing informed parental consent, "Defendants' actions constitute a denial of the parents' fundamental right to direct the medical care of their children, and their actions must survive strict scrutiny." *Id.* at 420. Competent parents, not governmental officials, speak

[22] The Court will need to analyze each signed form separately because different forms were used at different times and with different decisions selected, and yet Defendants claim the same level of consent was obtained at each birth for indefinite storage (and use).

[23] As to substantive due process, any substantive due process rights related to directing the medical care of children are entrusted to the parents or legal guardians of the children, rather than the children themselves. *Kanuszewski*, 927 F.3d at 415.

for and are empowered to make decisions for their minor children in matters of medical issues. *Pierce v. Society of Sisters,* 268 U.S. 510, 535 (1925).[24] The question is "whether Defendants had a compelling interest in retaining, transferring, and storing the children's blood samples after screening them for diseases, and whether Defendants' means for achieving their interest were narrowly tailored." *Id.* at 421. In other words, does a non-consensual post-testing third-party biobanking process as part of the infants' medical care pass strict scrutiny? The answer is no because the right to consent to medical treatment for oneself and one's minor children is objectively, deeply rooted in this Nation's history and tradition. See *Dubbs*, 336 F.3d at 1203.

A. Strict scrutiny applies.

Strict scrutiny is "the most demanding test known to constitutional law." *Kolbe v. Hogan*, 849 F.3d 114, 133 (4th Cir. 2017). It also "requires legislative clarity and evidence demonstrating the ineffectiveness of proposed

[24] The State does not *ipso facto* assume *parens patriae* status over every child in Michigan. The Supreme Court has long (and expressly) rejected that a minor child is "the mere creature of the State." *Parham,* 442 U.S. at 602. The right to decide how to bring up a child—which includes medical decisions—is a well-established *fundamental* constitutional right. "This primary role of the parents in the upbringing of their children is now established beyond debate as an enduring American tradition." *Id.* "It is cardinal… that the custody, care, and nurture of the child reside first in the parents, whose primary function and freedom includes preparation for obligations the state can neither supply, nor hinder." *H.L. v. Matheson*, 450 U.S. 398, 410 (1991). "Constitutional interpretation has consistently recognized that the parents' claim to authority in their own household to direct the rearing of their children is basic in the structure of our society." *Ginsberg v. New York*, 390 U.S. 629, 639 (1968).

alternatives." *Johnson v. City of Cincinnati*, 310 F.3d 484, 504 (6th Cir. 2002). Strict scrutiny requires the government to show that the challenged state action is narrowly tailored to achieve a compelling public interest. *Ondo v. City of Cleveland*, 795 F.3d 597, 608 (6th Cir. 2015). When strict scrutiny applies, the government has the burden. See, e.g., *Fisher v. Univ. of Tex. at Austin*, 570 U.S. 297, 308 (2013). A compelling interest is an interest "of the highest order." *Wisconsin v. Yoder*, 406 U.S. 205, 215 (1972). Once a compelling interest is established, the government must further show that "the means chosen to accomplish the government's asserted purpose [are] specifically and narrowly framed to accomplish that purpose." *Grutter v. Bollinger*, 539 U.S. 306, 333 (2003). Here, Defendants lack both a compelling interest and narrow tailoring.

B. There is no compelling interest.

Defendants cannot demonstrate a compelling governmental interest, as the health of the tested infant is no longer at stake ***after*** his or her samples have been fully vetted for life-threatening diseases. *Kanuszewski*, 927 F.3d at 421; **Exhibit OO, Shah Dep., p. 20.** Once the newborn blood spots are fully analyzed by screening, residual blood remains leftover in the form of excess dried blood spots. Such long-term retention of these blood spots is not directly related to or necessary for the screening of infants for potential

diseases. As Professor Suter explains, "newborn screening initially began as a population health endeavor but is rapidly becoming a resource for population research." **Exhibit CC, p. 756**. Many parents do not realize that their child has been screened for various diseases, they are unaware of the possibility that a blood sample from their newborn may be stored for potentially long periods of time and possibly shared with others for uses unrelated to individual screening purposes. ***Id.* at 757.** The biggest concern is threats to autonomy, privacy, and confidentiality of medical information.[25]

Because biobanking exceeds any possible needed use for genetic disease flagging purposes, Defendants do not have a compelling government interest in the retention and storage of blood spots for future unspecified uses by commercial or academic researchers. The test for a compelling interest is quite strict, and requires far more than speculations on possible future evils. *Mozert v. Hawkins Cnty. Bd. of Educ.*, 827 F.2d 1058, 1077 (6th Cir. 1987). To be compelling, "[o]nly the gravest abuses, endangering paramount interests, give occasion for permissible limitation." *Id.* Specimen convenience through the sale of blood spots is not a compelling

[25] See **Exhibit CC, p. 779** (efforts should be made to inform parents about the general nature of the permissible and impermissible uses of the samples as well as security provisions else the public may not trust the state, believing, at best, that it has been negligent in protecting against problematic uses of the samples or, at worst, that the state may have malignant plans for such samples, which is why it has not set limits on these future uses.)

enough of a governmental interest when measured against the significant encroachment upon personal liberty and autonomy. While undoubtedly Defendants will assert a ***desire*** to vacuum up the remaining blood samples once testing is completed, it is not a ***compelling*** one. A compelling state interest must be more than a colorable interest, or an interest serving the convenience of the State. *Hudson v. Dennehy*, 538 F. Supp. 2d 400, 410 (D. Mass. 2008); *Thomas v. Collins*, 323 U.S. 516, 530 (1945). Biobanking practices that result the non-consensual retention, storage, and use of bodily material personal and deeply-private medical and genetic information/data fails to be a sufficient interest. As for the Plaintiff-Parents of the two infants born before May 2010 where consent was never even attempted to be obtained, such ongoing retention, storage, and available uses violates substantive due process. For those five infants born after May 2010, the consent obtained is insufficient to meet narrow tailoring.

C. There is no narrow tailoring.

Defendants also fail narrow tailoring. Narrow tailoring means that "the means chosen are not substantially broader than necessary to achieve the government's interest." *Ward v. Rock Against Racism*, 491 U.S. 781, 800 (1989). Narrow tailoring requires when the government could adopt a narrower regulation that would significantly reduce the negative impact on

protected activity without substantially interfering with its legislative goals it must do so.

Biobanking and post-testing retention and storage is a means substantially broader than necessary to achieve the government's interest of screening infants for newborn metabolic abnormalities to flag potential diseases. All medical screenings could be fully and completely accomplished without the biobanking or post-screening uses and without any reduction of effectiveness of disease detection for newborn screening. As such, the addition of such fails narrow tailoring.

D. Sufficient consent could be obtained.

A narrower alternative Defendants could also obtain needed samples by tailoring its program by simply asking for and receiving sufficient informed parental consent at a far more appropriate pre-natal timeframe. The current practice fails to obtain such legally sufficient consent.[26] It is undisputed that constitutional rights can be waived by consent. However, not "any ole" consent will do. Courts must "indulge every reasonable presumption against waiver of fundamental constitutional rights." *Johnson v. Zerbst*, 304 U.S. 458, 464 (1938). Consent must be voluntary, knowingly, and intelligently

[26] As for the parents of the remaining five infants, Defendants will argue that their substantive due process rights were waived by consent using the five consent cards. The narrow tailoring analysis equally presents why this alleged obtained of consent fails.

obtained and confirmed by "clear and compelling" evidence of the same. *Curtis Publ'g Co. v. Butts*, 388 U.S. 130, 145 (1967). There is no such thing as presumed acquiescence in the loss of fundamental rights. *Ohio Bell Tel. Co. v. Public Utilities Comm'n*, 301 U.S. 292, 307 (1937).

E. Proper sufficient consent was not secured.

While there are differences in the overlap of the *Curtis* standard of constitutional waiver versus medical informed consent, neither standard has been met by Defendants in obtaining sufficient informed consent from parents for post-testing biobanking.

First, parents traditionally are not given enough information about the post-testing retention, storage, and uses of blood and deeply-private medical and genetic information to make a sufficiently informed choice. The Parent-Plaintiffs aver this. **Exhibits X, Y, Z.** The Eisenhauer study confirms the same. **Exhibit AA.** There was no disclosure of what constitutes "medical research" or "health research." There is no mention that the samples are sold for monies. There is no mention that for-profit companies have access. There is no mention of how samples can be selected based on data like zip code, age, gender, or more, which when combined with other data, can reveal the identity of the person from their sample. And there is no mention that even if a parent declines to participate in nebulous "medical research" or "health

research," Defendants nevertheless retain the blood samples indefinitely at two different sites.[27]

Defendants will undoubtedly suggest that there are printed pamphlets. None of the parents received them. **Exhibit X, ¶4; Exhibit Y, ¶4, and Exhibit Z, ¶4.** This is not remarkable or suspicious because the State's own Commission even acknowledged informational booklets describing newborn screening are not always available to parents. **Exhibit A, p. 36**. Plaintiffs would suggest that a lack of brochures is the norm rather than the exception.

Second, the consent sought is not "intelligently" obtained when moms are asked to "sign a form" in the immediate aftermath of the painful and body-damaging agony of childbirth. See **Exhibit V** (describing postpartum status of mothers); see also **Exhibit X, ¶14; Exhibit Y, ¶14; Exhibit Z, ¶12.** When dads are asked (though rarely), they too are in the "fog of war." If Defendants truly cared about true informed parental consent, seeking consent for retention of blood samples for research would be done in the prenatal period, i.e. the months and weeks (or even hours if women do not receive prenatal

[27] No one has been able to explain why Defendants, when presented with a decision of a parent not to participate in any "medical research" or "health research" that the State ***still*** keeps one of the infant's blood spot in the Lansing warehouse and the others at the Biobank. If the sample cannot be used for "medical research" or "health research," for what possible reason are the samples nonetheless retained? In all likelihood, the selection of not to participate in "medical research" or "health research" is illusory.

care) before the start of active childbirth. **Exhibit X, ¶14; Exhibit Y, ¶14; Exhibit Z, ¶12;** see also **Exhibit CC, p. 782.** Defendants have long had time, pre-birth, to undertake an informed "ask" long before a parent is at her (or his) mentally weakest and physical most exhausted point and while in an ineffectual state of mind to make such a key decision. Such select time is likely to intentionally prevent probing questions, then or later.[28] ***Id.***

Third, the forms themselves lack sufficient disclosure or explanation about the biobanking program or the post-screening long-term storage, retention, or uses of their children's blood spots. Again, Parent-Plaintiffs aver this; Dr. Eisenhauer confirms the same. **Exhibit X, ¶¶23, 39; Exhibit Y, ¶¶23, 39; Exhibit Z, ¶¶22, 37; Exhibit AA.** The pre-2017 forms merely seek consent for "medical" or "health" research. There is no mention of who is doing the health or medical research (with no mention of third parties, for-profit and others), or of the Biobank. There is no mention of the significant revenue stream of several million dollars or of development (or future plans to develop) sellable products for academic and commercial researchers. There is no discussion of risks or alternatives, especially by inadvertent mistakes of government employees (**Exhibit W**) or the existence of public

[28] Remember, after that signature, Defendants never seek consent from parents ever again.

data that cause privacy evisceration due to genetic linking. See e.g. **Exhibit QQ.** Defendants long undervalue that "any loss of [genetic] privacy cannot be reversed." ***Id.*****, p. 3.** Most critically, there is no disclosure of indefinite retention of private medical data within government databases.

When more information began to be provided on the forms starting in 2017, parents begin deciding against such activities. However, they still fail to sufficiently understand—likely due to the time of when consent is sought—that samples were nevertheless being indefinitely retained by Defendants. Even with more (but still insufficient amounts) of information, parents become leery of what they do not understand will happen to their children's blood spots containing deeply private medical and genetic information when sought be used for undisclosed research unrelated to the purposes for which the blood is originally to be drawn. **Exhibit Z** (attachments). And most problematic, there is no legal protection that such directives are even being honored. This opt-in/pull-out process does not exist under the statute or by promulgated administrative rules, but rather merely a voluntary internal self-agreement among the Defendants.

In short, the consent process utilized here in constitutionally deficient. It is nothing more than consent by stealth or subterfuge which is no consent at all. *Gouled v. United States*, 255 U.S. 298, 305-306 (1921).

F. Conclusion

Governmental interest as to the retention, storage, and use of bodily material containing personal and deeply-private medical and genetic information/data is unneeded to conduct newborn screening and thusly is not compelling. It is also not undertaken in a narrowly tailored way to overcome Plaintiff-Parents' fundamental right to make medical decisions on behalf of their children. Substantive due process has been violated.

III. Remedies (Further Briefing Needed)

"Federal courts must [] ensure that state officers meet their obligations under federal law." *Price v. Medicaid Director*, 838 F.3d 739, 746 (6th Cir. 2016). "[A] federal court may, without violating the Eleventh Amendment, issue a prospective injunction against a state officer to end a continuing violation of federal law." *Id.* at 746-747 (citing *Ex parte Young*, 209 U.S. 123, 159 (1908)). Plaintiffs have asked for different types of remedies under the guise of declaratory and injunctive relief. **First Am. Compl., ¶118.**

Declaratory relief is a proper remedy under Section 1983. 42 U.S.C. § 1983. This Court "may declare the rights and other legal relations of any interested party" via a declaratory judgment. 28 U.S.C. § 2201(a). "Any such declaration shall have the force and effect of a final judgment or decree and shall be reviewable as such." *Id.* Injunctive relief is available too. A party is

entitled to a permanent injunction if it can establish that it suffered a constitutional violation and will suffer continuing irreparable injury for which there is no adequate remedy at law. *Women's Medical Professional Corp. v. Baird*, 438 F.3d 595, 602 (6th Cir. 2006).

With these broad strokes of available remedies presented, there are numerous legal paths this Court can take to fashion an appropriate remedy for the violations of Plaintiffs' constitutional rights. Plaintiffs propose that, given the complexity of the issues on constitutionality, that the current motion be focused on that and leave the question of an appropriate remedy until after this Court decides this motion.

RELIEF REQUESTED

Based upon the foregoing, the Court is requested to grant summary judgment in favor of Plaintiffs and direct the parties to submit further briefing as the appropriate remedies for these constitutional violations.

Date: February 22, 2021

RESPECTFULLY SUBMITTED:

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CERTIFICATE OF SERVICE

I, the undersigned attorney of record, hereby certify that on the date stated below, I electronically filed the foregoing with the Clerk of the Court using the ECF system which will send notification of such filing to all counsel or parties of record.

Date: February 22, 2021

RESPECTFULLY SUBMITTED:

/s/ Philip L. Ellison

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INDEX OF EXHIBITS

Michigan Commission on Genetic Privacy and Progress

Final Report and Recommendations

February 1999

Genetics Commission Report

The Governor's Commission on Genetic Privacy and Progress was created in November 1997 by Governor Engler to examine specific issues in genetics and report on potential state involvement or intervention.

This document contains background on genetics and the commission's specific recommendations.

Our work would not have been possible without support from the Governor's Office, Michigan Department of Community Health (MDCH), Department of Civil Rights, and other units of state government. We want to thank Dennis Schornack, Jim Haveman, Carol Isaacs, Nan Reynolds, and Art Stein. We also want to thank the hundreds of people listed in the acknowledgment section for their important assistance and contributions. All were gracious with their time and help.

The project had valuable student support from Rosemary Quigley, Allison Shuren, Anita Bhama, and Anna Rath. It also benefited from prior work done by a joint University of Michigan/Michigan State University Genome Policy Project and from public forums held throughout the state.

The project could not have been completed without critical staff work from Janet Graham, executive assistant, Rhoda Powsner, project director, and my secretary, Nancy Clark.

Finally, we wish to thank Governor Engler for the opportunity to serve and consider these critical issues. As chair of the commission, I want to personally thank all the members for their lively discussions, insightful comments and zeal to create a thorough report for the citizens of Michigan.

On behalf of the commission, I hereby present this report to Governor Engler
this fifth day of February, 1999.

Edward B. Goldman
Chair

Table of Contents

I. Executive Summary of Recommendations

Summary of Genetic Commission Recommendations

1. General Recommendations

a. The commission recognizes that remarkable advances in basic knowledge in genetics as well as in genetic technology are occurring at a rapid rate. While the public has not indicated a strong interest in legislation generally, they have indicated a strong interest in privacy protection and protection from discrimination.

b. Any legislation should consider genetics in the context of medical issues as a whole. Thus, in the areas of privacy it is important to protect all confidential medical information.

c. For the reasons discussed in this report, including the rapid advancement of genetics technology, we believe that legislation should be as flexible as possible to account for the inevitable changes in technology and the corresponding challenges the technology will present. Legislation should be limited to areas in which professional standards and codes of ethics are insufficient to protect the public good and individual rights. In addition, legislators should take care to avoid legislation that inappropriately prohibits or hinders beneficial genetic testing and research.

d. Ongoing expert advice and analysis are needed. The Governor should provide a mechanism for continuing access to expertise that can assist in the creation of policy as the field of genetics evolves.

2. Privacy

The federal government, by September of 1999, is required to adopt privacy regulations on medical information. These regulations will set a floor for all state regulations. The commission's recommendation is to wait until the federal legislation is passed before determining whether legislative response at the state level is needed to confer additional protections. An expert advisory committee could assist at that time.

The commission does have the following specific recommendations concerning privacy:

a. Privacy protections should encompass all medical information, not just information related to genetic matters.

b. We recognize that there are federal and institutional guidelines that protect the privacy of individuals who take part in research, and the commission does not want to recommend more stringent regulations which would unreasonably hamper the conduct of research in genetics.

c. There may be a need for a very limited exception to general respect for privacy in the case that follows: The commission recommends that a physician be permitted, but not obligated, to disclose information to family members in the event that failure to disclose the information could reasonably lead to preventable serious harm to that person, and the patient refuses, even after counseling, to disclose that information.

d. The commission recommends that after the federal government acts, the state should consider the need for additional protections in the context of general protection of medical information.

3. Ownership

The commission recommends that there be no law creating special property rights in DNA or genetic samples, tissue or information. These laws have not been useful in other states and may introduce confusion and conflict with other laws such as those governing malpractice and the Federal Clinical Laboratory Regulations. Patients should continue to have rights to access their medical information.

4. Collection, Use and Storage

The commission has recommendations in the areas of forensics, newborn screening, and paternity.

a. Forensics. In criminal investigations, the commission recommends that if suspects are eliminated from further investigation, all of their DNA samples and records be destroyed in the presence of witnesses at a state-designated testing site. Audit records should be prepared.

b. Newborn Screening. The commission recommends that newborn screening continue as it currently has with no requirement for informed consent due to the important public health benefit of screening. Any added newborn testing should be only for conditions for which diagnosis and treatment are both efficacious and effective in preventing irreversible physical or mental changes or in ameliorating a chronic condition. The commission also recommends that the newborn screening cards be retained in an appropriate environment that preserves the integrity of the samples so they can be used as a resource for future research, for individual identification of missing children, and for investigation of familial conditions. Research should be allowed only under stringent conditions to protect privacy and in accord with the federal rules governing medical research. Thus, the commission recommends that any new screening testing or any research on newborn screening samples be reviewed and approved by an expert advisory committee such as the Genetic Disease Advisory Committee currently in existence.

Finally, the commission recommends public education including state-created publications that notify parents how to refuse use of samples for future research.

c. Paternity. The commission recommends that DNA-identifiable information not be included in paternity testing results that are forwarded to courts. The concern is to avoid placing genetic information in the public record. Other recommendations deal with clarifying technical aspects of existing law.

5. Discrimination

The commission considered issues of genetic discrimination in employment and discrimination that could compromise the ability to obtain, retain and afford health insurance. The commission was not charged with studying issues related to disability and life insurance, where separate considerations may apply.

a. Health Insurance. The commission recommends legislation to prohibit health insurers from requiring predictive genetic testing or testing for carrier status of asymptomatic individuals.

The commission recommends that there should be no obligation to release genetic information to insurers if that information was obtained as part of participation in a research project. However, the commission was divided regarding the ability of the health insurer to obtain genetic information known to the patient and obtained in a clinical (non-research) setting.

b. Employment. The commission recommends legislation to prevent use of genetic testing as a condition of employment.

6. Definitions

The commission recommends specific definitions of genetic testing and genetic information. The commission notes that definitions could be broad or narrow and the report makes specific recommendations about implications of definitions.

7. Education

In addition to specific education recommendations in the newborn screening section of this report, the commission recommends that education occur so that the citizens of the state of Michigan can be knowledgeable about genetics. Education should occur at the K-12 level and a model curriculum should be used. The commission believes that professional education should continue to occur through professional organizations. The commission recommends that educational material such as videotapes and publications should be made available with special emphasis on genetics in health care.

8. Research

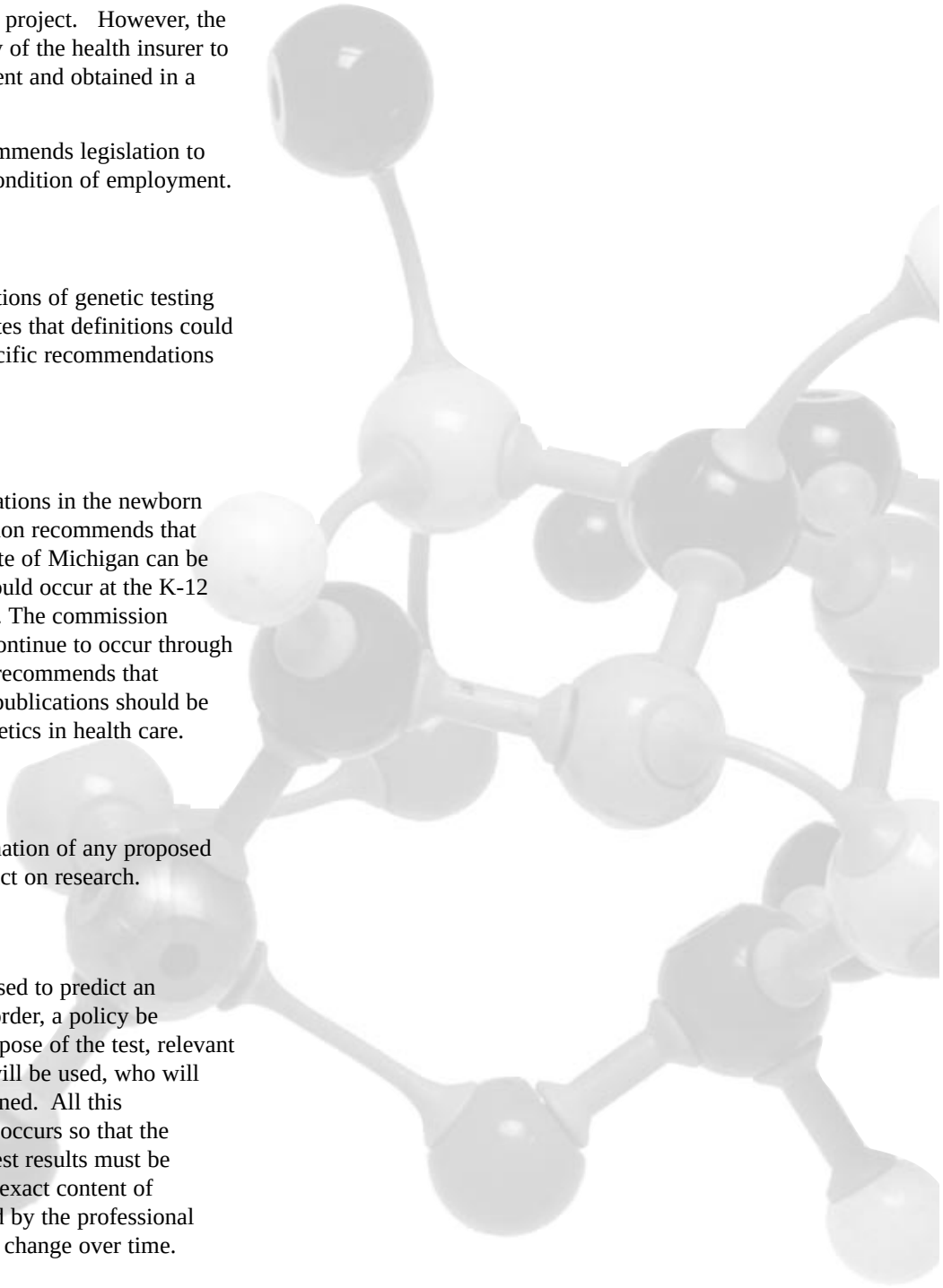
The commission recommends careful examination of any proposed laws to avoid any unintentional adverse impact on research.

9. Informed Consent

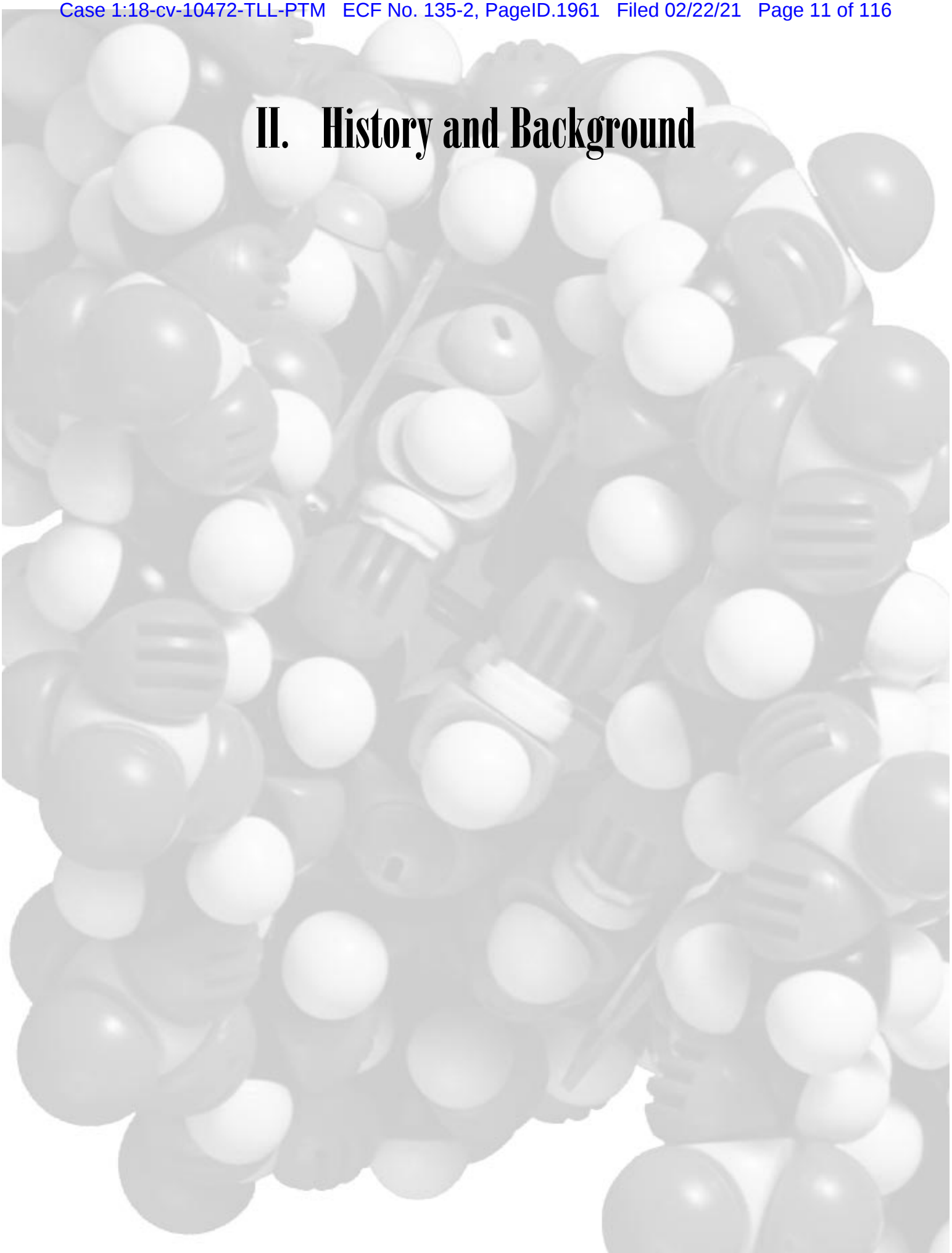
The commission recommends that for tests used to predict an individual's susceptibility to a disease or disorder, a policy be developed to inform the individual of the purpose of the test, relevant risks, benefits, alternatives, how the results will be used, who will have access, and how the results will be retained. All this information must be provided before the test occurs so that the individual can decide whether to proceed. Test results must be provided to the individual upon request. The exact content of information to be provided is best determined by the professional community since the content will necessarily change over time.

10. Telemedicine and Access

The commission recommends that physician-to-physician consultations be allowed across state lines because specialized genetic tests for many conditions are available at only a few sites in the United States.



II. History and Background



History and Background

The Michigan Commission on Genetic Privacy and Progress

In his January 28, 1997 State of the State Address, Governor John Engler announced plans to appoint a Governor's Commission on Genetic Privacy and Progress "to recommend ways to protect genetic privacy, prevent discrimination and maximize the beneficial uses of new medical knowledge" resulting from the Human Genome Project. Anticipating the tremendous good that such technology would bring, but also the harm that might result from improper use of genetic information, the Governor indicated his desire to resolve proactively problems that would inevitably arise.

The commission was created September 26, 1997 by Executive Order 1997-14.

Various professional and special interest groups submitted names of candidates for the commission. Interviews were conducted and recommendations were made to the Governor. He made the final selection. The commission consists of the following members:

- Edward B. Goldman, JD, University of Michigan Health System, Ann Arbor, Chair
- David J. Aughton, MD, William Beaumont Hospital, Royal Oak
- Shirley Bach, PhD, Western Michigan University, Kalamazoo
- Howard Cash, President, Gene Codes, Ann Arbor
- James K. Haveman, Jr., Director, Michigan Department of Community Health
- Robert Lentner, Mid-Michigan Chapter of Huntington's Disease Society, Midland
- Thomas Meyer, JD, Jackson National Life Insurance Company, Lansing
- Elizabeth Petty, MD, University of Michigan Health System, Ann Arbor
- Nanette Lee Reynolds, EdD, Director, Michigan Department of Civil Rights
- Sonia Suter, MS, JD, Greenwall Fellow, Georgetown and Johns Hopkins Universities, Washington D. C.
- Helga Toriello, PhD, Butterworth Hospital, Grand Rapids

Staff members are Rhoda M. Powsner, MD, JD, project director, and Janet L. Graham, executive assistant.

The first meeting of the commission was held in November 1997. The commission reviewed the charge in Executive Order 1997-14. The charge stated that:

1. The commission shall recommend model state statutory and administrative policies that protect the privacy of genetic information, prevent discrimination based upon such genetic information in the areas of employment, health care, health care insurance, and government record keeping, or regulate certain uses of genetic information so as to safeguard the interests of the people of the state of Michigan.

2. The commission shall restrict its policy recommendations to those that are appropriate for adoption by state government. In addition, the commission may encourage the consideration and adoption of policies consistent with those it recommends for state government by other organizations and institutions within the state.

3. The commission shall recommend state policies concerning the collection, storage, use and destruction of human DNA samples so as to protect and secure the privacy of such human DNA samples against abuse or misuse by any person or organization, including government.

4. The commission shall recommend state policies concerning access to genetic information and the conditions for the release of genetic information by any person or organization, including government.

5. The commission shall recommend state policies concerning the receipt and management of genetic information from any person or organization, including government, and conditions for the use of genetic information by such recipients.

In December 1997 and January 1998 by-laws were drafted and subcommittees were formed to address the various issues in the charge. Thereafter, monthly commission meetings were held in accordance with agendas that were drawn up to cover specific topics. The commission held 14 meetings including a two-day retreat in September.

Public forums were advertised and held in Grand Rapids, Saginaw, Flint, Ann Arbor, Detroit, Traverse City and Okemos. The Okemos program was a video conference that included Hancock, Iron Mountain and Marquette. In addition to the general public, special interest groups were represented. Testimony was varied. Most notable was the fact that the opinions expressed did not indicate overwhelming concern with any one particular aspect of genetics, but rather revealed a collection of concerns that one might expect from a reasonably representative group. The forums are discussed in greater detail elsewhere in the report.

From 1996-1998 the University of Michigan and Michigan State University conducted a genome policy project to study development of genetic policy. The project was based on extensive community dialogues with Michigan citizens. The resulting report helped the commission in understanding citizens' concerns. The project found that, in general, the participants were reluctant to endorse any legislation except for legislation to prevent discrimination and protect the privacy of medical information.

The commission systematically studied current and proposed legislation concerning genetics and met with the various state agencies involved in genetics-related issues. In addition to accumulating information about the history and function of programs dealing with newborn screening, forensic DNA testing and paternity testing, commission members met with personnel from the Insurance Bureau, representatives of the insurance industry, and staffs of the Department of Community Health, the Michigan State Police Forensic Laboratory, and the Family Independence Agency, as well as attorneys general working with these departments and county prose cuting attorneys dealing with paternity testing.

The commission examined current and proposed future uses of genetic analysis. One concern the commission had was the singling out of genetic issues to the exclusion of other medical issues. For example, the commission felt that the best way to protect genetic privacy was to protect the privacy of medical information generally. The commission strongly urges the state to consider genetic issues in the broader context of medical questions.

The commission not only drew upon consultants within the state, but it also exchanged information with the head of the DNA Forensic Program in Great Britain, members of the U.S. National Institute of Justice, genetics groups throughout the country, laboratory directors of newborn screening programs, the National Bioethical Advisory Committee, the Ethics Foundation of the American Medical Association, the Michigan State Medical Society, the American Society of Clinical Pathologists and Congressional staff members.

Background information and a familiarity with the ongoing activities of state programs permitted discussion and debate of actual as well as anticipated issues. If, while conducting their work, the commissioners found areas that could be enhanced without legislative action, they worked with the appropriate agencies to achieve that goal. Notable examples were questions associated with newborn screening, forensic DNA testing and paternity testing.

Much credit is owed to the Department of Community Health, the Family Independence Agency, the Insurance Bureau, the State Police Forensic Laboratory, the assistant attorneys general and the prosecuting attorneys working with these agencies for their assistance.

On file at MDCH are all agendas and minutes of the commission's meetings as well as materials from the public forums, working documents and background papers. The commission established a web site at www.mdch.state.mi.us/mcgpp/mcgpp.htm with other background information.

III. Public Forums

PUBLIC FORUMS

Background of the Forums: To educate the public and solicit public interest and concerns, the commission conducted public forums at Grand Valley State University in Grand Rapids, the Sarvis Center in Flint, the Wayne County Medical Society in Detroit, Saginaw Valley State University in Saginaw, Washtenaw Community College in Ypsilanti and Northwestern Michigan College in Traverse City. In addition, a public forum for Lansing included a video conference conducted from the office of the Michigan Public Health Institute in Okemos. That forum was transmitted to several sites in the Upper Peninsula, including Marquette, Iron Mountain and Hancock.

Prior to the forums, the commission published a widely distributed brochure and letter that outlined the purpose of the forums and encouraged the public's attendance. Brochures were sent to hospitals, medical professionals, the lay public, support groups involved in genetic issues and the legislature. In addition, newspapers and radio stations in each of the participant cities were contacted to promote the forums. The Lansing State Journal ran a two-page story that addressed many of the issues before the commission. Various radio stations attended the forums.

Despite efforts to publicize the forums, attendance was primarily people who had a personal or business interest in the issues. Attendance ranged from one at the Detroit meeting to more than 30 at the Okemos meeting.

At the beginning of each forum, the moderator introduced the commission members present. In addition, the moderator provided a short explanation of the commission's goals and clarification of the issues under consideration. After the public testimony, the panel engaged in discussion with the audience.

Summary of Testimony: The testimony of the public can be categorized into several recurring topics. A common theme in most testimony was the need to protect personal privacy of medical information.

- **Privacy and Access:** One concern expressed repeatedly is that privacy should not interfere with properly conducted research. The need to manage our information systems to assure that risks to privacy and access to confidential information are minimized was also an issue.

  There were mixed sentiments about the necessity or desirability of informing other family members of genetic conditions. Some suggested that there is a duty for physicians to inform family members of a genetic risk, while others felt that there were both a personal and a family right not to know. Some sessions discussed options for disclosure when there is imminent risk of injury to other family members.

  Although some expressed the view that medical records should be treated differently from genetic information, many thought there was no need for separate genetic-specific laws.

- **Collection, Storage, Use:** Most people advocated informed consent for collection and use of samples, however, the manager of a lab that analyzes DNA for paternity testing expressed concern about being over-regulated.

  A concern was raised regarding the process of reporting paternity results to the court system. Currently, positive results of paternity DNA testing, including both probability of paternity and genetic information, appear in court records that are open to public scrutiny.

  Some worried that an employer could ask for hair, blood or tissue samples for the purpose of drug testing and then use results or the samples for undisclosed purposes.

- **Education:** It was the view at almost every public forum that educating the public about genetics in general and ensuring that citizens keep up with the swift changes and advances in genetic technology is a responsibility the state of Michigan should address.

- **Research:** The public and the research community are apprehensive that privacy concerns might impede research. As a safeguard, many participants advocated the requirement of informed consent for anything other than anonymous research. One participant advised that precautions be taken at the time research samples are anonymized to ensure that the information derived from that research does not find its way back into clinical medical records.

- **Discrimination:** The biggest concern the public expressed at the forums is tremendous fear of health insurance or employment discrimination based on genetic information.

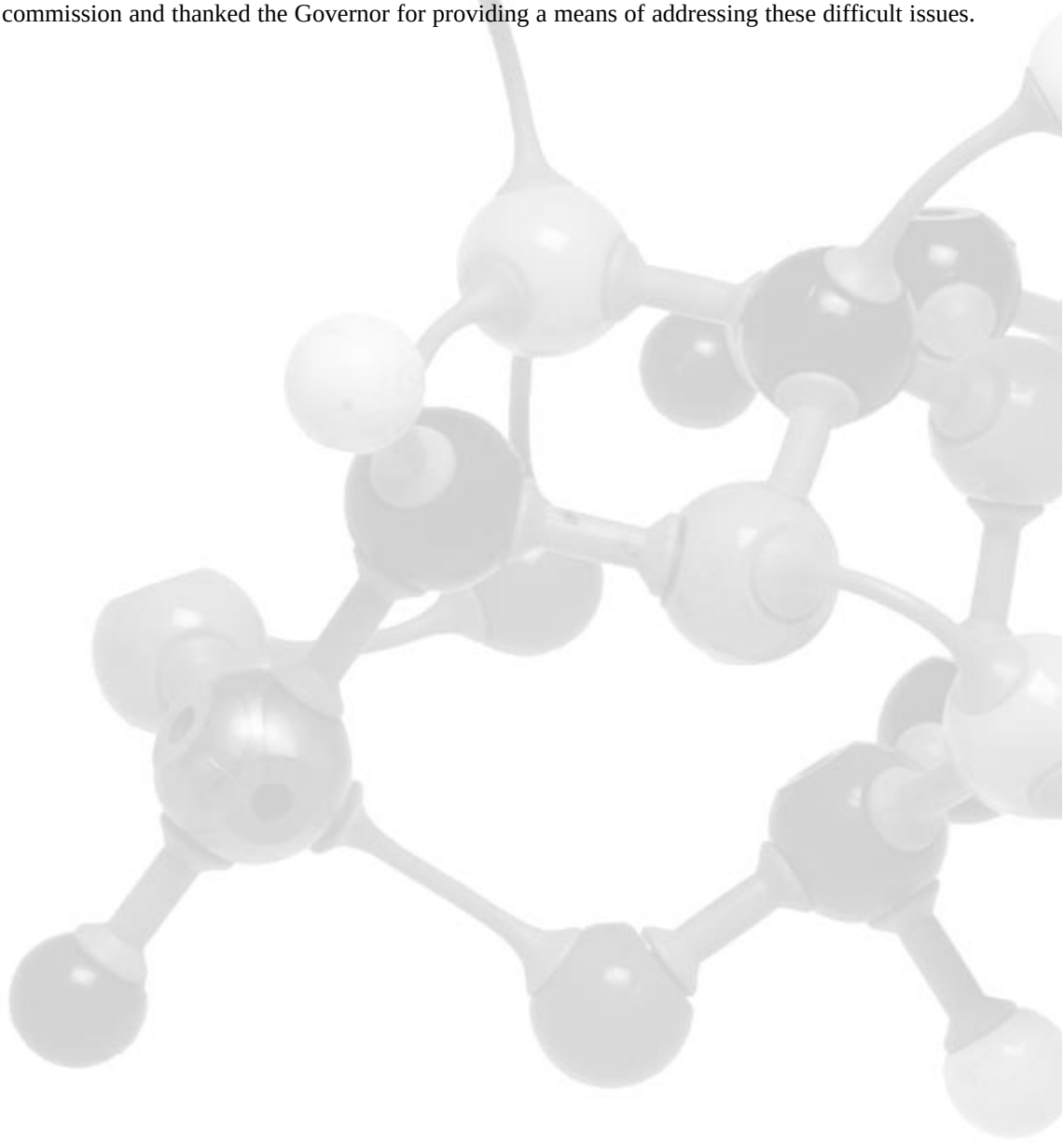
  One participant testified that she was advised by her physician not to undergo genetic testing for fear of not being able to acquire health insurance in the future. Insurers at the forums stated that though they do not require genetic testing at this time, they believe that they should have the right to use any information, including genetic information, already known to an applicant.

  There was also a concern that insurance companies might use genetic test results that are not actuarially validated to set premiums.

  Regarding employment discrimination, one common view is that "to condition employment on (genetic) information is to deprive capable individuals of the opportunity to be contributing members of the workforce."

Two other issues addressed by the public that were not part of the commission's mandate were (1) concerns about licensing technicians to perform DNA analyses, and (2) availability of medical information to adoptee and adoptive parents. The first issue is being addressed at the national level by professional organizations such as the American Society of Clinical Pathologists and the American Society of Crime Laboratory Directors. The second issue is already addressed in Michigan law.

In general, the views expressed by the public at the forums addressed both the risks and benefits of genetic testing. One participant said, "No matter what the cost, we must keep up with progress and technology." Many of the participants expressed thanks for the opportunity to offer input to the commission and thanked the Governor for providing a means of addressing these difficult issues.



IV. Michigan Genetics Laws

Michigan Genetics Laws

1. MCLA 28.171 DNA Identification Profiling System Act effective June 17, 1994. State Police, pursuant to rules to be adopted, shall work with the FBI to develop the capability of conducting DNA identification and genetic-marker profiling.

   State Police shall permanently retain the DNA identification profile of an individual convicted of:
   attempt to murder 750.91
   1st degree murder 750.316
   2nd degree murder 750.317
   kidnapping 750.349
   criminal sexual conduct any degree 750.520 b, c, d, e, g
   520b 1st ; 520c 2nd; 520d 3rd; 520e 4th; 520f (second offense) 520g assault with intent to commit criminal sexual conduct

2. Testing Newborns. MCLA 333.5431 (Since 1948). Health professionals in charge of newborns shall test for seven conditions (phenylketonuria, galactosemia, hypothyroidism, maple syrup urine disease, biotinidase deficiency, sickle cell anemia, and congenital adrenal hyperplasia) “and other treatable but otherwise handicapping conditions as designated by the department.”

   Tests shall be administered and reported to the Department of Community Health. Parents shall be told if test results are positive. The law does not mandate any consent to obtain the samples.

3. Chronic Diseases. MCLA 333.5401 et seq. (1978). The Department of Community Health shall establish a chronic disease prevention and control program including genetic disease. The program includes: prevention, early detection and reporting, surveillance, treatment, education, rehabilitation and maintenance of patients.

4. Adoption Code. MCLA 710.68 (last amended 1994). This statute describes how to obtain biological information on an adopted child, including genetic information.

V. The Report

The Report

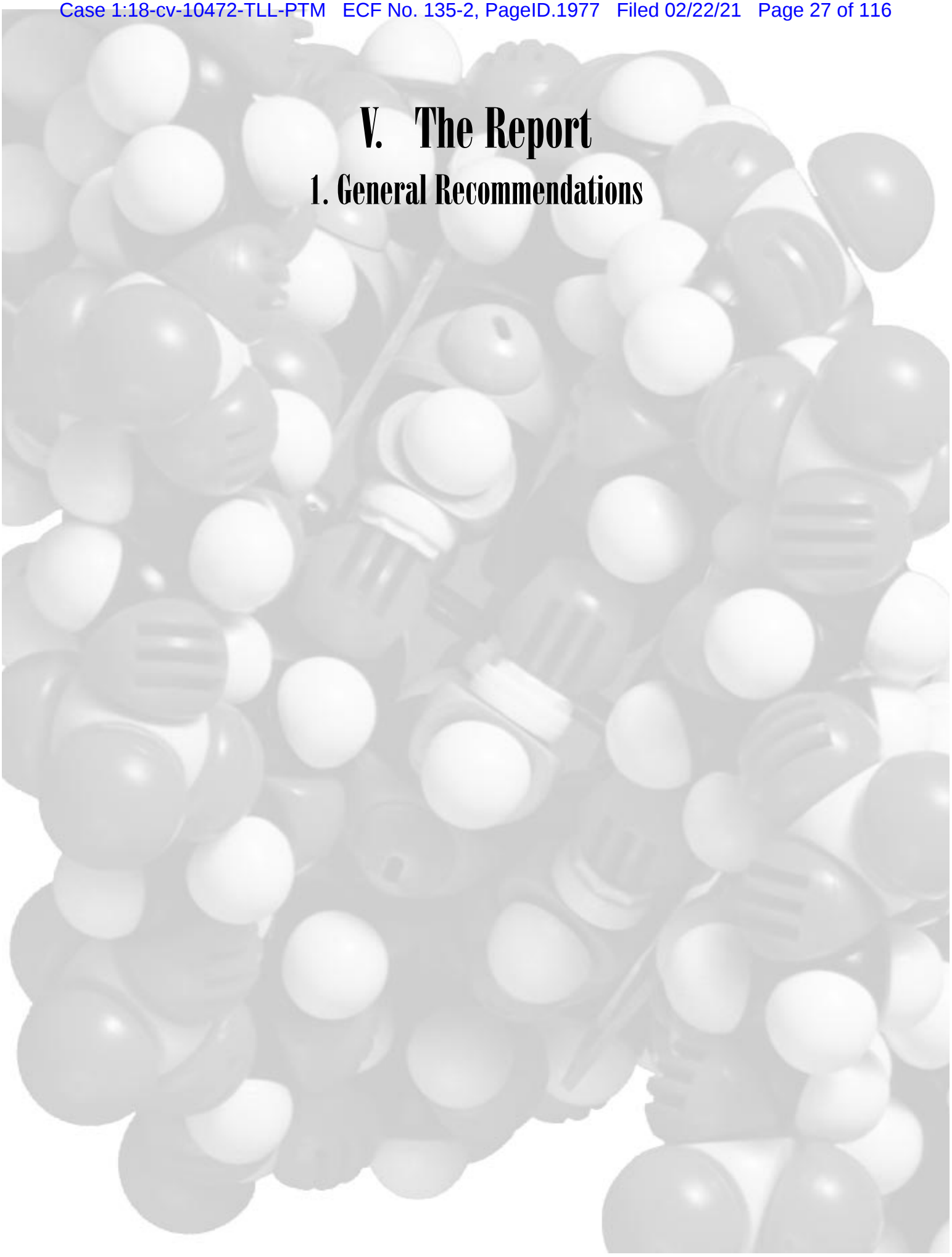
This report addresses the charges in Executive Order 1997-14.

Each section will set forth the issue to be considered, background and analysis and the commission recommendations. Substantial background material was collected and analyzed by the commission. To keep the size of this report reasonable, most of the background material is not included in this report but is referenced in the bibliography and list of articles in the appendix.

The report is based on substantial contributions by all commission members. In almost all cases, recommendations are the unanimous consensus of the members. For those few areas where consensus was not achieved, alternative minority recommendations are reflected.

V. The Report

1. General Recommendations



General Recommendations

Legislation

Issue: Is there a need for immediate legislative activity? Should genetics be a separate subject for legislation?

The commission recognizes that remarkable advances in genetics are occurring at a rapid rate. Although the public has not indicated a strong interest in legislation in this area generally, they have indicated a strong interest in privacy protection and protection from discrimination.

Any legislation should consider genetics in the context of medical issues generally because the commission is not persuaded that genetic information is substantively or substantially distinct from other medical information. Thus, in the area of privacy, it is important to protect all confidential medical information. Moreover, concerns with respect to genetics that arise in areas such as informed consent or insurance may be applicable to other medical information.

For the reasons discussed in this report, including the rapid advancement of genetics technology, we believe that legislation should be as flexible as possible to account for the inevitable changes in technology and the corresponding challenges the technology will present. Legislation should be limited to areas in which professional standards and codes of ethics are insufficient to protect the public good and individual rights. In addition, legislators should take care to avoid legislation that prohibits or hinders beneficial genetic testing and research.

Continuing Expert Advice and Analysis

Issue: How should state government keep track of advances in genetics and their implications for possible legislation?

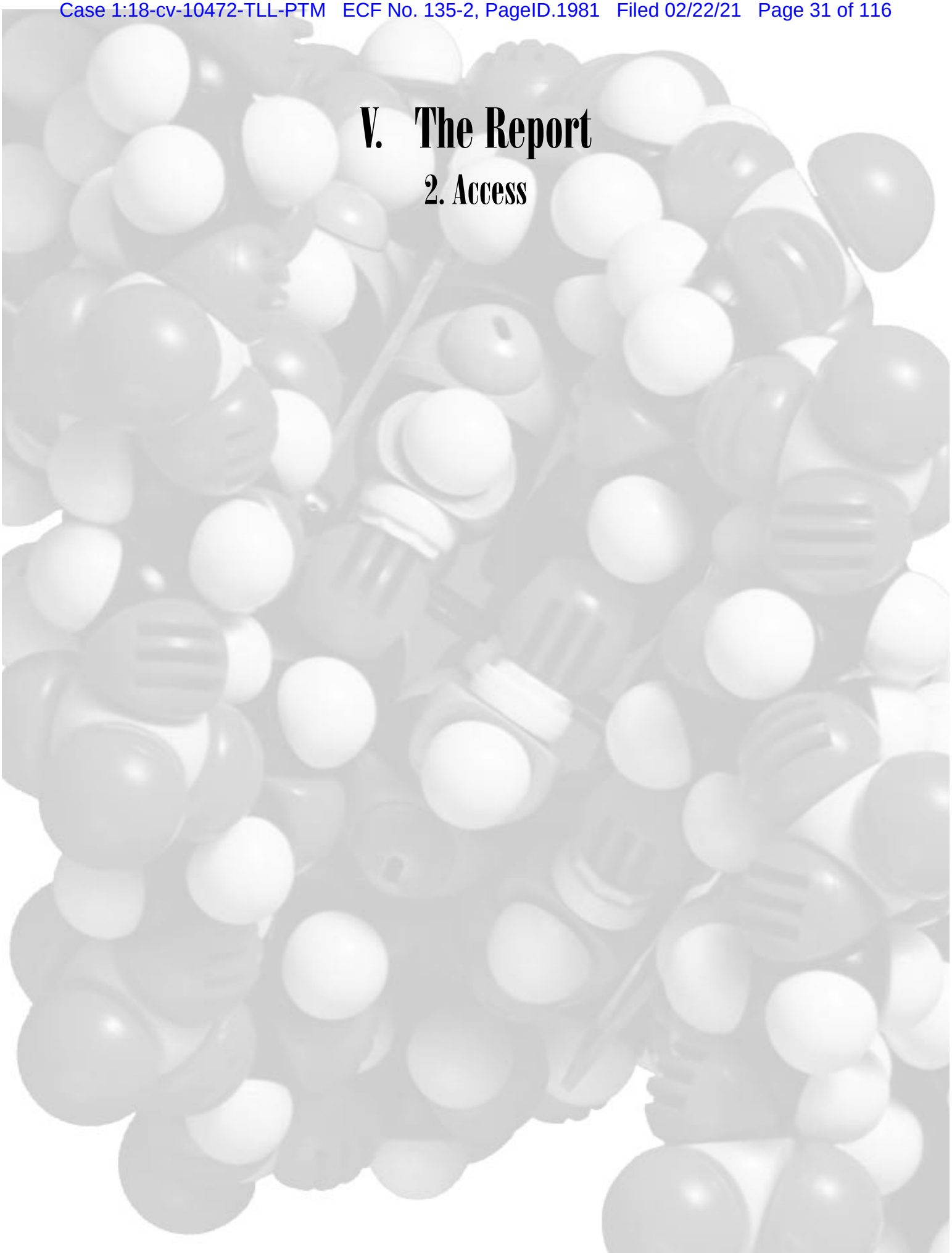
Background: The field of genetics is rapidly evolving. Scientific and medical advances in genetics have the potential to improve our health, identify criminals, provide new insights into human behavior, and improve our lives. At the same time, if misused, genetic information could result in discrimination and interfere with established civil liberties.

Analysis: The concerns associated with genetics are multi-disciplinary. Scientific, medical, legal and ethical analysis are important to understand the implications of genetic advances. Public input is critical to understand the concerns of Michigan citizens.

Recommendation: The commission recommends that the Governor provide a mechanism for continuing access to expertise that can assist in the creation and analysis of policy in the area of genetics. Analysis should be available to evaluate public concerns and to recommend approaches as genetic technology evolves. Expertise could be provided from research geneticists, clinical geneticists, physicians, lawyers, bioethicists, biotechnology representatives and other relevant stakeholders.

V. The Report

2. Access



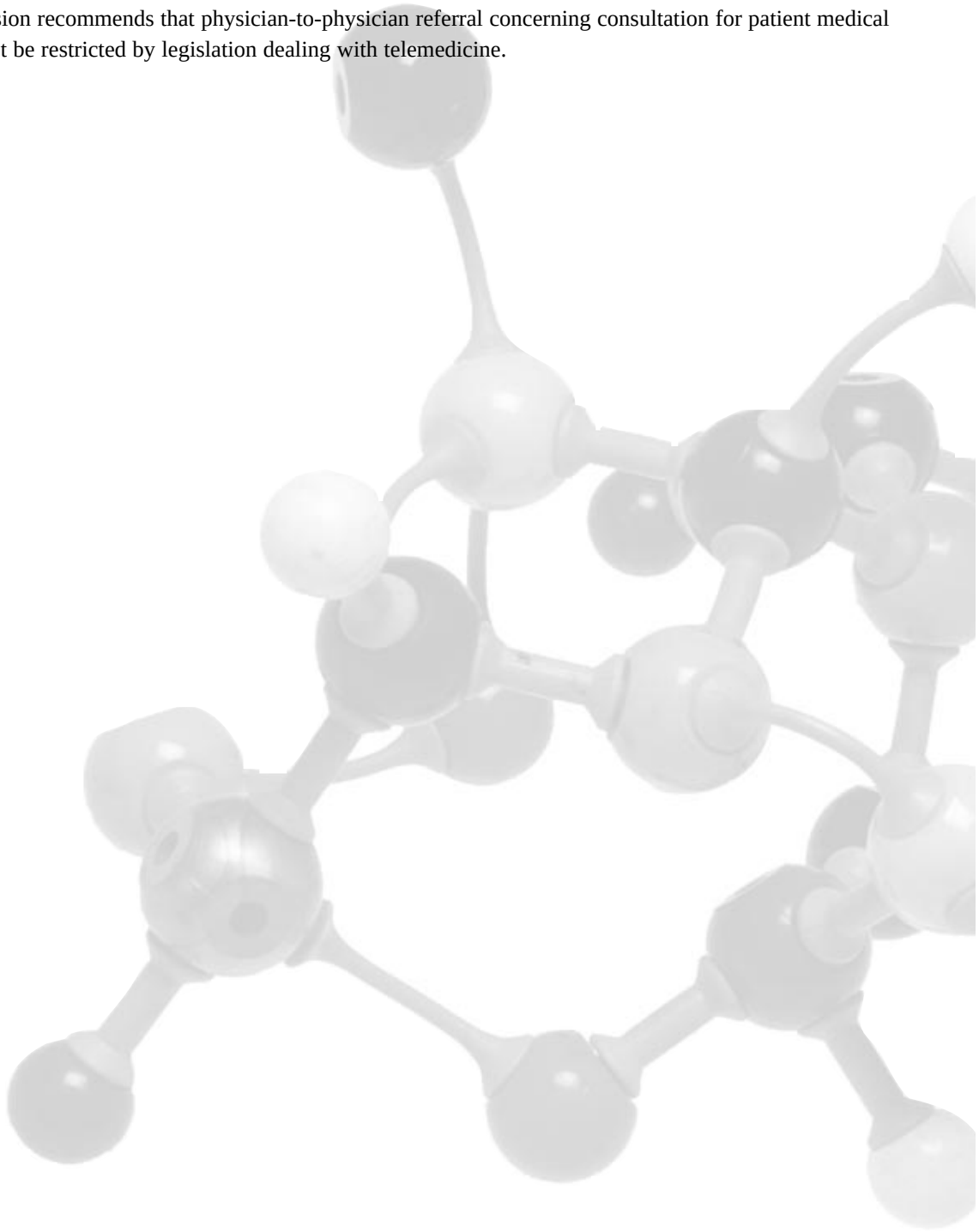
Access: Genetics, DNA Testing and Telemedicine

Issue: Should there be a limitation against consultation and testing across state lines?

Background: With the development of technology that facilitates medical diagnosis and treatment across state lines and national boundaries, regulatory and legal issues have arisen.

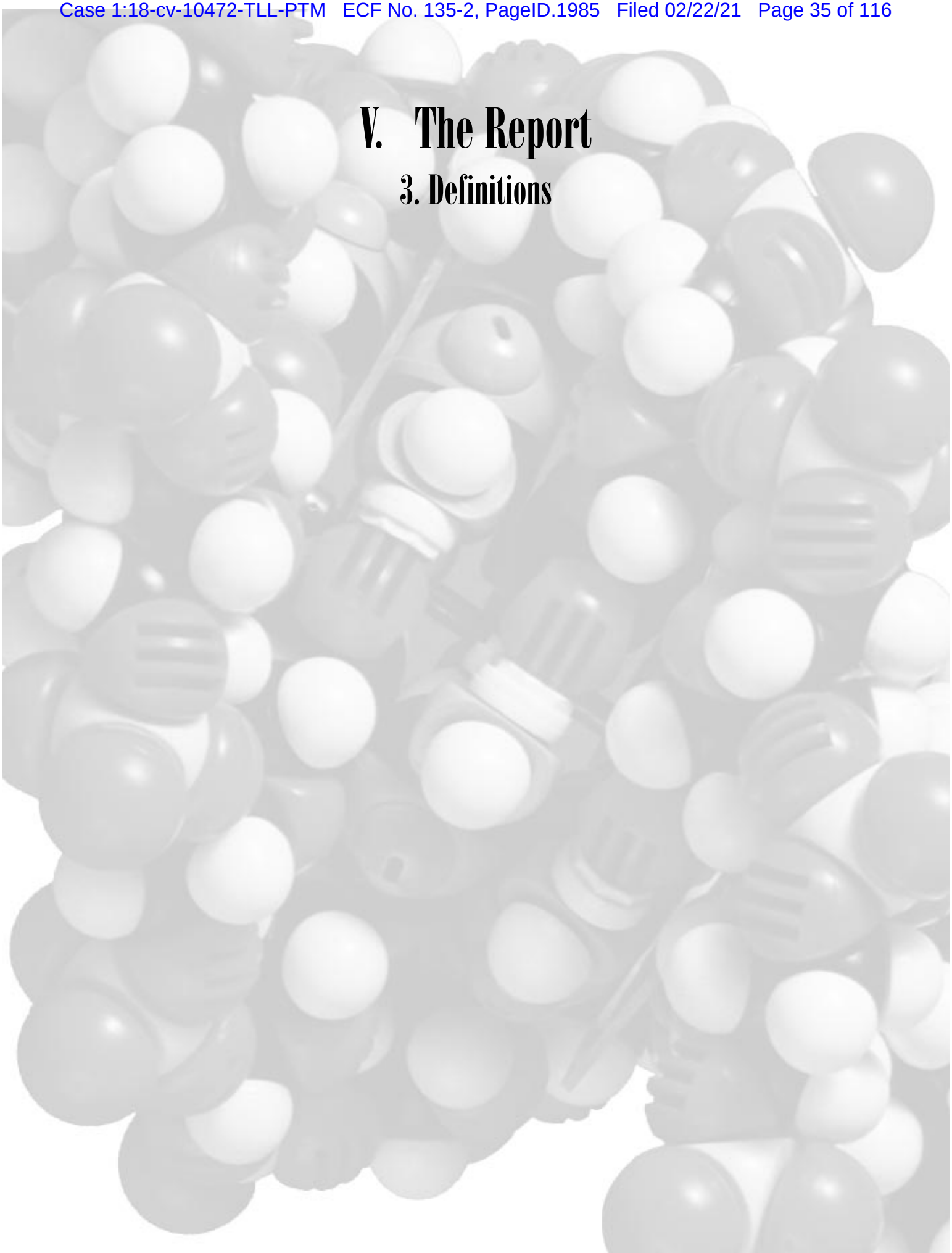
Analysis: Certain specialized genetic tests and consultations are best performed at locations outside of Michigan. Legislation restricting access to out-of-state consultations and testing could interfere with Michigan physician referrals to national locations that serve as referral centers for genetic consultation and specific testing.

Recommendation: The commission recommends that physician-to-physician referral concerning consultation for patient medical care or analysis of specimens not be restricted by legislation dealing with telemedicine.



V. The Report

3. Definitions



Definitions of Selected Terms

Issue: Are there terms that will need to be defined in legislation?

Background: Any legislation will require definitions of such terms as genes, genetic information, genetic testing, genetic sample, and genetic counseling.

The definitions will have significant implications. Genetic information can be defined narrowly as the result of genetic tests. But genetic information can also be obtained from a medical history, physical examination or other non-DNA tests. Therefore one might define genetic information more broadly to include information obtained from other sources in addition to genetic tests. Whether legislation uses the narrower or broader definitions will of course influence the scope and reach of the legislation. For example, legislation prohibiting insurance discrimination that defines genetic information narrowly will offer protection to a more limited group of individuals, but will have less impact on the insurance industry than broader definitions.

A recent Vermont law, 1997 Vermont Health Bill 89 entitled "an act relating to a state DNA data bank and to genetic testing," exemplifies one approach to defining genetic information. It defines genetic information as a result of genetic testing. Genetic testing is defined as a test, examination or analysis that is diagnostic or predictive of a particular heritable disease or disorder and is of a human chromosome or gene, human DNA or RNA, or a human genetically encoded protein. The test must be generally accepted in the scientific and medical communities as being specifically determinative for the presence or absence of a mutation, alteration, or deletion of a gene or chromosome.

The commission believes that it is critical for legislators to understand the implications of the definition they choose in drafting legislation and to consider how the definition will affect the scope of the legislation

Recommendations:

1. The commission recommends that the full implication of definitions be kept in mind when deciding on a definition. A broad definition would include the results of specific DNA testing as well as genetic family history and the results of other tests. A narrow definition would cover only specific DNA tests. For example, the broad definition of genetic information could include gender, eye color and other generally observed conditions.

2. The commission offers the following definitions:

   a. **Deoxyribonucleic Acid (DNA).** DNA is the molecule that encodes genetic information. DNA is a double-stranded molecule held together by weak bonds between pairs of nucleotides. The four nucleotides in DNA contain the nitrogenous bases, adenine, thymine, cytosine, and guanine (A, T, C, and G). The sequence of bases in the coding regions of DNA determines the sequence of nucleotides in RNA molecules and of amino acids in proteins.

   b. **Ribonucleic Acid (RNA).** RNA is a single-stranded molecule made up of four nucleotides containing the nitrogenous bases adenine, uracil, cytosine, and guanine (A, U, C and G). There are multiple cellular functions of RNA molecules, each served by one of several classes of RNA molecules, including messenger RNA, transfer RNA, ribosomal RNA and other small RNAs.

   c. **Mutation.** A mutation is a change in the nucleotide sequence of DNA.

   d. **Allele.** An allele is a specific variant found at a genetic locus.

   e. **Locus.** A locus is a specific physical position on a chromosome.

   f. **Chromosome.** Chromosomes are the autoreplicating structures of cells, containing the cellular DNA that bears in its nucleotide sequence the linear array of genes.

   g. **Gene.** The gene is the fundamental physical and functional unit of heredity. A gene is an ordered sequence of nucleotides located in a particular chromosome that encodes a specific functional product, e.g., a protein or RNA molecule.

h. **Genetic Information:**

a. **Narrow definition:** Genetic information is information about a gene, gene product, or inherited characteristic derived from a genetic test.

b. **Broad definition:** Genetic information about a gene, gene product or inherited characteristic derived from the individual or a family member of the individual, including information derived from tests that identify mutations in specific genes or chromosomes, other tests that are diagnostic of particular known genetic conditions, a physical medical examination, a family history or a direct analysis of genes or chromosomes. This definition would include physical characteristics.

i. **Genetic Test.** Genetic testing is the analysis of human DNA, RNA, chromosomes, proteins, and certain metabolites in order to detect heritable or somatic disease-related genotypes or karyotypes for clinical purposes. Such purposes include predicted risk of diseases, identifying carriers for single-gene disorders, and establishing prenatal and clinical diagnosis or prognosis. Prenatal, newborn and other carrier screening, as well as testing in high-risk families, are included. Tests for metabolites are covered only when they are undertaken with high probability that an excess or deficiency of the metabolite indicates or suggests the presence of heritable mutations in single genes. Other tests are covered only when their intended purpose is diagnosis of a presymptomatic genetic condition. A genetic test must be generally accepted in the scientific and medical communities as being specifically determinative for the presence or absence of a mutation of a gene or chromosome in order to qualify under this definition.

j. **Genetic Sample.** A genetic sample is a sample of blood, tissue or body fluid or any derivatives obtained for the purpose of performing a genetic test. A sample or a portion of a sample of blood, tissue, or body fluid or any derivative that was neither obtained nor used for genetic testing is excluded from this definition.

k. **Genetic Counseling.** Genetic counseling is a communication process that deals with the human problems associated with the occurrence or the risk of occurrence of a genetic disorder in a family. The process involves an attempt by one or more appropriately trained persons to help the individual or family to (1) comprehend the medical facts, including the diagnosis, probable course of the disorder and the available management; (2) appreciate the way heredity contributes to the disorder, and the risk of recurrence in specified relatives; (3) understand the alternatives for dealing with the risk of recurrence; (4) choose the course of action that seems appropriate to them in view of their risk, their family goals and their ethical and religious standards, and to act in accordance with that decision; and (5) to make the best possible adjustment to the disorder in an affected family member or understand the risk of recurrence of that disorder.

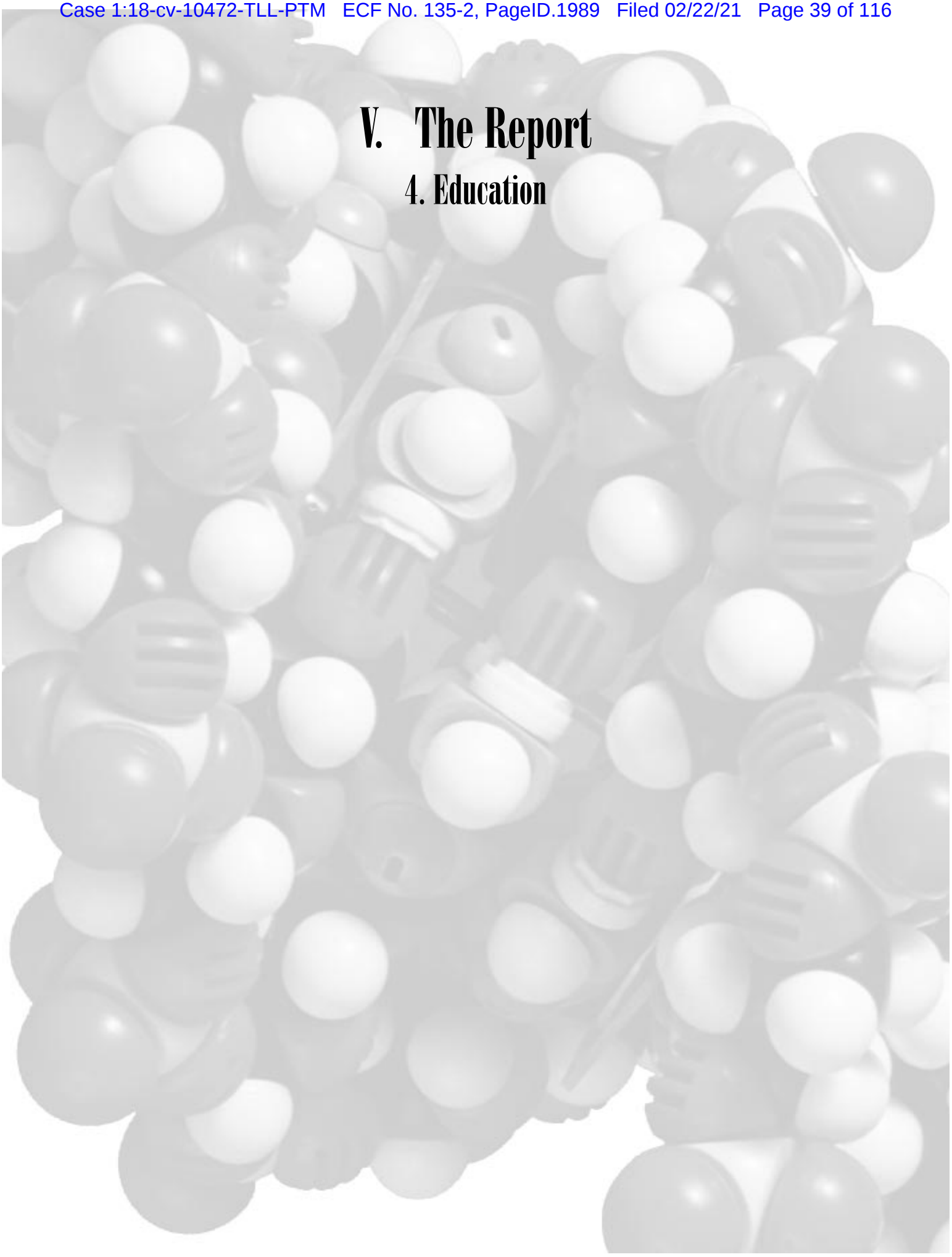
l. **Family Genetic History.** Family genetic history is genetic information about the family of an individual obtained from the individual's or a relative's interview, testing, or review of medical records relevant to the individual or the individual's family members.

3. We recommend that genetic testing should be limited to analysis of DNA, RNA, etc. and should not include a history, physical, or other evaluation such as x-rays or blood tests unless the evaluation is designed to be specifically determinative for the presence or absence of the mutation, alteration, or deletion of the gene or chromosome.

4. We recommend the use of a narrow definition of genetic testing and genetic information unless otherwise stipulated in this document.

V. The Report

4. Education



Education

Issue: What are the educational needs for Michigan? How should state resources be allocated for educational issues? Should education be directed to the public, professionals and industry groups?

Background: The Human Genome Project and the rapid development of genetics have produced an explosion of information. The news media reports advances in genetics weekly.

The news reports can heighten public expectations or cause public anxiety. The public may not have adequate background to be able to put news reports in context.

Analysis: Based on the commission's public meetings and a review of the literature, the commission believes that the general public is significantly unaware or misinformed about the risks and benefits of genetics. This misinformation can result in widespread public concern and public mistrust. It is important for the public to be aware of the benefits of genetics, including identification of pre-symptomatic treatable conditions.

As a result of the commission's discussions and information from the public forums, the commission also believes that employers and the insurance industry need education about genetic issues.

The commission has discovered a wide variety of material that should be made available to the public. This material is captured in the bibliography to this report and on the commission's web site.

Recommendations:

1. The commission recommends that the Michigan Department of Community Health provide education about genetics especially pre-symptomatic, predispositional, carrier status, inheritance and statistical issues. The commission recommends that genetics education be built into the K-12 school system set of core concepts.

2. The commission recommends that a state-wide educational resource be available to the judiciary, legislature, the school system and the general public. This resource could be used to create educational materials for specific issues, conduct seminars and help create public interest messages. Such a resource could be made up of educators from the state universities.

3. The commission recommends the creation of educational material for the general public. The general public material would include educational booklets about genetic testing and familial genetic disease. The commission believes that there needs to be an evaluation component to any curriculum to help measure if the material is achieving its intended results.

4. The commission recommends that the web site started by the commission be continued and updated so that it can be a resource to the citizens of the state.

5. Because the science of genetics is evolving so quickly, the commission recommends that a body with similar expertise to that of the commission be available to the state. This body could serve as an educational resource to state government as new legislation or rules are considered.

Resources:

1. There is a public broadcasting system web site that goes along with the program, "A Question of Genes," a two-hour nationally-televised special that follows the lives of several individuals and families as they confront genetic testing issues. The address of that web site is www.pbs.org/gene. The program itself is sponsored by the DOE Human Genome Program.

2. "The DNA Files: Unraveling the Mysteries of Genetic Science" is a series of nine one-hour nationally syndicated documentaries created by National Public Radio. Www.dnafiles.org.

3. The Human Genome News is available at the Human Genome Management Information System web site at www.ornl.gov/hgmis/publicat/publications.html#hgn.

4. The commission web site is www.mdch.state.mi.us/mcgpp/mcgpp.htm.

V. The Report

5. Insurance and Employment

Genetic Testing in Health Insurance and Employment

Health Insurance

ISSUE: Should genetic testing be allowed to be part of the application process for health insurance and employment?

Introduction

This report deals only with health or medical expense insurance as provided in the Governor's Executive Order. It does not address life, disability or long-term care insurance. The expressed fear at the public forums is that health insurance companies have been using, and will continue to use to an even greater extent, predictive genetic testing to deny insurance or restrict benefits.

While there is a lack of conclusive evidence that discrimination based on predictive genetic testing has decreased access to health insurance, the perception that such a problem exists has resulted in state and proposed national legislation addressing this issue. Currently, health insurers in Michigan do not require genetic testing to obtain or renew health insurance policies. Federal legislation passed in 1996, the Health Insurance Portability and Accountability Act (HIPAA), mandates that there can be no discrimination against asymptomatic persons based on genetic testing of applicants or participants in group health plans. While HIPAA addresses availability of insurance, it does not deal with rating and benefits.

There has been an effort at the federal level to expand the HIPAA mandates to individual health insurance policies. To date, this effort has not been successful.

Insurance issues include not just whether individuals can obtain and retain insurance policies, but whether it is appropriate for third-party payers to make decisions about coverage and premium rates based on genetic information. Insurance companies are concerned about adverse selection. Health care providers are concerned about the coverage of necessary medical tests and treatments in general.

Background

Group Versus Individual Health Insurance Coverage in Michigan: As of 1994, 97 percent of those with health insurance in Michigan received their coverage through employer group health insurance plans. (U.S. GAO Report to the Chairman, Committee on Labor and Human Resources, U.S. Senate: PRIVATE HEALTH INSURANCE: Millions Relying on Individual Market Face Cost and Coverage Trade-Offs, November 1996.)

What of the remaining three percent of Michigan insureds who buy health insurance on their own? Some of these purchase health insurance from one of a small group of commercial insurers that place individual applicants into a group that is experience rated. Within the group, age and other factors modify each individual's premium. Individual applicants are subject to actuarial rating and potentially higher premiums than applicants for group plans.

For individuals unable or unwilling to purchase health insurance from a commercial carrier, Michigan law provides that Blue Cross Blue Shield of Michigan is the insurer of last resort and is required to make insurance available to all who apply. Thus, Michigan's problems are different from other states in that access to health insurance is, and has been, available to any resident.

The Business of Health Insurance

As noted above, 97 percent of those in Michigan with health insurance are covered by employer group plans. Such plans generally do not require genetic testing or other forms of risk assessment of applicants. This is because the group is large enough to spread the risk among its members. Smaller employers usually pay higher premiums as the number of individuals among whom the risk is spread is limited. The difference in premium costs between large and small groups reflects the difference in the insurer's risk as well as the difference in administrative expense. Small employers attempt to compensate for this by joining trade organizations to allow individual risk to be spread among a larger group, thus potentially minimizing premiums.

The insurance industry points out that it is not common practice for health insurers to require genetic testing for obtaining or retaining policies. The Health Insurance Association of America (HIAA) stated in its May 20, 1998 memorandum to the commission

that "according to an HIAA survey of member companies, no insurer requires - or has any plans to require - genetic tests as a condition of acceptance or renewal of medical expense insurance." Despite the fact that insurers do not require predictive genetic testing of applicants, they worry about adverse selection; that is, the sale of coverage to individuals who purchase insurance because they have special knowledge or suspicion of an increased medical risk that is not known to the insurer. While adverse selection is a concern in all forms of insurance, it is a less well- documented phenomenon in health insurance than, for example, in life insurance.

Controlling Law

State Law – General: Regulation of insurance, including its accessibility, is primarily the responsibility of the states through their insurance commissioners. Prompted by concerns that advances in genetic technology may threaten privacy and lead to discrimination, some state legislatures have recently enacted statutes to prevent discrimination based on genetic test results or to protect the privacy of genetic information. These laws vary considerably in scope and have little impact on the vast majority of citizens covered by Medicare, Medicaid and employer group health insurance programs. It is estimated that only three to four percent of Americans with health insurance coverage will be affected by state statutes and this group is made up primarily of those who can afford to purchase their own coverage. (Reilly P: Genetic discrimination. in Long C (ed.) Genetic Testing and the Use of Information, Washington, D.C., AEI Press Inc., in press).

Michigan Statutes:

- The Insurance Code of 1956 (Act No. 218 of the Public Acts of 1956) prohibits discrimination based on race, color, marital status, sex or national origin (MCLA 500.2027(a)(I)). MCLA 500.2020 does not permit discrimination between individuals of the same class and hazard. Neither provision addresses genetic testing.

- MCLA 500.2213b prohibits insurers from canceling or refusing to renew policies on the basis of illness or claims experience for both group and individual insureds. The only grounds for revocation or non-renewal of policies are non-payment of premiums, fraud and misrepresentation.

- MCLA 500.3438 and MCLA 500. 3439 limit insurers' liabilities when multiple policies are purchased to cover the same event.

Federal Statutes:

- The Employee Retirement Income Security Act (ERISA) of 1974 (Pub. L. 93-406) regulates pension and benefit plans. Section 514 of ERISA protects employers' self-insured health benefit plans from state regulation regarding mandated benefits, non-discrimination statutes and the formation of high-risk pools.

- The Health Insurance Portability and Accountability Act (HIPAA), Pub. L. No. 104-191, passed in 1996, severely limits insurer-imposed waiting periods for pre-existing conditions and prohibits discrimination in issuing or renewing coverage based on genetic test results. The law applies to those applicants who have been covered by previous employers under large or small group insurance health plans for 18 months, thus primarily affecting those who are changing jobs or relocating. While HIPAA assures access, it does not address the issues of premiums and coverage. In Michigan, 97 percent of insured people are covered under group insurance plans. The three percent who have individual health insurance are not protected by HIPAA.

- Joint Federal and State Programs: Title IV of the Children's Health Insurance Program, the Balanced Budget Act of 1997, provides matching monies through federal and state funding for the years 1998-2007 for MIChild. The Department of Community Health has recently implemented a program to provide health insurance coverage for all eligible minors. Eligibility requirements include U.S. citizenship, Michigan residency, minor status and monthly income standards. Coverage is not conditioned on health status or genetic testing.

Public Concerns

Insurance Concerns of the Public: During the public forums, the public expressed concern that insurers will deny or cancel health insurance policies based on the results of genetic testing. The perception is that insurers will use test results to deny or cancel policies of or make other underwriting decisions that affect asymptomatic individuals whose genetic patterns deviate from the normal.

The commissioners also heard that the fear of losing insurance coverage is having an impact on public participation in research projects and, to some extent, is discouraging the use of genetic diagnostic tests advised by individuals' physicians.

The insurance industry, in its public testimony and in written communications, stated that it does not require genetic testing as part of the application for health insurance at this time. Insurers are willing to forego genetic testing of asymptomatic applicants for health insurance if those who had genetic testing prior to their application make the results of testing available. Otherwise, it perceives an uneven playing field favoring those with abnormal tests who can purchase insurance at standard rates without adjustment for risk.

Recommendations:

1. The majority of the members of the commission recommend that the Michigan Legislature prohibit health insurers from requiring predictive genetic testing (or testing for carrier status) of asymptomatic individuals. The prohibition against requiring predictive genetic testing of applicants for health insurance extends HIPAA's protections now afforded members of group health plans to those with individual health insurance policies.

   There was a difference of opinion among the commissioners as to whether asymptomatic applicants should be required to disclose the results of previous genetic testing. Those favoring non-disclosure argue that insurers could use this information to discriminate against applicants. Those favoring disclosure believed insurers should have results of prior testing to prevent adverse selection. They noted that the agreement of insurers to forego testing has been predicated on their ability to obtain results of prior genetic testing. Such access would help protect insurers against adverse selection i.e., when applicants do not disclose known risks on a health insurance application.

   In either case, applicants would continue to be able to disclose the results of genetic testing to insurers voluntarily.

2. The legislative definition of genetic testing used in the case of health insurance should be narrow enough to assure that only genetic testing of asymptomatic individuals is prohibited. It is not the intent of the commission to prohibit questions covering family history.

3. The commissioners recommend that applicants for health insurance should not be required to disclose the results of genetic testing or information derived from participation in medical research. The federal government defines research as "a systematic investigation designed to develop or contribute to generalized knowledge" (45 CFR ß 46.102d).

4. The commissioners recommend that adequate steps be taken to assure the validity and appropriate use of genetic actuarial data used by the health insurance industry.

5. The commission recommends that information obtained by any party, including but not limited to insurers, be carefully guarded from improper use and re-disclosure to third parties without the written consent of the individual.

6. The commission recommends that there be adequate enforcement of the rules against discrimination and breaches of privacy.

Employment

Issue: Should the use of genetic testing be permitted in the workplace to assess individual qualifications to perform a job and address workplace toxic reaction concerns?

Introduction

Over the years, concerns have been raised about the potential for discrimination in the workplace based on health status. Federal and state governments have responded to these concerns with legislation prohibiting discrimination. Now, genetic advances raise similar questions, namely, should employers use information derived from genetic testing in hiring, work assignments and provision of benefits?

Background

Employers have justified their use of genetic testing by citing their concerns about the health and suitability of employees and applicants for their particular workplace. They indicate such problems as inability to perform the job, public safety issues, retraining of individuals who incur disabling illnesses, and costs of absenteeism and health insurance.

Controlling Law

Michigan Law: Act No. 20 of the Public Acts of 1998, the Persons with Disabilities Civil Rights Act of 1998, derives from Act 220 of the Public Acts of 1976 and is the controlling state law dealing with discriminatory employment practices. It amends the Michigan Handicappers' Civil Rights Act, substituting the word "disability" for "handicap" in both the title and the text. Although it does not contain specific language prohibiting discrimination based on the results of genetic testing, portions of the law dealing with physical and mental medical examinations, as well as medical records, have been interpreted by the Department of Civil Rights to include results of testing.

Federal Law

The Rehabilitation Act of 1973 (29 USC ß 701 et seq.) was the first major piece of federal legislation to deal with discrimination against the handicapped. It is limited to employers who have contracts with the federal government. Its definition of "individual with handicaps" and regulations adopted by federal agencies for enforcement were models for state legislation and the Americans with Disabilities Act passed in 1990.

According to the Rehabilitation Act of 1973, an individual with a handicap is a person who:

1) Has a physical or mental impairment that substantially limits one or more major life activities
2) Has a record of such impairment or
3) Is regarded as having such an impairment.

The Americans with Disabilities Act (ADA) of 1990 (42 USCß 12101 et seq.): This act is the most sweeping legislation concerning disability discrimination. It mandates equal access to private employment, public services and accommodations. In the area of employment, it does not deal with all workers, but only those who are "qualified." To be qualified, the individual must be capable of performing all the essential functions of a job with or without accommodation.

The ADA has no specific prohibition against discrimination based on predictive genetic testing. However, an Equal Employment Opportunity Commission (EEOC) ruling of March 15, 1995 interpreted the ADA as applying to those who have been found to have a mutation that may put them at greater risk for developing symptoms and signs of a genetic disorder.

The ADA prohibits a medical examination of prospective employees until after an offer of employment is made. The offer of employment can be conditioned upon a medical examination. This examination is the only one in the course of employment that may include evaluation of medical factors other than those which have a direct bearing on the job to be performed, and it may consist of all elements of a complete evaluation, including laboratory tests, X-rays and the like.

Issues

Medical: There is little to be gained by employers, employees or applicants from predictive genetic testing that can not be better ascertained by appropriate clinical examinations. This holds true generally, and specifically when the public safety as well as heightened susceptibility to workplace toxins are a concern. These issues were discussed in a 1991 JAMA article on use of genetic testing by employers.

> "As when used for other purposes, genetic tests will have poor predictive value when used to identify workers who might pose risks to public safety. A more effective approach to protecting the public's safety would be routine testing of a worker's actual capacity to function in a job that is safety-sensitive. Airline pilots, for example, undergo physical examinations every six months."
> JAMA 266: 1826 (Oct.2 1991)

Concerns about increased susceptibility to certain workplace toxins led to testing of black males for sickle cell trait for fear that exposure to certain compounds would precipitate sickling of blood cells. Likewise, there have been attempts to identify workers with alpha1 antitrypsin deficiency because of the concern that respiratory irritants might cause chronic obstructive lung disease. However attractive these concepts may have been on a theoretical basis, they have not been scientifically validated.

> "Although these genetic tests have been used for research and to advise workers of potential risks, they also may have been inappropriately used to exclude affected workers from the workplace. For instance, the apparent exclusion of workers with sickle cell trait was based on theoretical considerations that had no basis in fact. To date, there is insufficient evidence to justify the use of any existing test for genetic susceptibility as a basis for employment decisions." Id.

Legal: The major issues that genetic testing has brought to the workplace is fear of discrimination and loss of privacy and confidentiality. The commission addresses the privacy and confidentiality of medical records, including genetic information, elsewhere in this report.

State law has not specifically addressed the use of genetic test results to discriminate against individuals who are qualified to perform jobs with or without accommodation.

Analysis

The Occupational Safety and Health Act (29 USC ß651 et seq.) provides federal guidelines for maintenance of health and safety in the workplace in addition to the state-mandated guidelines. Genetic testing of employees for possible susceptibility to a workplace toxin is no substitute for the maintenance of a healthy work environment. As shown above, the reliability of these tests is not great enough to assure that valid employment decisions are facilitated by their use. Employers should remove toxic agents or adequately protect workers who are in contact with them. Genetic screening would not assist an employer in determining an employee's ability to perform a job.

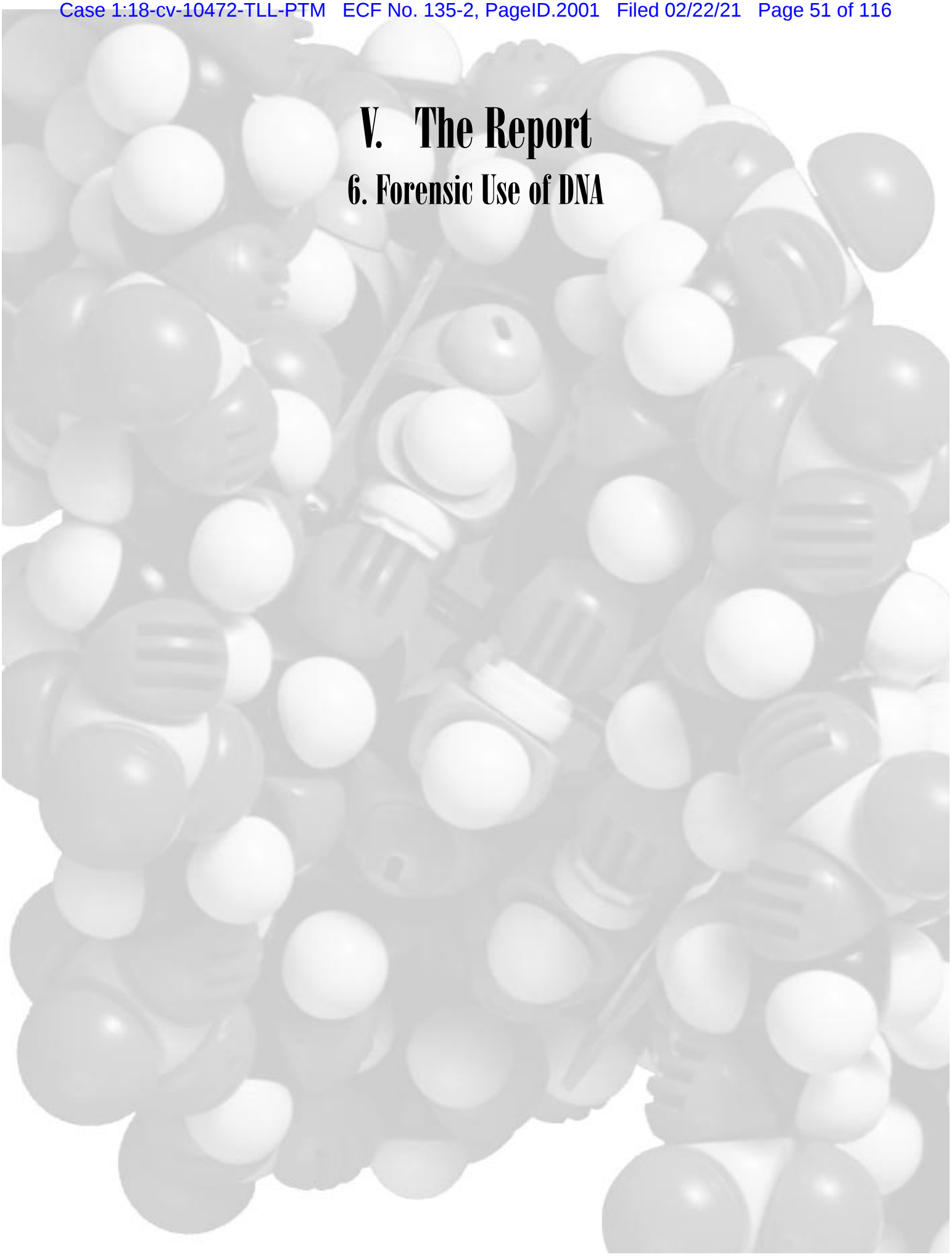
Recommendations

1. The commission finds that genetic screening has not been scientifically validated as a means of predicting the onset of clinical disease and therefore recommends that genetic testing not be relied on in assessing qualifications of an individual to perform a job.

2. The commission believes that employers' concerns about toxic exposures are best approached by making the workplace safe for all employees and therefore recommends the prohibition of genetic testing or the use of genetic information as a condition of employment.

V. The Report

6. Forensic Use of DNA



Forensic Use of DNA

Issue: How should the state handle test samples, results and reports concerning elimination of suspects?

Introduction

Federal and state governments have cooperated in the development and implementation of techniques and data retention related to DNA forensic testing. State legislation controlled the field in large part until Congress passed the federal DNA Identification Act of 1994. With the development of the Federal Bureau of Investigation's (FBI) Combined DNA Index System (CODIS) for the retention of data concerning convicted felons, direction has been given to the use and retention of information. Following is an overview of Michigan statutes and federal law for procedures governing forensic DNA testing.

Existing Law and Background

1. **Controlling Law and Rules:** Michigan Law: Act No. 250 of the Public Acts of 1990 known as the DNA Identification Profiling Systems Act (MCLA ß28.171 et seq.) calls for promulgation of rules for forensic testing concerning:

   - Collection of samples in a medically approved manner by qualified persons and the types and numbers of samples to be collected by corrections departments, law enforcement agencies and the Family Independence Agency.
   - Distribution of blood specimen vials, mailing tubes and labels and instructions for collecting samples.
   - Storage and transmission of samples.
   - Genetic profiling of samples.
   - Development of a system, including computerization of filing, cataloging, retrieving and comparing DNA profiles, in cooperation with the Federal Bureau of Investigation (FBI) and other appropriate persons.
   - Cooperation with the FBI in development of DNA identification and genetic marking profiling capability and training state police personnel.
   - Protection of the privacy interests of individuals whose samples are analyzed under the act.

   Other statutes deal with the procedures for DNA profiling and the categories of criminals whose DNA must be profiled.

   - Act No. 507 of the Public Act of 1996 amended Chapter XII A of Act 288 of the Public Acts of 1939 by adding section 18k (MCLA ß712.A18k) designated that individuals convicted or found responsible for violation of specified crimes shall provide samples for DNA profiling.
   - Act No. 509 of the Public Acts of 1996 amended section 33d of Act No. 232 of the Public Acts of 1953 "to revise, consolidate and codify laws relating to probationers, probation officers..." (MCLA ß791.233d). This ensured that prisoners required to provide samples for DNA testing did so prior to discharge, if they had not already done so.
   - Act No. 510 of the Public Acts of 1996 amended ß750.520(m) of the Michigan Penal Code regarding collection and forwarding of samples for DNA identification profiling according to rules promulgated by the state police.
   - Act No. 511 of the Public Acts of 1996 amended Act No. 73 of the Public Acts of 1988 by adding section 5a (ß803.225a) dealing with juvenile facilities. This action provides for testing of juveniles convicted or found responsible for certain crimes.
   - Act No. 512 of the Public Acts of 1996 amended Act No. 150 of the Public Acts of 1974 by adding section 7a (ß303.307a), which provides for DNA profiling of state wards convicted of specified crimes prior to discharge or being placed in any community. The rules developed in accordance with PA 250 and amending statutes are the foundation of genetic profiling procedures in various contexts and are found in the Michigan Administrative Code (R28.5051-5059).

   Qualifying Offenses for DNA Testing in Michigan: Crimes for which DNA identification profiling is mandated include sex offenses, murder, assault and kidnapping. Testing applies to juveniles and adults who are convicted of or found responsible for committing or attempting to commit those crimes.

   Consent for Obtaining Samples for DNA Profiling: Provision of samples for DNA profiling is mandatory for those convicted of the crimes delineated under Michigan law. Provision of samples may be voluntary or under warrant during the course of a criminal investigation.

Laboratory Oversight: The American Society of Crime Laboratory Directors establishes standards and monitors quality. Proficiency testing of technicians who perform DNA analyses is done under its auspices at least yearly.

Federal Law: DNA Identification Act of 1994 provides for the following:

- 42 USC ß14131 - Quality assurance and proficiency testing standards that include the formation of a national DNA Advisory Board.
- 42 USC ß14132 - The development of an index to facilitate law enforcement exchange of DNA identification information.
- 42 USC ß14133 - Lists the duties of the Federal Bureau of Investigation relative to proficiency testing requirements, privacy protection standards and criminal penalty for abridgment of privacy protections, including fines up to $100,000.
- 42 USC ß14134 - Authorizes funding to the FBI for carrying out the above sections of this title.

2. Collection and Analysis of Samples

Specimen Collection and Storage: Originally, only blood samples were collected. Presently, the use of buccal smears (cells obtained by swabbing the inside of the mouth) is gaining in popularity. Blood samples are stored in freezers (controlled environment), while buccal smears can be stored appropriately at room temperature. Continued evolution of techniques for collection and storage is anticipated.

DNA Analysis: The object of forensic DNA identification profiling is to establish a pattern that is unique to the individual without identifying genes that are associated with specific diseases or disorders. Thus, a DNA profile does not establish the suspect's genetic predispositions.

Access to Information: Only authorized users in law enforcement agencies have access to the FBI's CODIS Indexing System for the identification of DNA profiles.

Functioning of the Combined DNA Index System: CODIS consists of three levels:

- National DNA Index System (NDIS) - maintained by the FBI
- State DNA Index System (SDIS) - each state has one designated SDIS
- Local DNA Index System (LDIS) - each law enforcement system participating in CODIS maintains an LDIS database that receives pertinent information from its local laboratory, the Local DNA Analysis System (LDAS)

The CODIS ensures that DNA data added to an index meet specific criteria. For example, before accepting LDAS data for transfer to LDIS, CODIS performs a series of checks to filter substandard or inappropriate data and to ensure appropriate user authority. An array of similar techniques permits transfer of DNA data from local to state to national levels only with carefully controlled access through selected user authority.

3. Issues Regarding Forensic Use of DNA

Over the years, a number of problems have arisen as DNA forensic technology has evolved. Relevant portions of state laws have been amended and the use of the databank in cooperation with the federal government has been instituted. What follows is a summary of problems that have been resolved and proposed solutions for those remaining.

A. Resolved Issues

Period of Sample Retention: While not mandated by state law, DNA samples taken from convicted and responsible felons are retained indefinitely. Samples of elimination suspects are returned to the submitting local law enforcement agency upon conclusion of the investigation.

Period of Record Retention: DNA records of convicted individuals are retained and placed on the FBI CODIS system where they remain indefinitely. As required by Michigan Law (MCLA ß28.176), records of elimination suspects that contain an individual's name are to be returned to the submitting agency at the conclusion of the investigation. The Michigan Department of State Police has implemented procedures that comply with this law. Unidentifiable evidence is retained in each casework file to assure compliance with the accrediting body's laboratory standards.

B. Outstanding Issues

Questions have arisen about the manner in which local law enforcement agencies dispose of the returned elimination blood samples. Disposal of the blood samples returned to local law enforcement agencies is subject to Act No. 18 of the Public Acts of 1990 (Part 138 of the Public Health Code). Section 13811(b) of this act requires blood products and body fluids to be disposed of by one of the following methods:

i Flushing down a sanitary sewer
ii Decontaminating by autoclaving or incineration
iii Solidifying
iv If in solid form, transferring to a sanitary landfill
v A process approved by the department

There is no provision, however, for monitoring this disposal.

Recommendation

Since there is no assurance that returned elimination samples of blood and body fluids will be disposed of in an appropriate manner by local law enforcement agencies, the commission recommends that Michigan State Police protocol be modified to allow elimination specimens to be disposed of where the DNA analysis is conducted. This would require the State Police Forensic Laboratory to modify intra-departmental protocol for sample disposal as follows:

3. Elimination Samples/Purging Protocol

3.1 Elimination samples and related records will be destroyed in accordance with 3.1.1 and 3.1.2, infra, after completion of the analysis so long as the laboratory concluded that the sample was submitted by a person who should be eliminated from consideration as a suspect.

3.1.1 The destruction of samples will be performed in the presence of a witness.

3.1.2 An audit record, signed by the witness, will document the destruction of such samples.

The destruction of elimination samples in the proposed manner would establish clear auditable rules for medical waste disposal.

V. The Report

7. Informed Consent

Informed Consent

Issue: How should informed consent figure into genetic legislation?

Background: The informed consent doctrine states that health care professionals may not perform invasive tests or do studies on patients without first informing them of the nature of the procedure— its risks, benefits and alternatives. Health care professionals then need to obtain the uncoerced consent of a competent patient. This doctrine furthers patient autonomy and is an important keystone in medical law and ethics. In our discussions about privacy, discrimination and insurance we refer to the need to provide protection for patients. One important way to provide that protection is through an informed consent. Moreover, informed consent is an important way to protect individuals' privacy.

In considering informed consent, a review of case law may be useful to understand specific genetic issues.

Most courts require physicians to inform patients of the patient's physical condition, the purpose and advantages of the proposed treatment, the material risks of the proposed treatment and the material risks of alternatives, including no treatment. Plaintiffs, however, are increasingly asking courts to expand the scope of information that should be disclosed legally, and courts have reached differing conclusions.

A few courts have held that some physician-specific risk information is material information. The Wisconsin Supreme Court held that when physicians have "substantially different success rates with the same procedure and a reasonable person in the patient's position would consider such information material," this evidence may be admitted at trial[1]. Another court reasoned that a physician's HIV-positive status is a material risk when a physician performs invasive procedures[2]. Finally, the California Supreme Court held that a physician must disclose personal interests unrelated to the patient's health, whether research or economic, that may affect the physician's professional judgment. Thus, in *Moore v. Regents of the University of California*[3], the court found that a leukemia patient had a claim for violation of informed consent when the patient's physician failed to disclose his commercial and research interest in the patient's spleen cells at the time he sought consent for the patient's splenectomy.

Courts however, have not found statistical mortality information to be material. In *Arato v. Avedon*[4], the California Supreme Court upheld a trial court's decision in favor of the defendant physician who failed to disclose the statistical life expectancy associated with a particular cancer treatment. The court reasoned that the information was outside the scope of material risks and that, even if the information were material to the patient's nonmedical interests, such as pending business affairs, the scope of information to be disclosed under the informed consent doctrine should be limited to therapeutic information.

Increasingly, genetics professionals or societies, bioethicists and policy makers are expanding the scope of the information they believe is crucial for informed consent for genetic testing in the clinical and research settings, such as:

a. The manner in which samples will be collected;
b. Psychosocial risks, such as discrimination, stigmatization, altered family dynamics, anxiety, guilt, etc.;
c. The possibility of unexpected findings, such as non-paternity;
d. Recontact and notification policies;
e. Commercial or research interests the clinician or researcher may have in the samples;
f. Who will have access to samples and results;
g. Plans for storage and security of samples and test information, including whether samples will be anonymized, coded or identifiable;
h. Likely secondary uses for the samples and who controls future use of samples;
i. Opt-out provisions for future uses of samples;
j. Plans and mechanisms for destruction of samples and who controls this process;
k. The possibility of withdrawing consent and consequences of withdrawal from research studies;
l. Uses of samples after death.

1 Johnson v. Kokemoor, 546 N.W.2d 495 (Wis. 1996).
2 Estate of Behringer v. Medical Center, 592 A.2d 1251 (N.J. Super. 1991).
3 793 P.2d 479 (Cal. 1990).
4 858 P.2d 598 (Cal. 1993).

Whether current informed consent law would require disclosure of all of the information described above is an open question. For example, it is not clear whether claims brought for failure to disclose information related to discrimination would be legally cognizable. Under the rationale of Arato, this sort of information might not be considered "therapeutic" and therefore would not be material. Risks related to psychological reactions, however, might be deemed therapeutic information and therefore within the scope of information that must be disclosed.

Legislatures have begun to mandate certain informed consent requirements for genetics testing. A main component of such legislation is to require authorization for testing and disclosure of genetic information. Many bills and statutes mandate that, prior to genetic testing, an individual be informed of the purpose of the test, the potential uses of the test, the limitations of the test, the meaning of the test results, the procedures for providing notice of test results, and the right to keep the results confidential. Much of this legislation also requires written authorization for disclosure of genetic information to third parties following a description of the information to be disclosed, the name of the individual or entity receiving the information, and the purpose of the disclosure. In addition, authorization may be required for continued retention of genetic information or samples, creating possible administrative difficulties for clinical investigators.

Although the law demands disclosure of material information to patients, it does little to ensure that physicians' approach to informed consent is more than formalistic and legalistic. Many clinicians view informed consent law as requiring simply that the patient sign a document stating that she agrees to the procedure and understands the risks listed on the document. Many do not seem to view informed consent as a process to ensure that the patient sufficiently understands the information, options, and associated risks to make an intelligent decision about her choices. This is a problem in medicine generally. However, because the focus on information delivery is such a strong element of genetics, bioethicists and geneticists particularly worry about a formalistic approach to informed consent in many areas of genetics testing where the information can be complex and plentiful.

Analysis

There is a clear consensus that informed consent should be required for genetic testing in most contexts. The extent and specifics of what should be included in the information for informed consent may vary depending on the nature of testing, the reasons for testing and the setting (clinical or research contexts, for example).

1. Clinical Genetics

The risks and issues in clinical genetic testing vary; thus we distinguish between routine diagnostic testing and more complex genetic testing.

a. Routine Diagnostic Testing

In the clinical context, there is a clear presumption that any medical procedure requires informed consent. Some types of genetic testing, such as routine diagnostic testing, may not require anything more than the sort of informed consent that is part of general medical care. Thus, patients should be informed of the differential diagnosis as well as the various options for establishing a diagnosis, and they should have the option not to participate in diagnostic testing. For example, when a clinician sees an infant with apparent trisomy 21 (Down syndrome), the parents should be informed about the diagnostic suspicion and the nature of information that can be obtained from chromosome studies. However, it may not be necessary to use formal informed consent documents that describe the specifics of the test, including how cytogenetic studies are done, risks of false negatives and positives, physical risks of venipuncture, etc. In other words, routine diagnostic genetic testing should be treated like other areas of general medical care.

However, when there is still some uncertainty about the value of diagnostic genetic testing, the informed consent process should be more complex and require documentation. For example, some clinicians use ApoE testing to establish an Alzheimer's diagnosis. Clinicians disagree vociferously as to the value and propriety of using such tests for diagnostic purposes. In those cases, the patient should be informed of the disagreements, the concerns that opponents have with regard to such testing and the limitations of knowledge about the value of the test. In many ways, such testing is like offering experimental treatment, which requires complete and documented informed consent. When diagnostic genetic testing is not yet routine, detailed informed consent should be obtained and documented, similar to that required for experimental treatment.

b. The Four Ps

In the context of presymptomatic, predictive, prenatal or preconceptual testing, complex issues and risks arise that require more involved informed consent. For example, the potential risks of insurance discrimination are greatest for those who are currently healthy but who want to know whether they are at an increased risk for a disease that will develop in the future. In addition, testing related to reproduction raises complex moral, psychological and deeply personal issues as well. In these cases, genetics testing is offered to help people make personal life-planning decisions, rather than to offer medical treatment per se. The focus is on information delivery and therefore informed consent requirements should be more stringent. We therefore believe that legislation should mandate documented and thorough informed consent for the four Ps — prenatal, preconceptual, presymptomatic and predictive genetic testing.
One of the issues this recommendation raises is whether such legislation should describe in detail specifically which pieces of information should be disclosed for informed consent. For a few reasons, it may not be practicable or desirable to establish such a list for all such tests. Each of these types of tests presents different types of psychosocial issues and risks and they may involve different approaches to or combinations of testing (DNA/RNA analysis, metabolic studies, medical history, physical examination, radiographs and standard laboratory tests). As a result, it would be virtually impossible to describe with sufficient nuance the material pieces of information relevant to each type of genetic testing. In addition, genetics technology and our understanding of genetics are ever changing, which means that even if such a nuanced list could be created today, it may well be out of date tomorrow.

While we do not recommend legislation articulating the specific pieces of information that must be disclosed, we do believe that legislation should set minimum standards about the kinds of information that should be disclosed in order for consent to be informed, such as:

a. Nature and purpose of the test
b. Effectiveness and limitations of the test, including clinical predictiveness, false positive rates (specificity) and false negative (sensitivity) rates
c. Implications of taking the test, including the potential medical and non-medical risks and benefits
d. Potential future uses of the sample and information
e. Meaning of the test results and the procedure for providing notice of such results
f. Who will have access to such samples and information (or the right to keep the information confidential).

The details of what should be included in these general categories should be defined by professional organizations, not by legislators, since the information may change over time and differ for different types of tests. Moreover, generating the details of these requirements requires technical and clinical expertise. Therefore, specific professional societies and professionals most familiar with these genetic tests and their uses should set the standard of care for the type of information that should be disclosed with respect to each test. They should also help draft the specific wording for informed consent documents.

Determining what information is material with respect to a test will vary based on the nature of the test and what is known about the magnitude (both in terms of probability and degree) of the risk and benefit. This raises the question of whether the risk must be demonstrated to be real, or whether it is enough that such a risk could exist. For example, it is not clear that the risk of insurance discrimination currently is that great. Nevertheless, there is some basis to think that insurance discrimination could become a real risk in the future. In the face of these uncertainties, we recommend leaving it to professional societies to define which risks would be material to a patient undergoing a particular genetic test. In addition, genetics professionals, scholars, ethicists and policy makers should continue to examine assumptions and gather empirical data about associated psychosocial and other risks and benefits to determine which risks and benefits are truly material. As our knowledge increases, the information that should be disclosed will likely alter to some extent.

Our concerns raise additional issues. First, the number of individuals trained to educate patients and consumers about the relevant material information related to genetic testing will increasingly be insufficient. Traditionally, genetic counselors have been trained to ensure that informed consent is obtained. All data suggest, however, that the number of trained genetic counselors cannot possibly meet the inevitable growth of demand for genetic testing. Therefore, we recommend that geneticists, psychologists, sociologists, ethicists, lawyers and other scholars examine whether and which alternative methods and educational resources can be used to obtain informed consent effectively.

While we urge a mandate for documented informed consent for the Four Ps, we emphasize that documentation should not overshadow the primary objective of providing comprehensible information to the patient. Therefore we stress that the foremost goal is to educate patients and the public, rather than simply to provide mechanisms with which professionals can avoid liability. Legislation or professional standards with respect to informed consent should be geared toward encouraging real informed consent, instead of formal, but empty, compliance with the requirements of informed consent.

2. Research

Publicly funded research or any research under assurance with the federal government that involves human subject research must be approved by an Institutional Review Board (IRB)[5].

These review boards are responsible for evaluating the propriety of informed consent provisions. While the general requirements of IRBs are established by federal regulation, we nevertheless make the following suggestions about how IRBs should think about different kinds of research projects. When research involves identifiable samples, the informed consent provisions should be detailed and reviewed carefully to ensure that they address all of the relevant risks (physical and psychosocial) that subjects may face.

Other factors that IRBs should consider include whether there should be recontact provisions (and what their nature should be) and whether informed consent forms should have opt-out provisions allowing people to request destruction of samples after a certain point.

When research involves anonymous research samples, no specific informed consent should be required.

While IRBS offer some protection with respect to human subjects, their scope does not encompass research that is not publicly funded or under assurance with the federal government. This is a general human subjects research problem, but it is particularly important with respect to genetics research because such research is increasingly being conducted in the private sector. We therefore believe that IRB protections should apply to all human subjects research whether or not it is publicly funded. One solution would require IRB approval for any private research conducted in Michigan that would not otherwise be subject to IRB review.

Recommendation

The commission recommends legislation that requires the following before a genetic test is performed or a study is conducted. The person proposing the test must:

1. Inform the patient of the purpose of taking the sample; what tests will be performed; what the risks, benefits and alternatives are; who will have access to the test results; what will be done with the information and how results will be retained.

2. Give the patient a chance to decline the test and inform the patient of any consequences of declining. For example, if the test were mandated by law (tuberculosis for hospital employees), refusal could result in loss of an employment opportunity.

3. Provide the test results to the patient, if the patient desires the results, so the patient can understand the results and whether there is any need for follow-up.

4. Consistent with Michigan law, keep the test results confidential, not share the results with third parties without consent, and inform the patient where and how results will be stored. The patient should be granted access to results so that the patient can determine whether the test results are stored in a secure and appropriate manner.

5. The professional community should determine the content of the informed consent since the content will change over time.

5 CFR § 46.103.

V. The Report

8. Newborn Screening

Newborn Screening

Issue: Should newborn screening only occur after parental consent is obtained? What rules should the state impose concerning subsequent use of newborn screening specimen cards?

Introduction

Newborn screening for identification of specific diseases is compulsory in all states except Maryland and Wyoming. It is mandated under the parents patriae doctrine, which permits state intervention to protect the health and safety of its citizens. Newborn screening is limited primarily to diseases that can be effectively treated in the newborn period to prevent irreversible physical and mental changes. Implicit in the rationale for newborn screening is that the diseases for which newborns are screened can be effectively treated. Therefore, additional diseases should not be added to newborn screening panels without validation of diagnostic and treatment modalities.

Background

Controlling Law: Act No. 81 Public Acts of 1992 (MCLA ß 333. 5431) states that "A health professional in charge of care of a newborn infant shall administer or cause to be administered to the infant a test for phenylketonuria, galactosemia, hypothyroidism, maple syrup urine disease, biotinidase deficiency, sickle cell anemia, congenital adrenal hypoplasia and other treatable but otherwise handicapping conditions as designated by the department."

Laboratory Oversight: Laboratory oversight of the State Newborn Screening Laboratory derives from federal law and regulation. (Clinical Laboratories Improvement Act of 1988, CLIA '88, 42 CFR 493, Federal Register, February 28, 1992.)

Collection and Storage: Since newborn screening is mandated under state law, parental consent is not required. The state has developed informational booklets describing newborn screening; however, these are not always available to or read by parents.

Specimens are collected prior to the newborn's discharge from the hospital by means of heel pricks from which blood drops onto newborn screening cards. The blood spots are air-dried and forwarded on to the Michigan Department of Community Health's Newborn Screening Laboratory where analyses are performed. When abnormalities are found, referral is made to the designated medical specialty site for further testing or evaluation of the infant.

The newborn screening cards are stored in an unheated warehouse. There is inadequate information about how long these specimens remain suitable for current methods of analysis, even under ideal storage conditions (see Therrell article in Appendix). However, it is clear that DNA samples stored under less than optimal conditions do remain stable for many years. Since it can be reasonably anticipated that in the near future DNA testing will largely replace the so-called bacterial inhibition assays and other methods for newborn screening, storage of samples can be anticipated to be less of a problem.

Some problems associated with storage include the fact that not all newborn screening cards, as they are sent to the newborn screening laboratory from the hospitals, are as well-separated from each other as they could be. Contamination of specimens may result if the samples have not been allowed to dry adequately prior to shipment. Inadequate separation of specimens, if it occurs while in warehouse storage, is not a serious problem because the specimens are already dry. Moreover, newer modifications of DNA testing should minimize contamination-related problems. The commission noted that correcting the problem of inadequate specimen storage does not necessarily require the introduction of new techniques, but rather careful use of current techniques.

Period of Sample Retention: Samples have been retained since the onset of the newborn screening program. The federal Clinical Laboratory Information Act (CLIA) requires that records of results be kept for two years and that samples be retained as long as is medically appropriate.

Issues

Consent: As already noted, state law mandates newborn screening.

Research Use of Newborn Screening Cards: Not all of the sample spots on an individual newborn's screening cards are used for newborn screening. At present, some sample spots cleaned of any linkage to the babies' identification may be used for epidemiological studies under the aegis of MDCH. No parental consent is required for this; however, MDCH has rules for review and approval of the research proposals. Similarly, samples that are anonymous, but linked, are utilized without parental consent for the following purposes by MDCH:

- Research related to newborn screening at the time of collection
- Assessment of new technology
- Quality control
- Minimal risk research

Informed parental consent is required for research on identifiable samples. The samples may be used for familial research and forensic identification as requested or general research not associated with newborn screening.

Storage: Problems in the area of storage and sample retention relate to cost and effectiveness. For current methods of analyte testing of dried blood spots, the optimal storage temperature is believed to be at or below -20˚C, with a controlled humidity and adequate separation of specimen cards to prevent cross contamination. As noted previously, in Michigan newborn screening samples are stored in warehouses at ambient temperatures.

With evolving technology, especially as DNA analysis becomes more prevalent, simplified storage requirements are anticipated. For DNA testing of dried blood spots, ideal storage is at or below 4˚C; however, DNA from dried blood spots stored in the MDCH warehouse have been successfully performed years after collection.

As an indication of what changing technology is bringing to the area of sample retention, DNA analysis of buccal smears have been successfully used for forensic and paternity DNA specimens. These specimen cards can be readily stored at room temperature. Application to the area of newborn screening may be expected.

Retention of Specimens: As noted previously, there are conflicting views about how long newborn screening samples should be retained. As required by CLIA, laboratory records are retained for two years; however, the samples themselves are to be retained as long as medically necessary.

Newborn screening samples contain a wealth of information. Even though current storage methods are less than optimal for current analyte screening methods, the increasing use of DNA for screening, forensic identification and familial and medical research (for example, DNA markers in cases of childhood lymphoma in children whose newborn screens are still on file) suggests that these specimens should be retained for the present.

Safeguarding data/samples: The newborn screening laboratory has policies and procedures to assure that privacy and confidentiality are maintained. To maintain computer security, access is restricted to those who need to know. Staff education emphasizes the need for confidentiality and penalties for violations are enforced.

Newborn screening data are protected from third party access. Information about newborn screening is not provided to insurers. Family members other than parents who wish to obtain information about a child's newborn screening must obtain parental consent until the child reaches the age of majority, when the grown child may give consent. Generally, parental consent is obtained in the event of a court order for information, such as in cases of missing children.

Recommendations

1. The commission recommends that parental consent not be required for newborn screening for diseases that can be accurately diagnosed and effectively treated to prevent irreversible physical and mental changes or ameliorate a chronic condition.

2. Newborn screening should be restricted to conditions for which there is an accurate diagnosis and treatment that is both efficacious and effective to prevent irreversible physical or mental changes or ameliorate a chronic condition

3. The commission recommends that parents be given an opportunity to opt out of having their newborn's screening test card used in future research. This could be done by distributing an informational pamphlet at the time of screening with information about the process. The pamphlet could contain an MDCH telephone number that parents could call to invoke the opt-out provision.

4. The commissioners believe that the newborn screening specimens represent a vital resource for the study and treatment of disease. Not only are these specimens potentially of value in our understanding of the public's health, but they can be used, with appropriate consent, by families with special or recurring medical problems and in the identification of missing persons.

   Because of their present and potential value, the commission recommends that newborn screening samples be retained indefinitely.

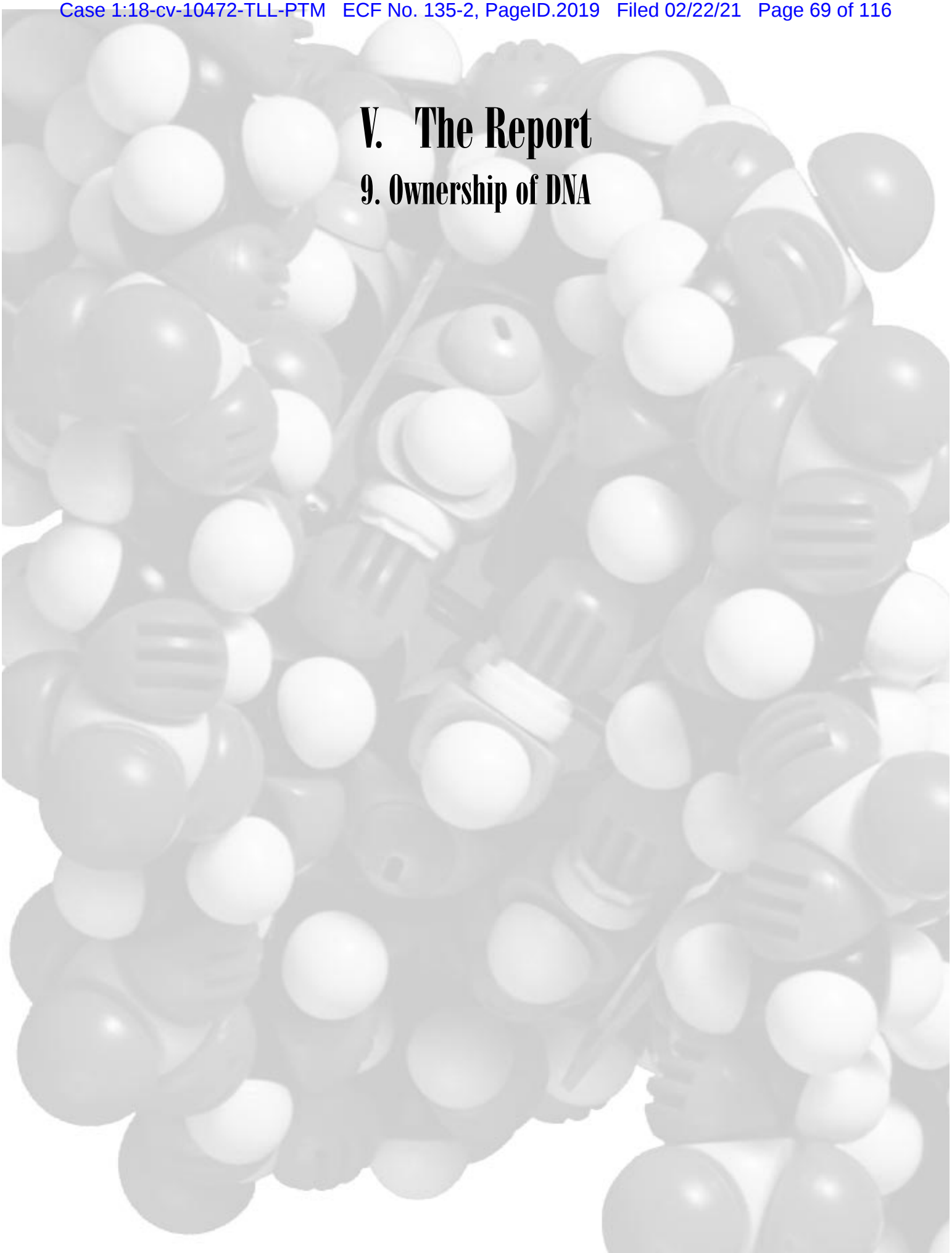
5. The commission recommends that the existing Genetic Disease Advisory Committee assist the Department of Community Health in making determinations regarding research, retention of specimens, as well as issues such as the advisability of adding new diseases to the newborn screening panel based on scientifically valid diagnostic and treatment modalities.

6. The commission believes its recommendations should assist the state in going forward with rules to support Public Act 81 of 1992.

7. Research on samples should occur only after review and approval of the research by MDCH with advice, as necessary, from the Genetic Disease Advisory Committee. Review and approval of research should be conducted pursuant to federal regulations on research. Section 45 Code of Federal Regulations Part 46 Protection of Human Subjects Section 46.101.et.seq.

V. The Report

9. Ownership of DNA



Ownership

Issue: Should individuals have an exclusive property interest in their DNA samples or genetic information?

Background: Statutes in some states have created property rights in genetic samples and information. The expressed rationale is to allow patients to protect their samples and to avoid commercial use of the samples. The laws do not specify the nature and extent of such rights.

Presently the full implications of creating such rights are unclear. At worst, these rights will lead to exceedingly complex and unnecessary legal entanglements as well as increased research costs. The laws conflict with existing law, regulation and practice. For example, federal law on clinical laboratories requires that laboratories keep samples for at least two years. State law requires that hospitals keep pathology samples. State law in the area of medical malpractice allows malpractice cases to be brought for up to six years post date of treatment. Clearly a facility would need access to the pathology slides and tissue samples to defend itself in a case alleging misdiagnosis or failure to diagnose. If a patient were allowed to remove their tissue samples from the hospital, it would make it impossible for the hospital to comply with the Federal Clinical Laboratories Act and impossible to defend itself adequately against a claim of failure to diagnose or misdiagnosis. The commission believes that the creation of property rights will do little to serve, and may even contravene, the purpose of creating such rights.

The commission believes that protecting privacy of medical information in conjunction with adequate informed consent about the uses to which samples will be put is a better mechanism for protecting individuals than creating a new property right in genetic samples or genetic information. If, for example, a researcher intended to use genetic samples for commercial gain, the researcher would have to disclose this to the prospective subject and the subject would then decide whether to donate the samples.

Analysis: Whether individuals should have property interests in their genetic samples and genetic information is an area of particular interest. Increasingly, some ethicists, legislators, scholars and lawyers are considering the creation of genetics property rights.

The issue is not entirely straightforward since ownership is not an absolute concept. Ownership or property rights may be subject to restrictions or simply be limited. In the law, we frequently talk about a bundle of property interests, which may be shared among a number of different individuals. In other words, having a property interest in something only means that one has at least some of the sticks of interests in the bundle; it does not imply that one has the whole bundle of interests. Some of the key elements (or sticks) that make up the bundle of ownership interests include:

a. The right of exclusion (right to exclusive possession or enjoyment)
b. Control over how the object is used or kept from use (transferability)
c. Devisability (transferring through will and testament)
d. The right to use and manage the property
e. The right to alter, destroy or alienate (transfer, often through sale)
f. The right to the income, capital and security
g. Length of terms of ownership interests
h. Duty to forbear from harmful use

A claim that the law should recognize a property interest in genetic information could be based on the following reasons:

a. An individual possesses the DNA in her body, and therefore the genetic information is physically located in her cells
b. The information is uniquely hers.
c. The individual can exclude others from using or benefiting from the use of her genetic material by restricting access to her cells—by controlling disposal of her hair, body fluids, waste products, etc.
d. The genetic information can be wasted, modified, destroyed or alienated only by the person in whose cells the genetic material resides.
e. The individual cannot be forced to expropriate the information encoded in her DNA; she controls who has access to that information
f. Only the individual can give away the genetic information in her cells.

Some of the arguments used to defend genetic ownership rights are problematic, however. First, some of the discussions conflate the terms genetic information and genetic material, treating them too often as one and the same. In addition, people often point to the uniqueness of genetic information, forgetting that a vast majority of everyone's DNA is very similar to everyone else's. Only a small percentage of our genetic material is really unique.

A larger problem is that many proponents of property rights ignore the fact that the law treats body parts differently in terms of property interests, depending on whether the body parts are still part of you and whether the body parts are regenerative. One cannot be required to give up cells within one's body, in large part because the law recognizes an individual's right to bodily integrity. In fact, this is one of the principles underlying informed consent law. Yet, once you consent to have your body parts removed, you no longer have the same level of legal control over those body parts.

For example, in *Moore v. Regents of the University of California*, Moore consented to have his spleen removed. His spleen was used to create cell lines that generated lucrative pharmaceutical products and Moore sued for conversion of his property, including the cells and genetic material of his spleen. The California Supreme Court held that he did not have a property interest in the excised material, although he had a cause of action for lack of informed consent. As the court noted, California statutory law drastically limits any continuing interest of a patient in excised cells. In addition, the subject matter of the patented line was not Moore's property since it was factually and legally distinct from the excised cells.

The ruling was in line with the general legal trend to allow individuals to sell regenerative materials — such as hair, blood, and semen — but not solid organs. The court's ruling, however, was largely influenced by policy considerations, in particular the need to balance the patient's rights of privacy and autonomy against the public interest in promoting research. The court concluded that recognizing property rights in this case would severely hinder research since biological materials are routinely distributed to other researchers. All of the researchers could therefore potentially become part of a long chain of individuals sued for claims like conversion, and tracing the title of ownership would be exceedingly complex, if even possible. The likely effect might be reluctance on the part of companies to invest in product development and researchers to avoid research, given the difficulties of establishing whether a clear title exists. The court reasoned that informed consent principles would protect the patient's autonomy interests in protecting bodily integrity by requiring a researcher to disclose her commercial interests in the material.

We need not adopt the rationale of the *Moore* court. That case reflects the evolving common law in California, not Michigan. Nevertheless, the commission supports the *Moore* line of thought with regard to property rights in genetic samples and information for several reasons. First, it is never fully clear what individuals mean when they say that there should be property rights in genetic information and samples. Which specific bundles of interests would they protect? This is highly relevant since it would greatly influence the hurdles or barriers that researchers, clinicians, insurers, etc. would need to overcome in order to obtain genetic information or tissue samples.

Second, creating property interests would dramatically change the legal landscape and would likely conflict with many state and federal statutes and regulations that govern the control and management of both medical information and tissue samples. Too little attention is paid to the issue of whether proposed legislation would impose conflicting duties on researchers and clinicians.

Third, we have yet to find a persuasive argument that property interests necessarily do a better job of protecting autonomy interests than informed consent law. This is particularly important, given the large uncertainty about precisely what it would mean to have a property interest in the genetic information and samples. If we are going to change the legal landscape so profoundly, we need to be fully cognizant of the long-term implications and fully clear about exactly which interests we are carving out.

Finally, this problem raises the very difficult issue of defining exactly what we mean by genetic information and genetic samples. If we head down the path of creating property interests in genetic information and samples, with all of the attendant difficulties that such legislation or common law would present in the area of research, clinical care, underwriting, etc., we need to recognize that careless descriptions of the property being protected only exacerbate those problems.

Thus, we propose that in order to protect individual's autonomy and privacy interests, we should focus on developing and honing legal mechanisms already in place rather than quickly restructuring the legal system in rather dramatic ways, at least at this point. We believe it is too early to go the "property" route, if ever we should take that route. Instead, we should focus on informed consent mechanisms, confidentiality protections of medical information and security mechanisms for storage of information and samples.

Many of the ownership concerns can be addressed through these mechanisms. For example, informed consent prior to obtaining samples can address who has access to samples, who has control over destruction of samples, what future uses will be allowed, and questions of research and commercial use. Most importantly, opt-out provisions when samples are collected in the clinical or research setting can allow individuals to have a say in whether their genetic material is used for genetic research. The real work of protecting individual autonomy, therefore, will turn on informed consent and the nature of information that a person must have prior to donating samples, and the nature of aspects of use to which the person must consent.

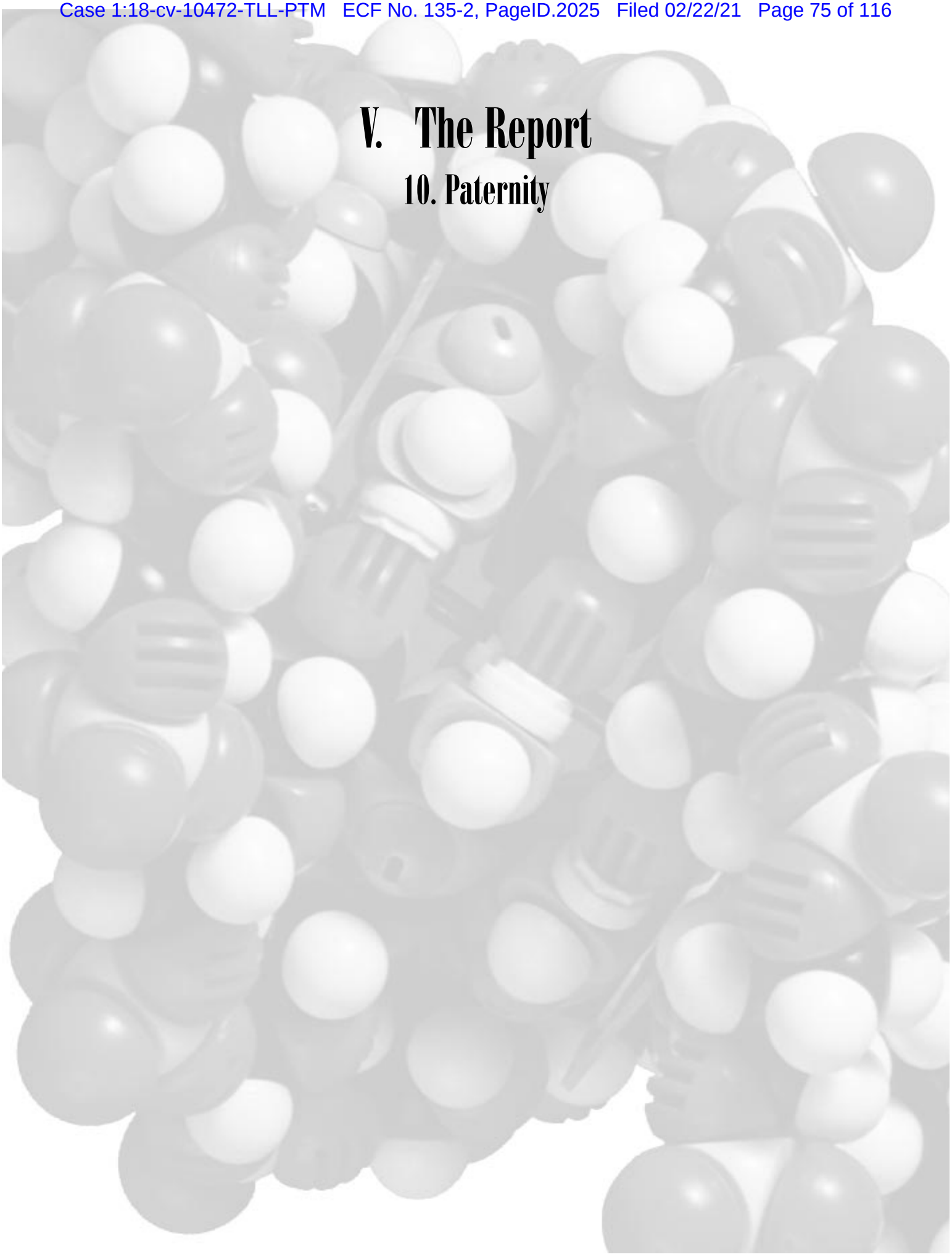
At this point, we favor maintaining the status quo because too little is currently known about many things, including 1) the magnitude of the potential harms that ownership interests are intended to avert, 2) whether ownership interests would solve the problems better than other legal mechanisms and 3) what the negative consequences might be in establishing ownership interests.

Recommendation

The commission recommends that property rights in genetic samples and information not be created for the individual providing the samples.

V. The Report

10. Paternity



DNA in Paternity Testing

Issue: How should genetic information and materials taken for paternity testing be protected?

Introduction

A large number of paternity tests are obtained voluntarily by the mother or putative father wishing to establish paternity. The remainder of the tests are initiated by the Family Independence Agency (FIA) through county prosecuting attorneys' offices in confirming eligibility for public assistance pursuant to Title IV-D of the Social Security Act.

Background

In June 1998, the Michigan legislature passed Act No. 113 of the Public Acts of 1998 (MCLA §722.711 et seq.), amending the older Paternity Act (Act No. 205 of the Public Acts of 1956). Among other provisions, the 1998 statute deals with DNA paternity identification and specifies procedures for collection of specimens, reporting results of DNA testing, destruction of samples and ensuring individual privacy. The law is discussed below.

As of this writing, the state has concerns about the destruction of samples in cases in which paternity is excluded, privacy and confidentiality, expungement of records, and ambiguities caused by incomplete definitions.

Elements of Act No. 113 of the Public Acts of 1998

Consent: The putative father may either acknowledge the child or undergo DNA testing, which is either voluntary or court ordered. When testing is ordered by the court, MCLA §722.714a (2) requires that the prosecuting attorney's office provide information about the nature of the test, the purposes for which it is being done, its uses, the reporting of the test results and the putative father's right to have the test results kept confidential, except as provided in section 6a.

Testing: MCLA §722.716(2) provides that a "DNA profile determination shall be conducted by a person accredited for paternity determinations by a nationally recognized scientific organization, including, but not limited to the American Association of Blood Banks." MCLA §722.716(a) (2) specifies that the national standards under which the testing laboratory is accredited shall determine the period for retention and destruction of paternity testing materials.

Most paternity testing ordered by the prosecuting attorneys is conducted by private laboratories, which have contracts with the state. To establish parentage, DNA profiling of blood is performed on samples of blood from the mother and child as well as the putative father. The child's genetic pattern is derived in equal portions from the mother and the father; the child's pattern is compared with both. As the first step, the bands that are present on both the mother's and child's patterns are marked. The next step is to compare the unmarked bands in the child's pattern with the bands in the father's DNA pattern. The number of matches between father and unmarked child bands is recorded. The probability of the putative father's having this number of bands matching those of the child's pattern is calculated. (Cellmark Diagnostics, DNA FingerprintingSM: The Future of Identification [Germantown, MD]).

MCLA §722.716(5) provides that paternity shall be presumed if the probability of paternity is greater than 99 percent and states further that if "two or more persons shall have a probability of 99 percent or higher, paternity is presumed for the person with the highest probability."

Reporting Results of DNA Profiling: The American Association of Blood Banks (AABB), which accredits the laboratories doing the majority of paternity tests for the state of Michigan, has devised a standard form for reporting results of paternity testing.

The paternity report in its entirety, including the patterns of the mother, child and putative father, as well as the probability of paternity, is filed with the court according to MCLA §722.716(4).

Absent the timely filing of objections, the putative father is presumed to be the father of the child if the reported probability of paternity is higher than 99 percent. With this laboratory report for guidance, the court establishes paternity, usually in an Order or Judgment of Filiation.

The entire report of the case in which paternity is established appears on the court record. Court records are not sealed and they are open to public scrutiny. The report includes both the probability of paternity and information about the test patterns. The test result patterns are unique to the mother, father and child tested, although they don't reveal genetic predispositions.

Retention of Samples and Results: As noted earlier, MCLA §722.716(a) (2) specifies that the national standards under which the testing laboratory is accredited shall determine the period for retention and destruction of paternity testing materials. If as a result of DNA paternity testing the putative father is judged to be the child's father, then the genetic testing materials of the mother, child and father are required to be retained for the length of time set by national standards. If the putative father's test reveals he is not the child's father, his genetic testing material is required to be destroyed after the testing is completed. The mother's and child's blood must be retained for the prescribed period so that it may be used for further testing. When testing material is destroyed, the adult individual or the guardian of a minor individual whose blood has been tested is to be notified by certified mail.

Confidentiality: The Family Independence Agency or its designees and the contracting laboratories are required to maintain the confidentiality of the genetic testing material, which is defined as, "any substance or information used for or produced by genetic paternity testing under this act other than a report submitted to a court for a paternity determination."

Recommendations

The commission makes the following recommendations:

1. Once the court establishes paternity, the report as it appears in the open court record should contain only the probability of paternity. The commission believes it is important to modify the form of the laboratory report so that the genetic information it contains does not become a matter of public information.

2. P.A. 113 deals with testing materials, which are defined in Sec 1.(d) as, "any substance or information used or produced by genetic paternity testing conducted under this act other than a report submitted to a court for a paternity determination." Substituting "genetic testing materials" for "testing material" would clarify that the samples are being referenced.

3. Provisions concerning elimination samples in Act No. 113 of the Public Acts of 1998 concern: (1) destruction of samples when an individual is not the father and (2) notification of destruction of these samples. The obvious intent of these provisions is to protect individual privacy.

   To facilitate the process involved in protecting of privacy in the paternity act, the commission suggests that the testing laboratory be responsible for destruction of samples and the expungement of records in accordance with recognized national standards of the laboratory's accrediting body. The records detailing both the destruction of samples and the expungement of records for paternity tests performed in Michigan should be audited in accordance with rules promulgated by the state.

4. According to MCLA §722.716(5), paternity is presumed if the probability of fatherhood is greater than 99 percent. If two or more persons have a probability of paternity greater than 99 percent, paternity shall be presumed for the one with the highest probability. This may result in an incorrect identification. The commission recommends that testing be fully carried out until all but one of the putative fathers is eliminated.

   To accomplish this, the law should be amended to read as follows: "If the results of the analysis of samples from two or more persons indicate a probability of paternity greater than 99 percent, subsequent tests should be performed until all but one of the putative fathers is eliminated."

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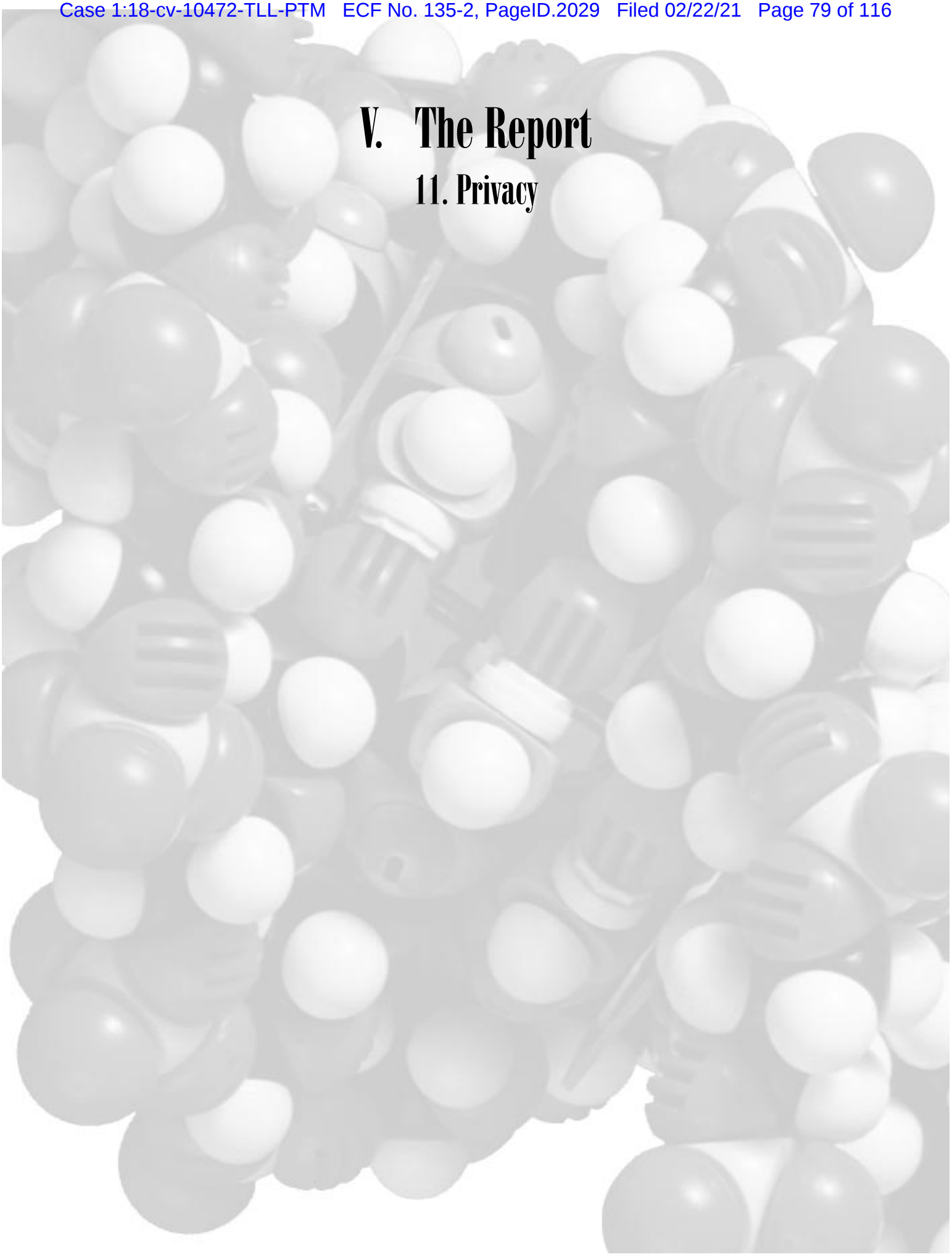
11. Privacy



Privacy

Issues: Is there a specific need for state privacy laws concerning genetic information? Should there be any exceptions allowing physicians to disclose genetic information? Should there be considerations for research?

Background: Michigan has a comprehensive statutory scheme protecting access to health care information. Genetic information is thus protected under these rules. Special protection has been suggested because of the relevance of genetic information for family members, but special protection is unlikely to succeed. A preferred approach is to protect all health-related information.

Michigan has laws on professional-patient interaction, including doctor-patient, dentist-patient, social worker-patient, counselor-patient and psychologist-patient protection. Each of these laws balance social policies. For example, the doctor-patient law, MCLA 600.2157, states that all information necessary to diagnose and treat is confidential except as otherwise provided by law.

Michigan also has specific laws dealing with research confidentiality. For example, MCLA 333.2631 states that information shared with the Michigan Department of Community Health for medical research concerning mortality or morbidity is confidential and shall not be further disclosed.

Michigan has general medical privacy laws and also has specific laws in the areas of HIV and substance abuse. For example, MCLA 333.6111 states that records of the identity, diagnosis, treatment and prognosis of substance abuse patients are confidential.

Genetic information is just one part of a patient's total medical record and policies intended to protect genetic privacy must also cover the privacy of all health-related information.

Michigan also has specific laws concerning genetic information:

1. The DNA Identification Profiling System Act allows the Michigan State Police to retain DNA identification profiles of individuals convicted of attempted murder, first and second degree murder, kidnapping or criminal sexual conduct in any degree including assault with intent to commit criminal sexual conduct. MCLA 28.171.

2. The newborn testing law requires testing of newborns for seven specific genetic conditions. MCLA 333.5431. This information is kept by the state. The section of this report on newborn screening makes recommendations about these test results.

3. The law on chronic disease prevention and control requires the Department of Community Health to establish a chronic disease prevention and control program including genetic diseases. MCLA 333.5401.

4. The Michigan Adoption Code has provisions about obtaining biological information on an adopted child, including genetic conditions. MCLA 710.68(a).

5. Paternity testing can be done by blood or genetic testing and Michigan has a central paternity registry.

The federal government has been actively engaged in thinking about a federal privacy law for health information. In 1996, Congress passed the Health Insurance Portability and Accountability Act of 1996, which set a deadline for Congress to protect personal privacy. The law required the Secretary of Health and Human Services to recommend to Congress ways to protect individually identifiable information and establish penalties for wrongful disclosure of personal medical information. Secretary Shalala presented those recommendations to Congress September, 1997. Congress now has until August, 1999 to enact a privacy law. If Congress fails to act, the Secretary of Health and Human Services is directed to promulgate regulations relating to privacy of health information by February 21, 2000. Thus, the federal government will soon be creating federal privacy laws.

The secretary's report, submitted September 11, 1997, recommended that Congress enact national standards to provide fundamental privacy rights for patients and to define responsibilities for those who serve them. A summary of the recommendations is part of the commission's work papers.

It is likely that the federal government will pass medical privacy laws, including rules for genetic privacy, and that those laws will act as a floor for state legislation. It is, however, possible that the federal government will enact laws that preempt other state legislation.

An important balancing act must be considered here. Confidentiality is important to maintain trust between physicians and patients and to protect patients' health care information. At the same time, it is important to conduct health-related research including genetic linkage studies and outcome analyses. At the moment, the state and federal governments want both to improve the health care system and to increase privacy of health care information. This means that any privacy laws will need exceptions for authorized research.

Analysis: Given the major thrust for federal legislation, it is probably premature for the state to spend a great deal of time creating privacy laws that ultimately may be superseded by federal action.

It is important to balance the interest in ongoing research and protecting patient privacy.

Recommendations

1. The commission recommends that genetic information be protected just as all medical information is protected. The commission does not recommend special protection for genetic information since the commission feels that it is critically important to protect all medical information and it would not be useful to create a separate set of laws for genetic information. The commission believes it is important to consider both use of and access to information. The commission believes that research uses are important and access can be controlled in a way that keeps confidentiality intact. Exceptions to confidentiality should exist for criminal investigations, court proceedings, paternity disputes, decedent identification, convicted criminals and newborn screening. After the federal government enacts privacy legislation the state can conduct an analysis to determine the need for any state legislation.

2. The commission recommends that no state law be enacted that would prohibit legitimate research from occurring. Federal law will generally govern research, but the state can, through the use of existing laws such as MCLA 333.2631, provide added protection to genetic research. For example, MCLA 333.2631 states that information shared with the Michigan Department of Community Health while conducting medical research concerning mortality and morbidity is confidential and cannot be further disclosed. That law could be broadened to say that information shared with the department while conducting medical research concerning mortality and morbidity, genetic studies or other studies approved by the department would be confidential and could not be further disclosed.

3. The commission notes that in the area of genetics, family access to medical information may be important. Accordingly, the commission recommends that there be consideration for access to information about deceased family members when there is a demonstrated need by the living family members to have the information to conduct appropriate genetic studies. A law could indicate that for family members who have been deceased 100 years or more there should be open access. If the family member has been deceased fewer than 100 years, either an executor could grant access or, in the absence of an estate, a physician could obtain access to the records upon a showing that there was a need for the information to provide appropriate health care for living family members.

4. Further, the commission believes the state should enact a narrow law allowing, but not requiring, a physician to disclose information to a family member under the following limited circumstances:

   a. A patient has a genetic variant that other family members could also have inherited.

   b. The variant is associated with a condition that is either treatable or is important to be disclosed to avoid future injury.

   c. The patient, after appropriate counseling, refuses to share the information or allow the information to be shared with other family members.

   d. Failure to share the information could result in serious physical harm to the unknowing family member.

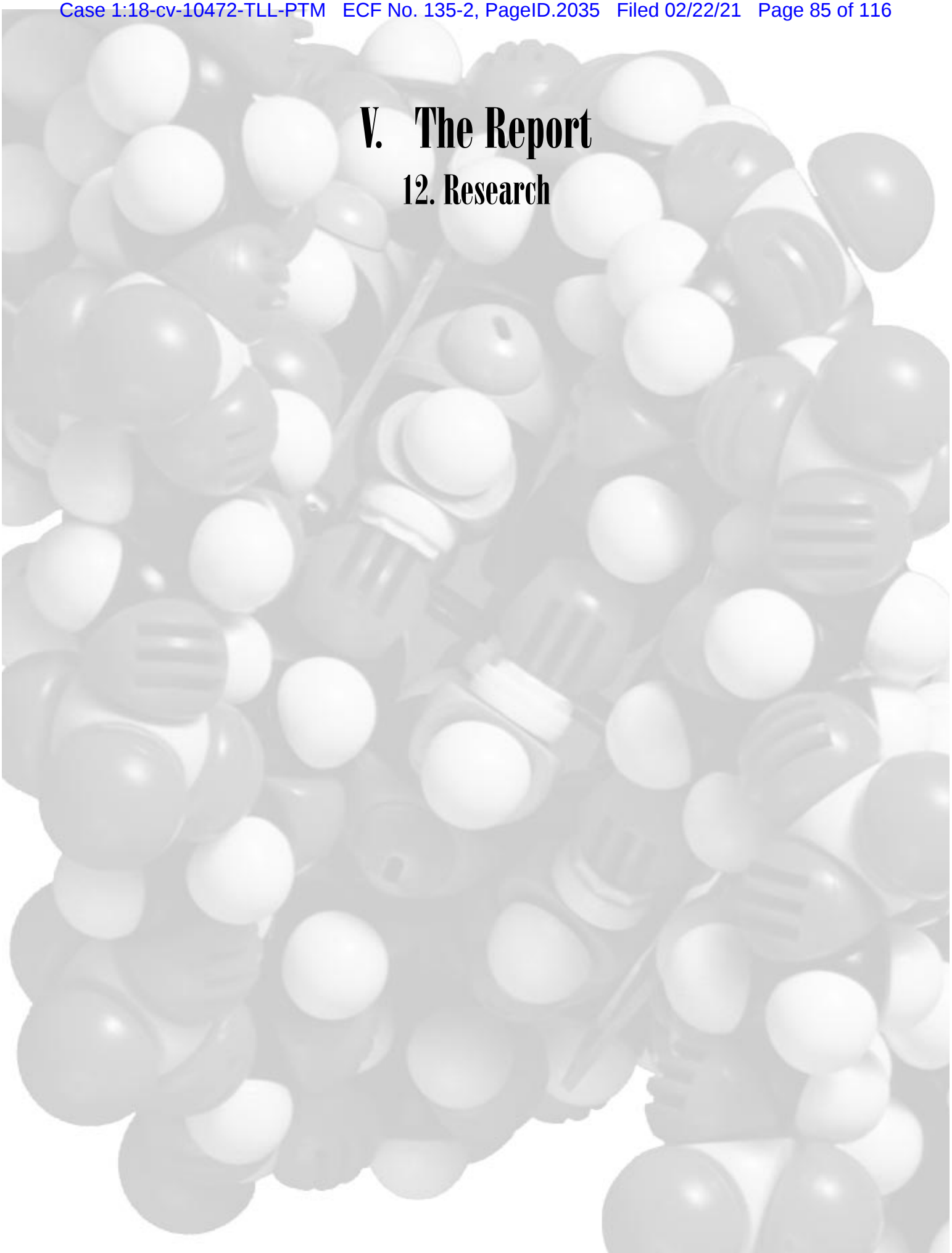
   In these very limited circumstances, the commission believes that the health care professional (physician or counselor) should have the option to disclose the information and should be immune from liability for disclosing or not disclosing. This would require a limited exception to doctor-patient confidentiality.

5. The commission also recommends that any privacy laws should consider both release and re-disclosure of information. In some cases, as indicated above, it may be appropriate to disclose information to a third party but only on the condition that the third party cannot re-disclose the information.

6. Finally, the commission recommends that health care professionals, employers and anyone else with access to genetic information must provide full information to a patient or consumer so that the consumer can make an informed choice before submitting to any testing. This means that there would be a full discussion of the test, its implications, who would have access to the test results, how the test results would be used and how the results would be kept confidential. This is discussed in the section on informed consent.

V. The Report

12. Research



Research

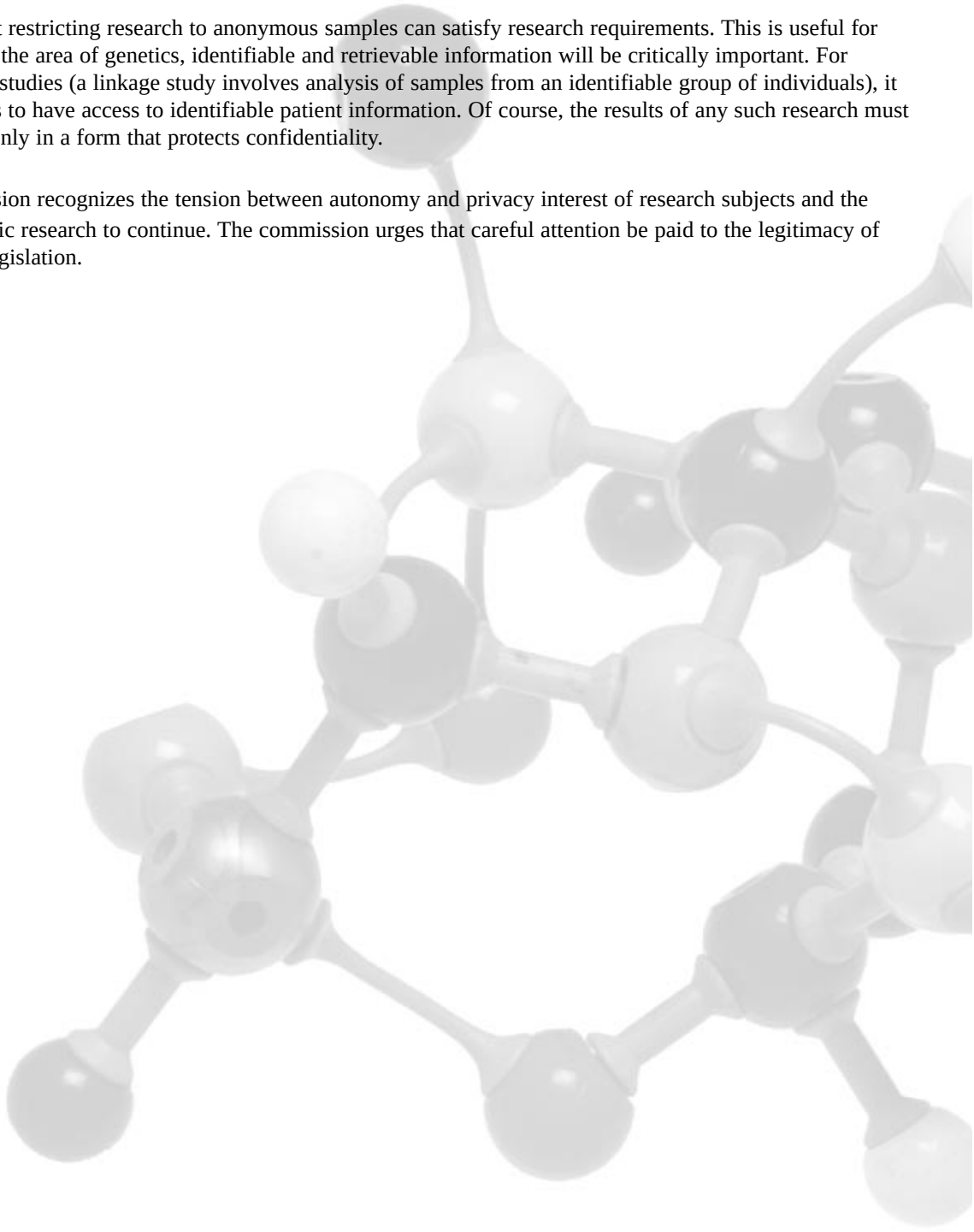
Issue: Should research and its implications be considered in constructing legislation?

Background: As noted throughout this report, genetics has provided significant advances in research over the past decade. These advances are expected to continue and accelerate as studies for therapeutic genetic treatment begin. The commission believes that research is important and the import of any potential legislation on research should always be considered.

Given the values of genetic research, the commission urges the state legislature to consider the potential effects that certain policies might have on research. The commission believes that any limitations on research should be imposed only when necessary to further other important public interests.

Some commentators believe that restricting research to anonymous samples can satisfy research requirements. This is useful for some research, but especially in the area of genetics, identifiable and retrievable information will be critically important. For example in familial and linkage studies (a linkage study involves analysis of samples from an identifiable group of individuals), it will be important for researchers to have access to identifiable patient information. Of course, the results of any such research must be published and disseminated only in a form that protects confidentiality.

Recommendation: The commission recognizes the tension between autonomy and privacy interest of research subjects and the public interest in allowing genetic research to continue. The commission urges that careful attention be paid to the legitimacy of research issues in considering legislation.



V. The Report

13. References

References

Overview of Clinical or Medical Genetic Services

Elizabeth M. Petty, M.D.

Hereditary diseases have been described since biblical times but it wasn't until the last quarter of the 20th century that molecular and medical genetics blossomed into a recognized clinical subspecialty. The University of Michigan Medical Center was the first institution worldwide to establish and operate a university-based medical genetics clinic to serve individuals with and families concerned about inherited diseases. The doors of this unique clinic opened in 1941, three years before DNA was discovered as the basic chemical unit of heredity and over a decade before the double helix structure of DNA was described by Watson and Crick. Today's medical genetics evaluation has evolved and generally encompasses elements from both the general medical physical examination used routinely by all physicians and the specialized dysmorphology examinations used to define and characterize syndromes. The increasing availability of molecular genetic testing in all areas of medicine is expected to revolutionize the practice of medicine.

The medical genetics evaluation is one part of a specialized clinical service for individuals and families with concerns about genetic conditions that may run in their family, birth defects, genetic risk for adult-onset conditions, or issues regarding abnormal development. The field of medical genetics is a rapidly evolving and changing field reflecting our increasing knowledge about the human genome. Even within the specialty of medical genetics there are further specializations of various individuals who have expertise in a relatively focused and narrow area. The broad scope and complexity of disorders seen through medical genetics clinics necessitate a broad range of expertise to provide appropriate diagnosis and management for patients. Therefore, the genetics clinic is best served by a true team approach where genetic counselors, medical geneticists, laboratory geneticists, and other health care providers interact with the patient and patient's family to provide comprehensive care and appropriate evaluation. Other medical specialists who may be used for appropriate medical genetics evaluations include neurologists, cardiologists, oncologists, orthopedists and other surgery subspecialists, ophthalmologists, developmental pediatricians, physical medicine and rehabilitation specialists, pain management physicians, audiologists, plastic surgeons, psychiatrists and psychologists, social workers, pathologists, dermatologists, and radiologists. The interaction of all of these health care professionals together along with the genetics team is often necessary to provide patients with the most appropriate management for their multisystemic disorders.

Medical Genetics as a Clinical Medical Specialty

As recent as the past few decades, medical genetics visits were largely geared towards making diagnoses based on physical examinations of patients and examination of detailed family histories. Clinic visits were focused on delineating and defining the cardinal or characteristic features of particular syndromes, describing new syndromes, and determining the inheritance pattern of these syndromes. With the discovery of particular chromosome abnormalities in the late 1950s, geneticists began to use cytogenetic testing as a means to identify the chromosomal basis for particular syndromes. In the early 1960s, increased knowledge regarding the biochemical basis of metabolic diseases, subsequent development of diagnostic assays and, ultimately, improved management of metabolic diseases sparked the development of newborn screening programs and biochemical genetics clinics to identify and treat individuals with inborn errors of metabolism. The recognition of restriction fragment length polymorphism and Southern blotting ushered in a new era of molecular genetics in the 1970s. In the late 1980s DNA diagnostics, as a means to augment clinical genetic diagnoses and enable DNA-based prenatal diagnoses, became more widely available and more regularly employed. The advent of the polymerase chain reaction in 1985 and the implementation of the Human Genome Project in 1990 have unquestionably revolutionized the field of molecular genetics and, as anticipated, significantly influenced the thinking of clinical geneticists and the evolution of the medical genetics evaluation.

The clinical geneticist now has a wide variety of auxiliary tests available to help confirm diagnoses, make predictive diagnoses in asymptomatic individuals, and provide prenatal diagnoses for interested individuals. These rapid advances in genetic discoveries, resulting technology and their subsequent media exposure have also changed, and likely will continue to change, the character of, public desire for, and the available services provided by a genetics clinic. Finally, the impact of an ever-changing health care reimbursement system is having, and will continue to have, a major role in determining how medical genetics evaluations are conducted and clinical services are provided. Medical genetics has evolved from a descriptive discipline to one with increasing emphasis on specific testing, counseling, education, prevention, and management.

Despite extensive growth of clinical genetic services over the latter half of the 20th century, medical genetics was not actually recognized as a bona fide medical specialty by the American Board of Medical Specialists until 1991. The American College of Medical Genetics was also established in 1991 and was formally recognized by the American Medical Association five years later in

1996 when it was admitted to their House of Delegates. Even before formal medical recognition, clinical geneticists believed in the importance and uniqueness of the specialty as well as their role in providing patients and their families with the most accurate diagnostic and prognostic information available and offering them the most up-to-date strategies for management.

The Role of Medical Geneticists

To provide precise information to patients, families, and other health care providers about genetic disorders, it is absolutely essential that a thoughtful and comprehensive medical genetics evaluation by a trained clinician is fully integrated in the provision of today's clinical genetic services. Most often a formally trained clinical geneticist performs the medical genetics evaluation. Practicing clinical geneticists are, for the most part, physicians who have had their initial primary medical training in another area of medicine (usually pediatrics but sometimes internal medicine, obstetrics and gynecology, or even pathology or other specialties). They subsequently obtain at least two years of additional formal subspecialty training in clinical medical genetics. Traditionally, formal clinical genetics training was available through specialized fellowship training programs, accredited by the American Board of Medical Genetics (ABMG), for M.D.s and D.O.s. ABMG began certifying medical geneticists and genetic counselors in 1981, two years after the creation of the board. Beginning in 1997, the Accreditation Counsel for Graduate Medical Education (ACGME), rather than the ABMG, is granting accreditation for M.D. and D.O. clinical genetics training programs. In rare instances other professionals such as formally trained Ph.D. geneticists and dentists with interests in genetic syndromes have assumed active primary roles as clinical geneticists. After completion of a formal training program, physicians are eligible to sit for formal board examinations in clinical genetics, which are currently given every three years and must be renewed every 10 years. Thus, board-certified clinical geneticists are individuals who, after completing specialized training, have passed the ABMG Clinical Genetics examination.

The Role of Genetic Counselors

Most clinical geneticists work very closely with genetic counselors and laboratory-based geneticists in providing and delivering comprehensive clinical genetic services. Formally trained genetic counselors have a master's degree from an accredited training program and are board-certified by the American College of Medical Genetics. Formally-trained genetic counselors provide appropriate genetic education and counseling to individuals and families about their genetic risk, the natural history of the condition, issues in management and treatment, diagnostic testing, and psychosocial support. During a clinic session the roles of the counselor and the clinical geneticists are often closely intertwined to fully optimize care for patients and their families. Thus, the medical genetics evaluation is intimately connected to and reliant upon superb genetic counseling services.

Genetic counseling traditionally involves time-intensive sessions with a patient not only to discuss diagnostic, prognostic, recurrence risk, and medical management strategies, but also to fully educate them about their disease process, discuss genetic testing issues, and to address psychosocial concerns related to their disorder. Patients are referred to appropriate support systems and educational resources as needed. Board-certified clinical geneticists in conjunction with board-certified genetic counselors conduct most formal genetic counseling. However, with the increasing recognition of genetic components of many medical disorders and the relative paucity of clinical genetic professionals, it is likely that all physicians and related health care professionals will need to understand and be able to provide some basic genetic counseling to a large number of their patients. Only the more complicated cases are likely to be referred to genetic clinics that are routinely available in all large medical centers and, increasingly, throughout smaller communities as outreach clinics associated with the larger centers are an increasing component of genetic counseling. Discussion of genetic testing counseling in the near future may also encompass issues regarding genetic therapy.

Purposes of Medical Genetics Evaluations

There are several purposes of the medical genetics evaluation which may vary considerable depending on the particular disorder or the unique concerns of the patient or patient's family. Most often, a complete physical examination and clinical evaluation is used to help establish or confirm a particular diagnosis for an individual or for several individuals within a family. A good medical genetics evaluation should not only address what the disorder is but address other questions as well, such as: Why did it occur? When did it likely happen? Who else may be affected? What are the chances it may occur again in this family? What future problems should we anticipate? Can we avoid these problems? How can we optimize the individual's present and future health and psychological well being given this condition?

An accurate diagnosis enables precise genetic counseling and informative patient education. Specifically, recurrence risks can be more accurately provided given a confirmed and specific diagnosis. In addition, patients and their primary health care team can be specifically educated regarding the particular diagnosis and provided with anticipatory guidelines regarding potential problems as well as state-of-the-art therapeutic or management options. Once a diagnosis if formally established, or in individuals where routine follow-up is scheduled for a known diagnosis, the medical genetics examination helps determine the extent of systemic involvement

for individual patients to help provide focused medical management for their unique problems related to their particular disease. Necessary referrals to additional subspecialists who may be needed to help care for the patient should be made based on the individual's physical findings. A better sense about an individual's prognosis for morbidity or mortality may be made based on the medical genetics evaluation. Individualized counseling can be directed to focus on particular patient concerns. On follow-up visits for individuals with a genetic condition, a focused medical genetics evaluation is critically important to help identify any new problems and address any new patient concerns and questions.

Another important role of the medical genetics evaluation is to assess other family members for the condition that has been identified. There are often no cures to completely eradicate the genetic disease or disorder other than using family planning to avoid having a child with the condition. Frequently there are medical management strategies that can markedly improve an individual's condition and daily life. In addition, appropriate anticipation and watchful evaluation for potential problems will enable early detection, improving medical management and decreasing morbidity. Appropriate psychosocial support and education may enable affected individuals to manage their lives more effectively even given the physical symptoms of the condition. The ability to recognize a specific genetic disorder in a family followed by counseling may provide interested individuals with an opportunity for specific family planning.

A good clinical geneticist will do a thoughtful and comprehensive evaluation of a patient, even when a particular diagnosis at first glance seems quite likely. Sometimes this evaluation can be accomplished in one visit, while other times it may require a series of visits in a tiered fashion using additional genetic tests and specialized genetic examinations. As important as it is to give the patient a precise specific diagnosis, it is even more important not to mislabel an individual with an incorrect diagnosis based on a hasty evaluation or incomplete review of the patient's medical history, family history, and medical records. It is estimated that approximately one-third to one-half of patients presenting to a genetics clinic for a diagnosis leave the clinic without a specific diagnosis. It is a common and important practice in medical genetics clinics to continually re-evaluate these undiagnosed patients on a regular basis. Some syndromes or conditions become more easily recognizable with age and the rapid growth of genetic knowledge and resulting diagnostic technology may facilitate making a diagnosis in some patients.

The medical genetics evaluation is clearly rooted in and has evolved from the basic and important general components of physical examinations and diagnostic evaluations that are used in all areas of medical practice. Importantly, the past and present medical history of an individual, their family history and the physical examination remain critical components of a medical genetics evaluation just as they are in any medical diagnostic evaluation. As in any medical specialty where a wide variety of relatively rare conditions are diagnosed and managed, there is a great utility and benefit in having clinical genetic centers where physicians, genetic counselors, and other genetic professionals can review cases together. These conferences may be used to review cases before and following clinic visits to help make a diagnosis and discuss appropriate management. Such conferences are increasingly important given the evolving genetic technology to keep one another abreast of the most current diagnostic options and management strategies for patients. Some conditions are rare enough that any one clinical geneticist may only see a condition once in his or her lifetime, if at all, and, therefore, may have a difficult time recognizing a condition when first meeting a patient with it. Fortunately the clinical genetics community is well supplied with resident experts for virtually every disease. They are generally very open and willing to provide curbside consultations and expert advice.

Genetic Testing as a Clinical Diagnostic and Prognostic Tool

Fortunately, DNA-based testing can now be offered for hundreds of conditions that have prominent medical manifestations. Testing can be used in a variety of situations servicing various purposes from molecular diagnostic confirmation of a disease process to facilitate more appropriate medical management and accurate recurrence risk counseling, as in the case of suspected hemochromatosis, or presymptomatically to more accurately predicting one's risk of developing colon cancer. The $3 billion Human Genome Project was launched in 1990. Its goal is to sequence the entire human genome by the year 2005 and thus uncover the genetic codes for all of our estimated 70,000 to 90,000 human genes. Since there have been genetic discoveries revealed at an unprecedented pace, with the announcement of existing new disease gene discoveries occurring at least two to three times per month. This pace is predicted to skyrocket in the next century. Indeed, a new era of molecular genetics has ushered in a new and important component of clinical medicine. It has already made an undeniable impact in how medicine is practiced specifically and in how several diseases are diagnosed and managed. With the real prospect of increasing gene discoveries and related understanding of their function and regulation in health and disease, it is almost certain that the number of genetic tests available will continue to grow. Similarly, it is anticipated that the use of DNA diagnostic testing for more complex and perhaps polygenic or multifactorial traits will become readily available in the near future. The overall biomedical technology explosion has fostered the increased need and demand for specialized medical and molecular genetic services.

Accredited clinical molecular genetic diagnostic laboratories are directed by board-certified molecular geneticists holding M.D. or Ph.D. degrees or both. Similarly, cytogenetic and biochemical genetics laboratories are run by geneticists or pathologists board-certified in those specialties. General operating procedures for the laboratories are regulated by LIA, a national diagnostic

laboratory board that oversees laboratory practices in all areas of clinical medicine. National organizations in pathology, genetics, oncology, obstetrics and gynecology, medicine and pediatrics have national committees that help develop profession guidelines for the development and use of various genetic tests. In particular, the American College of Medical Genetics, the American Society of Human Genetics, and the Association of Molecular Pathology continue to develop and provide specific position papers related to guidelines for genetic testing services.

Diagnostic genetic tests can be broken down into three large and sometimes overlapping categories. These include cytogenetic studies which may include routine karyotypes, high-resolution karyotypes, and molecular fluorescent insight to hybridization studies; biochemical tests, which may include screening urine or plasma samples for the recognition of specific classes of metabolic diseases or specialized quantitative tests to look precisely at some specific enzymatic function to yield a precise diagnosis; and DNA-based diagnostic tests. Biochemical tests, depending on the specific test, may be conducted in samples of urine, plasma, red or white blood cells and, in many cases, prenatal samples including placental tissue and amniocytes. Cytogentic studies can be conducted from any cells that can be easily cultured. They are most often done from peripheral blood leukocytes (white blood cells) collected from a whole-blood specimen. Cytogenetic studies can also be conducted from bone marrow samples, amniocytes, chorionic villus samples, and skin biopsies. Abnormal fetuses that were miscarried can also be studied.

The type of genetic testing varies widely. These include: indirect methods of analysis such as linkage analysis; direct-mutation testing either by screening DNA sequences for unknown mutations or doing a specific DNA test to look for a known mutation; and functional analyses of gene expression by looking at resultant gene expression levels, protein products, or biochemical by-products. Each of the tests has its strengths and weaknesses. The specificity and sensitivity of any one test may vary considerably from another test for the same disorder. For some disorders, such as hereditary non-polyposis colon cancer, an adult-onset autosomal dominant disease where genetic heterogeneity exists, clinicians may have to choose between a number of different types of available genetic testing methods to identify the most appropriate, sensitive, specific and cost-effective test for any one individual or family. In many cases where a disease gene has been cloned, the resulting DNA test may indeed be the most appropriate test to offer a patient, though this is not always the case. Consider, for instance, a disease such as Neurofibromatosis type I (NFI, an autosomal dominant neurocutaneous disorder) where most affected adults have an easily recognizable disorder based on cutaneous examination. The gene for this disorder was closed in 1990. At the time of this writing, clinical DNA-based testing is limited to an analysis of the size of the resulting NF1 gene protein product. It is about 70% sensitive in identifying mutations in affected individuals (i.e. it is less sensitive in identifying the disease in affected adults than a good clinical examination). This test offers no particular clinical benefit, especially given the lack of any genotype/phenotype correlations that could offer insight into the patient's prognosis.

The types of molecular testing currently available can be divided into three main groups: indirect DNA analysis, direct mutation detection, and RNA-based functional assays. Technically, the analysis of protein products and functional assays could also be considered a form of indirect testing, as the specific disease-causing DNA mutation is not identified. However, given that the functional assays currently used in cancer diagnosis demonstrate a gene-specific abnormal product, it seems they are best left in their own classification. It is anticipated that functional-based genetic tests will be some of the most widely applied genetic diagnostic methods in the near future. They may be more readily applied to large population-based screening in diseases such as breast cancer where no predominant mutations have been identified in the cloned cancer genes. Indirect DNA testing, or linkage analysis, is used still in some cases where the precise mutation testing for a genetic mutation is not yet available or if a gene has only been very well localized and is not yet cloned. This is a method for tracking a disease gene on a chromosome through several family members without specifically analyzing the particular disease gene. For DNA diagnostic linkage studies to be effective it is important that the disease is most likely caused by one particular gene, that samples are available from multiple appropriate family members, and that patients undergoing such studies understand the ambiguities that may be associated with linkage studies. These ambiguities include the potential for recombination (chromosomes' regions mix with one another during formation of the egg or sperm of the parents' chromosome). As more disease genes are cloned, the availability of specific mutation testing and mutation screening for many disorders is becoming increasingly possible. DNA testing can be done on any nucleated cell specimen from which DNA can be obtained. Therefore, DNA testing can be used for prenatal diagnosis, routine clinical diagnosis, and can even be used to analyze achievable pathological specimens from deceased affected family members if necessary. Blood samples for DNA testing are most often requested to be sent in special tubes to ensure high-quality DNA for testing, but in reality DNA can often be extracted from body fluid or tissue stains the size of a dime. Some mutational studies are also based on functional assays of mutations. These require special specimen handling as for many of these tests it is important to have intact RNA as the sample source. Thus, for any special genetic tests, it is extremely important to know exactly what type of test is being done and how the sample should be sent. Failure to obtain, handle, or ship a specimen properly could result in no results, or worse, could potentially cause false-positive or false-negative results especially with sensitive biochemical assays.

It is anticipated with the advances made through the Human Genome Project that our ability to do predictive testing for adult-onset disorders will only continue to grow. It is important that the physicians and scientists responsibly translate this explosion of genetic information into molecular diagnostic tests. Specifically, in the area of predictive or presymptomatic testing the full implications of such testing should be well-understood. It is also important that, for each disease being tested for, the epidemiology, penetrance, clinical variability, and management of the disorder are understood. It is also important to remember that genetic testing is an

evolving process with the development of increasingly more sensitive, specific, and cost-effective methods. Genetic testing laboratory databases designed for health care professionals are maintained on-line. One currently available database, HELIX, provides information about which laboratories offer research or clinical genetic testing for all diseases with a genetic component. Thus, clinicians and researchers wanting to learn more about DNA testing can use on-line databases, consultation with local genetic centers, and information provided by national disease-associated organizations to ascertain current information about specific genetic testing for any disease in consideration.

It is also critically important to remember that genetic testing encompasses more than a simple laboratory and needs to include pre-testing counseling and education; provision of informed consent; accurate interpretation of the test results; and post-testing education, management and support. This is especially true when DNA-based testing is used to more accurately determine a healthy individual's genetic risk as in preconceptual testing to determine carrier status of parents for a given autosomal recessive disease, or in predictive testing of an asymptomatic individual who, by virtue of their family history or their ethnicity, are at risk of having inherited a particular mutation and seek to learn whether they have indeed inherited the mutation in question. In the future it is likely that this type of predictive testing will be readily available for a wide variety of conditions. Currently individuals with a family history of colorectal cancer are seeking such predictive testing in order or begin appropriate medical management.

In addition to specific genetic tests, a variety of diagnostic studies may be required in concert with a clinical evaluation and medical history in order to reach a particular diagnosis for a patient or to provide information about prognosis and medical management. These tests will include specific genetic-based testing but are not limited only to those genetic tests. For example, in a newborn boy who has excessive bleeding after a circumcision, a specialized precise DNA-based mutational analysis may reveal the molecular basis for his bleeding disorder and confirm his diagnosis of Hemophilia A. More routine hematology laboratory tests, such as clotting factor studies, will be most useful in making the initial diagnoses critical to the patient's immediate medical management. Thus, other routine laboratory studies may be required in the medical genetics evaluation to help reach a diagnosis or manage patient symptoms. Blood counts, clotting factors, liver function tests, kidney function tests, acid base status, and measurements of other breakdown products of metabolism may be useful. None of these laboratory studies are considered routine in the medical genetics evaluation but are used as necessary depending on the circumstances of individual cases. Various diagnostic imaging studies are often of great importance and help in the medical genetics evaluation. In addition to still photography and video imaging, various types of X-ray studies, including skeletal surveys, may be of specific help in determining various genetic conditions including skeletal dysplasia and to recognize any bony congenital anomalies that may point to a specific syndrome diagnosis. Specialized imaging studies such as CT scans, MRI scans, and echocardiograms may be required in the evaluation of certain conditions or to help make a specific diagnosis. For example in Marfan syndrome, where aortic root dilatation and aortic rupture may occur, an echocardiogram documenting aortic root size may be useful in helping to confirm a diagnosis. Once the diagnosis is made, routine echocardiograms or in some cases, other imaging studies such as transesophageal echocardiograms or spiral CT scans of the aorta, need to be done on a regular basis to monitor the patient for any signs of progression of aorta or aortic root problems necessitating more aggressive medical management. Therefore, diagnostic imaging studies in clinical patients can be quite useful not only in initial diagnosis but also in routine follow-up and management. Indeed in some cases such as cystic fibrosis a simple lab test at the patient's request can make the diagnosis as well as a DNA analysis. Specialized imaging studies in the prenatal period are routinely used to look for congenital anomalies such as detailed ultrasounds and fetal echocardiography.

Unique Areas of Genetic Testing and Counseling or the Four Ps: Preconceptual, Prenatal, Presymptomatic and Predictive Testing

By its very nature, genetic testing has the potential power to determine what disorders may be most likely to occur in a family or in an asymptomatic healthy individual. The use of genetic testing for purposes of family planning to either prevent or better manage a child with a genetic disease has been available for decades. Preconceptual genetic counseling and testing can help determine which couples may be at highest risk of having a child with an inherited condition. Prenatal genetic counseling and testing which can occur any time between conception and the birth of the baby often is done between eight and 24 weeks of gestation to provide parents with information about the health of their baby so they can plan for the care of their infant.

The fields of predictive and presymptomatic molecular genetic testing for late childhood or adult-onset disorders such as cancer are relatively new areas in clinical medicine. Presymptomatic testing implies that an asymptomatic individual who has a positive genetic test for a disease gene will, at some time in their life, develop symptoms of the disease if they live as long as their average anticipated life span. Predictive testing implies that the test result will enable one to make a calculated prediction about the likelihood of an asymptomatic individual developing the disease over the course of their anticipated life span. Therefore, simply stated, presymptomatic testing implies that one will get the disease if one has the mutation, whereas predictive testing helps determine only the likelihood that one will develop the disease. In general, because of the incomplete penetrance of many genetic mutations, genetic testing of asymptomatic individuals is most often properly referred to as predictive testing. Sometimes the term susceptibility testing is used in discussions of predictive testing. Susceptibility testing also implies that one is able to calculate an individual's risk of developing the disease for which they have inherited the gene. In general, however, susceptibility testing refers

to testing for genetic mutations that have a very low penetrance or that do not follow clear Mendelian inheritance patterns of disease. It is important to bear in mind that the degree of penetrance will vary for each disease gene in question, and likely for different mutant alleles within the disease gene. Therefore, it is absolutely essential that both the patient and health care provider fully understand that predictive genetic tests are probabilistic rather than deterministic in nature. The test results only help determine the specific probability or odds that an individual will develop a specific type of cancer by a certain age. Most of the presymptomatic (e.g. Huntington Disease) and predictive (e.g. inherited breast cancer genes BRCA1, BRCA2) clinical tests currently available have been developed for testing in families with clearly inherited genetic syndromes rather than general population-based mutation screening efforts. Testing available today if used in the general population would likely lead to erroneous risk estimates. Both health care providers and consumers must understand basic information regarding the application of presymptomatic and predictive molecular genetic tests for these syndromes. Health care professionals must critically evaluate and appropriately use these molecular genetic tests, helping their patients consider not only what test might be most appropriate but also when testing might be most appropriate.

Presymptomatic and predictive genetic testing encompasses more than the actual DNA-based test. It includes genetic counseling and education for the individual, and possibly other family members who are considering testing, evaluation of the client for emotional stability and ability to understand the implications of positive and negative presymptomatic tests, and post-testing counseling and follow-up including therapeutic interventions and clinical referrals as needed. It is important that individuals remember that presymptomatic genetic testing does not predict the exact age of onset of the disease, the severity of symptoms, or the course of disease progression for specific individuals.

Because of the many issues involved in presymptomatic testing for an adult-onset disorder such as Huntington Disease (HD) or breast cancer, guidelines for testing have been developed by various groups. For HD, guidelines highlight the importance of pre- and post-testing genetic counseling, a neurological evaluation, a comprehensive psychological evaluation, and presence of a support person who will be with the client throughout the testing process. The support person can be a close friend, a spouse, or other individual identified by the client as someone who they can trust and depend on to provide support during the testing process especially when results are disclosed. It is not recommended that the support person be a sibling or other family member who is also undergoing testing at the same time. It is recommended that clients have contacted or identified a local counselor or therapist who will be able to help them deal with their emotions triggered by the test results. It is recommended that the results be disclosed only in person because of several questions that arise when the test results are given to the client whether they are positive or negative. It is also strongly recommended that minors be tested only if it is clinically indicated, such as when minors are having symptoms consistent with a possible diagnosis of HD. It is specifically recommended by the vast majority of geneticists that no presymptomatic testing of minors occur. Since there is no specific treatment or therapies to alter the course of the disease, this is no advantage or benefit for testing minors at this time. It is also widely recognized by the HD groups and geneticists that many at-risk adults choose not to undergo presymptomatic testing because they would rather not know this information given the fact that there are no specific therapeutic options. Thus, it is felt presymptomatic testing should only be done when individuals can reliably give informed consent for the testing.

Summary of Genetic Testing in Medical Practice

The discovery of specific genes involved in human disease has grown at an exciting and unprecedented pace during the last decade of the 20th century. These discoveries were sparked by the 1990 launch of the Human Genome Project. Additionally, the explosion of innovative molecular genetic technology in the last quarter of the century, including development of recombinant DNA methods in the 1970s and the advent of the polymerase chain reaction in 1985, has allowed investigators to characterize cancer genes more rapidly. Many of the laudable scientific advances in characterizing novel human disease genes have been, and continue to be, translated into clinically useful diagnostic and prognostic tests. Some of the most widely discussed new types of clinical molecular testing in medical practice today involve the actual analysis of a specific DNA sequence or its resulting protein product. It is important to note, however, that other types of genetic tests have demonstrated significant utility in the investigation, detection, and management of human disease over the past several decades. Available genetic tests useful in medical practice vary considerably from those based on analysis of single nucleotide changes at the DNA level to those looking at large structural chromosome rearrangements.

To date, the major impact of modern molecular genetics in clinical medicine has been in the improvement of our ability to predict, diagnose, and classify human disease. Despite this, the actual number of proven cost-effective and clinically useful molecular genetic diagnostic tests available at the close of the 20th century is still relatively limited compared with the actual number of diseases identified as having some genetic basis. Until recently one of the largest roadblocks in the rapid and efficient translation of molecular genetic information into the development of sensitive, robust clinical DNA-based tests for diseases was secondary to limitations in the technology for cost-effective mutation screening. With innovative and increasingly automatable molecular genetic technology being developed, it is likely that these limitations will be significantly reduced. Armed with tremendous new knowledge about various genes and significant advances in technology to manipulate and analyze DNA, RNA and proteins, we are poised with

the real potential to develop molecular genetic tests not only for clinical predictive and diagnostic testing, but also for more specific prognostic testing and potentially as a rapid means of directing the development of specific gene therapies. With our deeper understanding of genetic mechanisms underlying the pathogenesis of human disease, the widespread use of DNA or molecular-based testing may become a practical reality for the rapid diagnosis and focused management of several human diseases, both inherited and sporadic. Future progress should provide new tools for predicting genetic risk and therapeutic responses, hopefully leading to a significant shift in medical therapy towards disease prevention. It is anticipated that our knowledge in this area will continue to skyrocket, ushering in a new era of molecular medicine that will significantly alter the practice of medicine in the next century especially in the areas of predictive risk analysis, preventive management strategies, and anticipatory guidance. One of the biggest challenges of the next millennium will be understanding, appropriately applying, and accurately interpreting the plethora of anticipated molecular diagnostic tests. It is critical in applying these tests cost-effectively to make sure that health care professionals understand basic genetic principles as applied to clinical molecular genetic diagnostic tests. It is equally vital to make sure that the benefits, ramifications and limitations of such testing are understood by the individual undergoing the testing and by society in general.

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Dennis Schornack, Special Advisor for Strategic Initiatives, Executive Office • Mary Schroer, Representative, Michigan House of Representatives • Jacqueline Scott, Bureau of Laboratories, Department of Community Health • Dale L. Shugars, Senator, Michigan Senate • Alma Wheeler Smith, Senator, Michigan Senate • Marc Speiser, Office of State Senator John Schwarz • F. Douglas Stacks, National Legal Laboratories • Michael Strazzella, Manager of Congressional and Regulatory Affairs, American Society of Clinical Pathologists • Marilyn Stephen, Assistant Prosecuting Attorney and Chief, Child Support Division, Office of the Attorney General • Arthur Stine, Director of Constituent Services, Department of Civil Rights

Jeff Taylor, Executive Director, Michigan Public Health Institute • Angela R. Tiberio, MD, Michigan State Medical Society Advisory Committee on Genetic Technology • Brenda Trolin, National Conference of State Legislators • Judge Susan VanderCook, Probate Court, Jackson County • Daniel VanDyke, Michigan State Medical Society Advisory Committee on Genetic Technology

Wendy Wagenheim, Legislative Affairs Director, American Civil Liberties Union • Lois Waldman, Director, Commission for Women's Equality, American Jewish Congress, Department of Community Health • William B. Weil, Jr., MD, Michigan State Medical Society Advisory Committee on Genetic Technology • David J. Werrett, Director of Research and DNA Services for the Forensic Science Service, UK • Nancy Whitman, Librarian, Law Library, Library of Michigan.

John Engler, Governor
James K. Haveman, Jr., Director

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PUBLIC HEALTH CODE (EXCERPT)
Act 368 of 1978

333.5431 Testing newborn infant for certain conditions; reporting positive test results to parents, guardian, or person in loco parentis; compliance; fee; "Detroit consumer price index" defined; violation as misdemeanor; hardship waiver; conduct of department regarding blood specimens; pamphlet; additional blood specimen for future identification.

Sec. 5431. (1) A health professional in charge of the care of a newborn infant or, if none, the health professional in charge at the birth of an infant shall administer or cause to be administered to the infant a test for each of the following:

(a) Phenylketonuria.

(b) Galactosemia.

(c) Hypothyroidism.

(d) Maple syrup urine disease.

(e) Biotinidase deficiency.

(f) Sickle cell anemia.

(g) Congenital adrenal hyperplasia.

(h) Medium-chain acyl-coenzyme A dehydrogenase deficiency.

(i) Other treatable but otherwise disabling conditions as designated by the department.

(2) The informed consent requirements of sections 17020 and 17520 do not apply to the tests required under subsection (1). The tests required under subsection (1) shall be administered and reported within a time and under conditions prescribed by the department. The department may require that the tests be performed by the department.

(3) If the results of a test administered under subsection (1) are positive, the results shall be reported to the infant's parents, guardian, or person in loco parentis. A person is in compliance with this subsection if the person makes a good faith effort to report the positive test results to the infant's parents, guardian, or person in loco parentis.

(4) Subject to the annual adjustment required under this subsection and subject to subsection (6), if the department performs 1 or more of the tests required under subsection (1), the department may charge a fee for the tests of not more than $53.71. The department shall adjust the amount prescribed by this subsection annually by an amount determined by the state treasurer to reflect the cumulative annual percentage change in the Detroit consumer price index. As used in this subsection, "Detroit consumer price index" means the most comprehensive index of consumer prices available for the Detroit area from the bureau of labor statistics of the United States department of labor.

(5) A person who violates this section or a rule promulgated under this part is guilty of a misdemeanor.

(6) The department shall provide for a hardship waiver of the fee authorized under subsection (4) under circumstances found appropriate by the department.

(7) The department shall do all of the following in regard to the blood specimens taken for purposes of conducting the tests required under subsection (1):

(a) By April 1, 2000, develop a schedule for the retention and disposal of the blood specimens used for the tests after the tests are completed. The schedule shall meet at least all of the following requirements:

(*i*) Be consistent with nationally recognized standards for laboratory accreditation and federal law.

(*ii*) Require that the disposal be conducted in compliance with section 13811.

(*iii*) Require that the disposal be conducted in the presence of a witness. For purposes of this subparagraph, the witness may be an individual involved in the disposal or any other individual.

(*iv*) Require that a written record of the disposal be made and kept, and that the witness required under subparagraph (*iii*) signs the record.

(b) Allow the blood specimens to be used for medical research during the retention period established under subdivision (a), as long as the medical research is conducted in a manner that preserves the confidentiality of the test subjects and is consistent to protect human subjects from research risks under subpart A of part 46 of subchapter A of title 45 of the code of federal regulations.

(8) The department shall rewrite its pamphlet explaining the requirements of this section when the supply of pamphlets in existence on March 15, 2000 is exhausted. When the department rewrites the explanatory pamphlet, it shall include at least all of the following information in the pamphlet:

(a) The nature and purpose of the testing program required under this section, including, but not limited to, a brief description of each condition or disorder listed in subsection (1).

(b) The purpose and value of the infant's parent, guardian, or person in loco parentis retaining a blood specimen obtained under subsection (9) in a safe place.

(c) The department's schedule for retaining and disposing of blood specimens developed under subsection (7)(a).

(d) That the blood specimens taken for purposes of conducting the tests required under subsection (1) may be used for medical research pursuant to subsection (7)(b).

(9) In addition to the requirements of subsection (1), the health professional described in subsection (1) or the hospital or other facility in which the birth of an infant takes place, or both, may offer to draw an additional blood specimen from the infant. If such an offer is made, it shall be made to the infant's parent, guardian, or person in loco parentis at the time the blood specimens are drawn for purposes of subsection (1). If the infant's parent, guardian, or person in loco parentis accepts the offer of an additional blood specimen, the blood specimen shall be preserved in a manner that does not require special storage conditions or techniques, including, but not limited to, lamination. The health professional or hospital or other facility employee making the offer shall explain to the parent, guardian, or person in loco parentis at the time the offer is made that the additional blood specimen can be used for future identification purposes and should be kept in a safe place. The health professional or hospital or other facility making the offer may charge a fee that is not more than the actual cost of obtaining and preserving the additional blood specimen.

History: 1978, Act 368, Eff. Sept. 30, 1978;—Am. 1986, Act 300, Eff. Mar. 31, 1987;—Am. 1987, Act 14, Imd. Eff. Apr. 14, 1987;—Am. 1988, Act 264, Imd. Eff. July 15, 1988;—Am. 1992, Act 81, Imd. Eff. June 2, 1992;—Am. 1998, Act 88, Imd. Eff. May 13, 1998;—Am. 1999, Act 138, Imd. Eff. Oct. 5, 1999;—Am. 2000, Act 33, Imd. Eff. Mar. 15, 2000;—Am. 2002, Act 691, Eff. Apr. 1, 2003.

Popular name: Act 368

Administrative rules: R 325.1471 et seq. of the Michigan Administrative Code.

1965-2015 Michigan Newborn Screening: A Public Health Success Story

Foreword

Half a century is a long time, especially when talking about a public health program. Since the start of the Michigan Newborn Screening Program in 1965, it was evident that the work was not only life saving for the babies identified but also very important to the people who worked persistently on improving the program. The original Michigan screening pioneers, Drs. Richard Allen and K. Stanley Read, with great support from state senator, Dr. Vern Ehlers, developed the foundation for what the program is today. Now, the Michigan Newborn Screening Program screens for 55 disorders. Five decades of hard work and dedication has led to life altering diagnosis and treatment for over 7,200 Michigan newborns.

To celebrate these fifty years, the Newborn Screening Program has put together a compilation of Michigan's successes. We would like to thank all of those involved in the newborn screening process, from hospital staff to medical management, for making all of this possible. Here's to fifty more years of improving and saving babies' lives!

– Harry Hawkins, *Newborn Screening Laboratory Manager*

– William Young, *Newborn Screening Follow-Up Program Manager*

January, 2015

Acknowledgements

Michigan's Newborn Screening Program has a rich history of success made possible by the contributions of many individuals over the last 50 years. We'd like to recognize and thank those who were so instrumental in advocating for, and implementing new screening technologies and treatments that have benefited Michigan babies over the last five decades. Each of the following individuals dedicated more than 25 years of their career to make newborn screening a better program—without them, it would not be what it is today.

Pioneers

Dr. Richard Allen
Pediatric Neurologist and Director,
University of Michigan Metabolic Clinic

Dr. K. Stanley Read
Public Health Laboratory Microbiologist

Leaders

Harry Hawkins
Newborn Screening Laboratory Section Manager

Dr. Charles Whitten
Hematologist and Founder, Sickle Cell Detection and Information Program

Dr. William Young
Newborn Screening Follow-up Program Manager

Support Team

Karen Andruszewski
Newborn Screening Quality Assurance Coordinator

Denise Archambeault
Newborn Screening Laboratory Data Technician

Janice Bach
Genomics and Genetic Disorders Section Manager

Caron Burns
Newborn Screening Laboratory Endocrine Unit Manager

Catherine Mazzolini
University of Michigan Metabolic Clinic
Administrative Assistant

Eleanor Stanley
Newborn Screening Laboratory Metabolic Unit Manager

Introduction

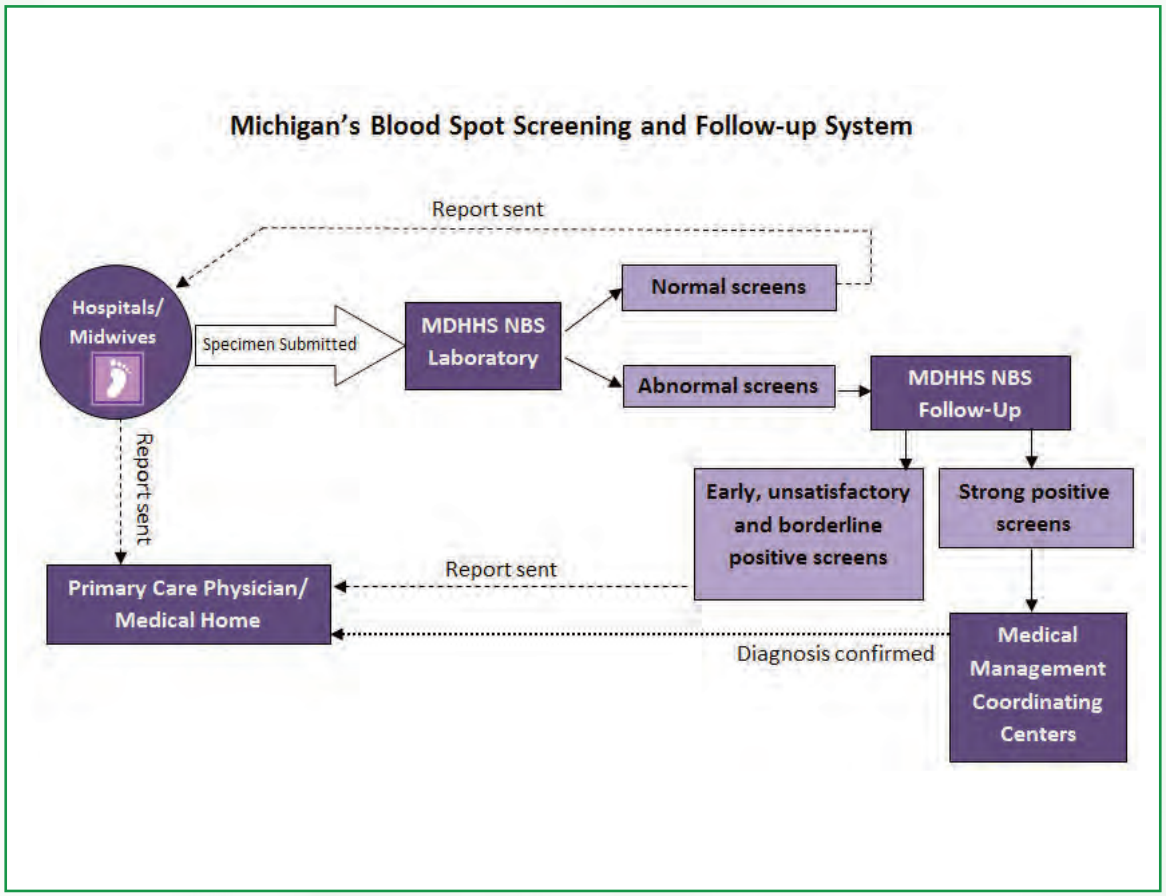
Newborn Screening is a public health program that touches nearly every Michigan newborn in all corners of the state, from Detroit to Traverse City to the far reaches of the Upper Peninsula. Every baby must be screened because most babies who have a medical condition on the newborn screening (NBS) panel seem healthy at birth but can become very sick in a short time. If not found early, the consequences can include serious and permanent health problems, severe developmental delays and even death.

Michigan law requires testing of all newborns to ensure every baby who needs treatment is found as early as possible.

Newborn screening works because a coordinated system of players—hospitals and midwives, couriers, public health laboratory and follow-up staff, primary care providers, medical specialists and families—help to make sure every baby has an opportunity to be tested and treated quickly, if needed.

Between 24 and 36 hours of life, a few drops of blood are drawn from a baby's heel to fill five or six spots on a filter paper card. The card with the dried blood spots is sent to the State Newborn Screening Laboratory for testing. Follow-up with referral to medical management coordinating centers is activated immediately when an abnormal screen is reported.

Thanks to advances in science and hard work by many dedicated individuals over the last 50 years, Michigan blood spot screening now looks for over 50 conditions that may affect blood cells, brain development, how the body breaks down nutrients from food, hormones, lungs and breathing, and how the body fights infection. In addition, babies are screened by hospital and home birth attendants for hearing loss and low oxygen levels that could be a sign of critical congenital heart disease. On the occasion of our golden anniversary in 2015, we stop to reflect on our accomplishments and celebrate lives saved and improved through 50 years of newborn screening.



In the Beginning

A breakthrough in the treatment of inborn errors of metabolism occurred in 1954 when Dr. Horst Bickel and co-workers introduced a dietary therapy for the management of the rare disorder phenylketonuria (PKU), a disease that without treatment can cause damage to the brain and central nervous system. At the same time, it was recognized that the therapy would be most effective if introduced in the newborn period. This prompted the search for an effective screening test for early detection of PKU. The discovery came in 1962 when Dr. Robert Guthrie devised a brilliant method for detecting PKU in large populations of newborn infants. The method was the semi-quantitative Bacterial Inhibition Assay (BIA) that allowed growth of Bacillus subtilis on agar plates exposed to elevated levels of phenylalanine in a drop of blood obtained from a newborn's heel. Not only did Dr. Guthrie invent this newborn screening test for PKU, he devised the logistics for obtaining blood on filter paper from newborns in hospital nurseries and sending the specimens to a centralized state public health laboratory for testing, so that babies with PKU could be identified and treated early to improve health outcomes. In retrospect, the simple strategy Dr. Guthrie promoted throughout his career has proved to be one of the most significant achievements in public health over the past 50 years.

PKU was the first disorder diagnosed through newborn screening. An inborn error of amino acid metabolism resulting from a deficiency in the enzyme phenylalanine hydroxylase, it can lead to severe intellectual disabilities without early treatment.

The Michigan NBS Story: From One Disorder to 50+

Michigan's Newborn Screening Program began in **1965** as a result of Dr. Guthrie's screening technology for detection of PKU. The program was pioneered by Dr. Richard Allen, a pediatric neurologist at the University of Michigan, and Dr. K. Stanley Read, a microbiologist at the Michigan Department of Public Health Laboratory. The collaboration of Drs. Allen and Read established state laboratory testing methods and protocols for referral, diagnosis and medical management. These men realized very early the power of this public health strategy in prevention of disability not only for PKU but for other inherited disorders and birth defects. This was demonstrated in **1977** when Michigan became one of the first states to add a second disorder to the NBS panel. By using the same dried blood spot specimens collected for PKU detection, screening for *Congenital Hypothyroidism* (CH) was added.

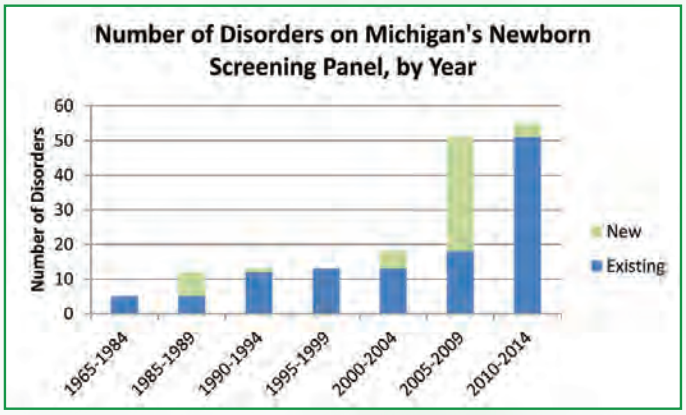
In **1985**, *Galactosemia* (GALT) was the third disorder added to the screening panel. Over the years, GALT was found to be life threatening in the newborn period and therefore, timely diagnosis and early treatment were vital for saving the lives of affected babies.

With the continued addition of new diseases to the NBS panel, it became important to develop a system for short-term and long-term follow-up. The NBS Follow-up and medical management programs developed by Dr. Allen and Dr. William Young in the 1980s, remain a fundamental part of newborn screening in order to ensure every baby in Michigan receives a screen, and that those identified receive proper diagnosis and treatment.

Shortly after GALT screening began, it was recognized that a reliable funding source would be necessary to further expand NBS for additional disorders. Fortunately, a far-sighted state senator, Dr. Vern Ehlers, recognized the importance of the

screening program. In **1987**, Senator Ehlers, with help from Dr. Allen and Dr. Charles Whitten, introduced and guided a groundbreaking bill through the legislative process. Public Act 14 of 1987 doubled the screening panel from three to six disorders, adding *Biotinidase Deficiency* (BIOT), *Maple Syrup Urine Disease* (MSUD) and *Sickle Cell Disease* (SCD). The legislation also established a fee for each filter paper test card sold, assuring a more stable funding source to cover the costs associated with laboratory testing and follow-up. Senator Ehlers would remain a strong advocate for newborn screening both as a state Senator and later as a member of the U.S. Congress from Michigan's 3rd congressional district.

The introduction of tandem mass spectrometry (MS/MS) allowed for major enhancements in NBS laboratory technology making it possible to detect amino acid, organic acid and fatty acid oxidation disorders. With strong support from family advocates that led to a legislative mandate, Michigan added screening for *Medium-chain acyl-CoA dehydrogenase deficiency* (MCAD) in **2003**. Over the next two years, the availability of MS/MS technology allowed the addition of *Homocystinuria* (HCY), *Citrullinemia* (CIT), *Argininosuccinic Acidemia* (ASA) and 31 more conditions.



While the NBS fee enacted in 1987 provided a mechanism for effective maintenance and expansion of the program, adding any new disorder still required legislative approval to amend the public health code. With the ever increasing technical complexities involved in decision making about NBS, Senator Tom George and others sponsored a bill, which later became Act No. 31 of 2006, to establish a legislatively mandated Newborn Screening Quality Assurance Advisory Committee (NBS-QAAC). This panel of experts has met annually since 2006 to review the program and recommend changes to the screening panel for legislature approval, streamlining the process and avoiding the need for introduction and passage of new legislation whenever a disorder is added.

One of the first recommendations made by the NBS-QAAC was to add *Cystic Fibrosis* (CF) to the panel, beginning in **2007**. Testing for CF required additional enhancements in laboratory technology brought on by Michigan Department of Health and Human Services (MDHHS) laboratory scientist Kelly TenEyck. This technology for the first time incorporated the use of molecular testing in the newborn screening environment. A related molecular technology would be used again in **2010** for the application of *Severe Combined Immunodeficiency* (SCID) screening. Laboratory scientist, Heather Wood, played a major role both in Michigan and nationally in perfecting the molecular techniques used for detection of these disorders.

Another enhancement in **2007** was statewide implementation of the point of care screening test for *Hearing Loss*. Although many hospitals had already begun to screen infants several years earlier, universal screening of all infants was not required until 2007. More recently, in **2014**, a second point of care screen was added to the mandated NBS panel, namely pulse oximetry screening for detection of *Critical Congenital Heart Disease* (CCHD). Also in **2014**, *Pompe disease* was the first lysosomal storage disorder approved for the Michigan NBS panel with implementation of statewide screening scheduled to begin by the fall of 2015. Michigan's NBS program has undergone remarkable expansion since its inception—from a single disorder in 1965 to 55 conditions as of **2015**. Approximately 6.9 million Michigan newborns have been screened with more than 7,200 babies identified with disease and treated early for disabling and life threatening conditions.

Michigan NBS Timeline

1965 – Dr. Richard Allen and Dr. K. Stanley Read implement newborn screening for PKU

1965 – First Michigan newborn is identified with PKU through NBS

1977 – CH

1985 – GALT

1987 –BIOT, MSUD and SCD

1987 – Public Health Code is amended by Act 14 of 1987 to add three disorders and initiate a fee for the NBS test

1990 – 3 millionth baby is screened

1990 – Michigan one of the first states to use automated continuous flow technology for PKU and GALT testing

1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990

National Milestones in the Last Decade

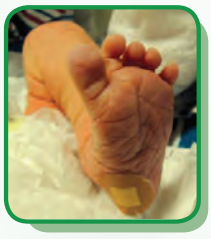
2005 – American College of Medical Genetics determines the Recommended Uniform Screening Panel for NBS, a list of conditions recommended for screening which Michigan follows when adding disorders to the panel

2008 – Newborn Screening Saves Lives Act is passed

2011 – CDC declares NBS one of the "Ten Great Public Health Achievements"

*** Dates above the timeline signify when new disorders were added to the Michigan Newborn Screening panel.**

1993 – Congenital Adrenal Hyperplasia (CAH)



2003 – MCAD

2004 – HCY, CIT and ASA

2005 – MS/MS allows addition of 31 metabolic disorders

2007 – CF

2007 – Hearing Loss

2011 – SCID

2014 – CCHD

2015 – 2016 Screening for Pompe disease, a lysosomal disorder, scheduled to begin

1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

2000 – Public Health Code is amended by Act 33 of 2000 to allow the use of blood specimens for medical research during retention period established by the department

2003 – Laboratory Information Management System (LIMS) is developed

2003 – MS/MS is first used for MCAD, MSUD and PKU

2006 – Public Health Code is amended by Act 31 of 2006 to create NBS-QAAC

2008 – Laboratory operations are extended to six days a week

2008 – Courier system is implemented to reduce specimen transit times

2009 – NBS results are displayed on the Michigan Care Improvement Registry (MCIR) for healthcare providers

2009 – The Michigan BioTrust for Health initiative is launched

2015 – Newborn Screening Online (NBSO) Card Order and Inventory System is implemented

Laboratory Blood Spot Screening

At the heart of Michigan newborn screening is the blood spot testing performed by the MDHHS Laboratory, where scientists and technicians take great strides to make sure all samples are tested accurately and results are reported as quickly as possible. As described earlier, Michigan NBS started with the "Guthrie test" for detection of PKU. This relatively inexpensive test was done by comparing and measuring bacterial growth zone rings around a ¼ inch disc that was punched out of blood or urine samples on filter paper cards. Many refinements have brought newborn screening a long way due to improvements in laboratory technology and instrumentation over the last half-century. Through the years it became obvious that this vital screening test would best be performed in a high volume, centralized laboratory rather than individual hospitals. To improve testing quality at an affordable cost, the State Public Health Laboratory officially took over the screening duties for all Michigan newborns in 1987.

The laboratory has experienced many changes over the years. In 1978, the Centers for Disease Control and Prevention implemented a Quality Assurance Program to provide proficiency testing and vital support for state laboratories. The Clinical Laboratory Improvement Amendments (CLIA) program was phased in through 1994 to establish quality standards for laboratory testing. The filter paper for specimen collection is now specially manufactured as a controlled filter paper medical device. Many of the assays have become more automated, and a sophisticated laboratory information management system tracks each sample from arrival in the lab through every step of the screening process. Through rigorous quality control and quality assurance, these changes allow for quicker and more accurate results. In addition, every infant's screening results are now available to his or her primary care provider on the Michigan

Care Improvement Registry website. With guidance from former laboratory division directors, Dr. Jacqueline Scott (1990-2002) and Dr. Kevin Cavanagh (2003-2013), major advancements were implemented.

The laboratory actively participates in national initiatives to improve screening standards promoted by the Association for Public Health Laboratories and Newborn Screening Technical Assistance and Evaluation Program; and undergoes inspections to meet the College of American Pathologists (CAP) accreditation process. Recently the laboratory has undergone renovations to provide workspace for new instruments. Since 2008, the laboratory operates six days a week including holidays, employs 24 staff members and processes over 122,000 samples a year.

Since 1965, the MDHHS Laboratory has helped identify nearly 5,700 newborns with disease, although many more infants receive an initial positive result requiring follow-up to make sure no problems exist. To minimize the chance of missing a true case of disease, the laboratory works with the MDHHS NBS Follow-up team and medical experts to establish cutoff ranges for abnormal results that balance sensitivity and specificity, making sure an assay is highly likely to identify affected children while minimizing the number of "false positive" test results. For every true case, about 7 babies need additional follow-up to rule out a disorder. That may be as simple as repeating the heel stick screen, or involve a referral for diagnostic evaluation and testing by a medical specialist. But the payoff—finding the one baby with a condition that will benefit from early treatment out of about every 450 children screened—is well worth the effort.

Continuous Quality Improvement

A key factor to the success of NBS is making sure a specimen is obtained from every baby between 24-36 hours after birth and getting the sample to the state laboratory in Lansing for testing as quickly as possible. Delays in blood spot specimen arrival at the laboratory could contribute to irreversible health problems for infants with a disorder requiring immediate diagnosis and treatment. Prompt specimen collection, pickup and delivery reduce turnaround time from birth to reporting of results and initiation of treatment.

The logistics of sending NBS specimens quickly from across Michigan's large geographic area—83 birthing hospitals in 48 counties—to the state laboratory are complex. In 2006, more than 95% of specimens were sent by U.S. mail, arriving on average 3.4 days after collection. In 2008, the NBS Program began providing a courier service to all Michigan birthing hospitals in an effort to reduce specimen transit time. Currently, all birthing hospitals in the state have Monday through Friday and either Saturday or Sunday courier service. Along with Saturday laboratory operations, these changes have resulted in reducing average specimen transit time to 1.8 days in 2014. A recent innovation is the creation of hospital-specific cutoffs for evaluating specimen transit time based on specimen collection time and each hospital's particular courier pickup days and times. This information allows for better monitoring and identification of hospital or other transit-related factors that contribute to delays.

Hospital Performance Metric	Goal
Late Screens	<2%
Receipt by Appropriate Day	>90%
Unsatisfactory Screens	<1%
NBS Card Number on Birth Certificate	>95%
Completed BioTrust for Health Consent Forms	>90%
Reported Pulse Oximetry Screening Results	>90%

After specimens arrive in the laboratory, Newborn Screening Follow-up staff links NBS cards with birth certificates to find babies whose blood spot specimen has not been received in the laboratory and may have been missed. Staff also works with hospitals and midwives to reduce the number of specimens drawn that are unsatisfactory for testing, and to reduce

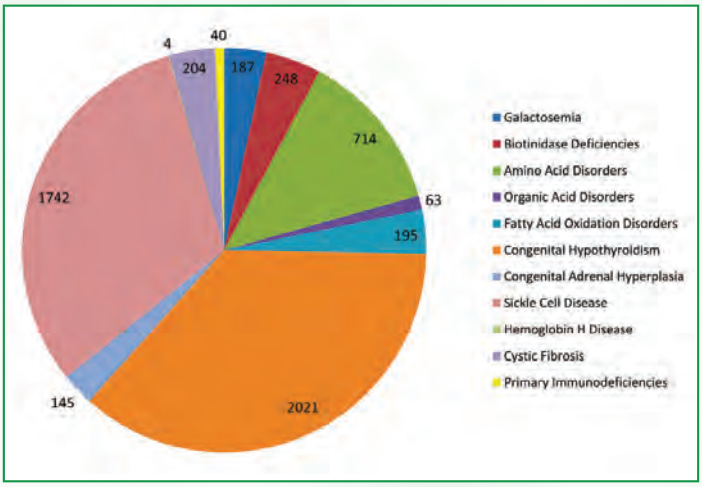
turnaround time from collection to receipt in the laboratory. Training and technical assistance are provided through quarterly hospital-specific performance reports, newsletters, screening guides, and other materials posted to www.michigan.gov/newbornscreening as well as site visits and regional in-service trainings.

As part of continuing efforts to improve quality and customer service, a Newborn Screening Online (NBSO) ordering system has been developed and will be implemented before the end of 2015. NBSO provides a web-based system for purchasing NBS test cards and will be available 24/7 to hospitals, midwives and homebirth parents. All NBS related pamphlets can also be ordered online. NBSO is expected to expedite the shipping process and allows automated tracking and inventory of all NBS supplies which were formerly manual functions.

Through continual process improvements such as monitoring timely specimen collection and transit, evaluating screening algorithms, and establishing referral and medical management protocols, the Michigan NBS Program has become one of the most comprehensive and effective screening programs in the nation.

Follow-Up and Medical Management

Currently, the NBS program confirms an average of 255 newborns with diseases on the NBS panel through blood spot screening each year. NBS is no longer just a test for PKU nor is it just a blood screening test. NBS is a comprehensive program that includes blood spot, hearing and critical congenital heart disease screening with assurance of follow-up. If a baby is identified with one of these conditions, treatment is started early and usually continues through life. Referrals of suspected cases are made to designated medical management coordinating centers, and a network of medical specialists has been identified for each group of diseases. This multi-faceted collaboration allows all newborns across the state to benefit from early identification and coordinated comprehensive care.



Distribution of Disorders Identified in Newborns via blood spot screening, Michigan Residents, 1965-2014

Cystic Fibrosis

Cystic fibrosis (CF) is an inherited chronic disease that primarily affects the respiratory and digestive systems. Newborn screening will identify nearly all infants with CF and some who are carriers (those with one abnormal CF gene but not affected with the disease). Follow-up testing after a positive screen differentiates newborns who have CF from those who are carriers. The Cystic Fibrosis Newborn Screening Coordinating Center at the University of Michigan and MDHHS work closely with the state's five CF care centers in Ann Arbor, Detroit, Lansing, Grand Rapids and Kalamazoo so that all babies receive diagnostic sweat chloride testing, genetic counseling and specialty care following a positive CF newborn screen. These centers are accredited by the CF Foundation in providing expertise in the diagnosis and management of children with CF. While there is wide variation in disease symptoms, early treatment is usually aimed at preventing lung infections and improving nutrition. The Cystic Fibrosis Quality Improvement Committee is actively involved in research collaborations and provides MDHHS guidance on screening protocols. CF newborn screening identifies over 30 babies each year and offers a greater chance for improved quality of life and increased survival for children affected with this disease.

"Before NBS we would sweat test patients months or years after they exhibited symptoms and that would put them so far behind in therapies and treatment. Now many of them thrive from the beginning and do so well!"

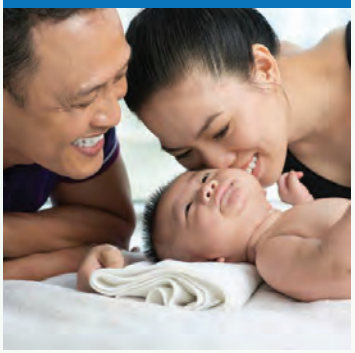
– Paulette Ratkiewicz, CF sweat testing technician

Endocrine Disorders

The Michigan NBS panel includes two endocrine disorders, congenital hypothyroidism (CH) and congenital adrenal hyperplasia (CAH). CH is one of the most commonly detected NBS disorders, accounting for about 90 cases annually or 36% of all newborns identified through screening. It affects the body's ability to produce thyroid hormone, and can lead to intellectual disability and poor growth if not treated with thyroid hormone replacement. CAH affects the adrenal glands and hormones needed to help protect the body during stress or illness. Treatment for classic CAH may include steroids to replace low hormones and surgery for girls born with ambiguous genitalia. Follow-up for babies with positive screens
is carried out by the Pediatric Endocrine Coordinating Center at the University of Michigan, and patients are managed by pediatric endocrinologists across the state. A Pediatric Endocrine Advisory Council (PEAC) was formed under the leadership of Dr. Nancy Hopwood and the University of Michigan, Division of Pediatric Endocrinology in 1987 to establish a statewide group of board certified pediatric endocrinologists who now provide oversight and recommendations to MDHHS for the screening, diagnosis and medical management of CH and CAH.

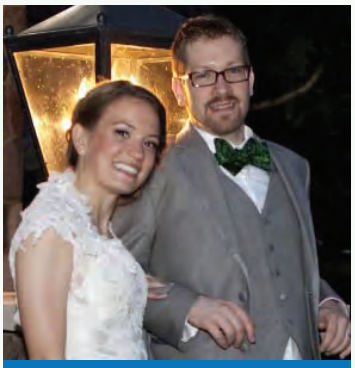
"Under the direction of Bill Young, the laboratory and follow-up program collaborated to implement the NICU protocol in 2007 which has led to the detection of babies with congenital hypothyroidism who otherwise would have gone undetected by newborn screening."

– Karen Andruszewski and Caron Burns



Metabolic Disorders

Metabolic Disorders, also called Inborn Errors of Metabolism (IEM), account for the majority (~80%) of conditions on the NBS panel. This category includes the disease that started it all, PKU. The Children's Hospital of Michigan Metabolic Clinic (CHMMC) located in Detroit is the designated medical management coordinating center providing diagnosis and long term follow-up for children identified by NBS who have amino acid, organic acid and fatty acid oxidation disorders as well as biotinidase deficiency and galactosemia. Individually the disorders are relatively rare, but together about 70 children are identified each year by NBS. While the features of IEM disorders vary depending on the specific condition, they typically affect enzymes involved in breaking down food to make energy for the body. If not diagnosed promptly, they can lead to a variety of serious health problems, intellectual disability, coma or death. Lifelong nutritional treatment in the form of a special diet, vitamins and/or supplements is required for most metabolic disorders; and weekly to monthly monitoring of blood levels may be needed to assure proper diet restrictions are in place. The Metabolic Quality Improvement Committee includes biochemical genetics experts from the University of Michigan in addition to CHMMC, and provides MDHHS with guidance on addition of new metabolic disorders to the NBS panel as well as individual case follow-up.



"Without newborn screening and everyone involved in those first crucial hours, my life would have turned out very differently."

– Mike Finkel, Young Adult with PKU

Primary Immunodeficiencies

Screening for primary immunodeficiency disorders began in 2010. This group of diseases includes Severe Combined Immunodeficiency Disease (SCID). There are multiple genetic mutations that cause different forms of SCID or other immunodeficiency syndromes, all of which involve abnormal production of antibodies needed to fight infection. About 15 babies are found with some type of primary immunodeficiency each year. Early identification allows for timely treatment leading to better health outcomes. The NBS Primary Immunodeficiency Coordinating Center at Children's Hospital of Michigan helps to assure diagnostic confirmation and referral for treatment which may involve hematopoietic stem cell transplant at CHM, Helen DeVos Children's Hospital, or University of Michigan. The Michigan Primary Immunodeficiency Disorders Quality Improvement Committee was established prior to implementation of screening and currently meets twice a year to review laboratory and clinical services, and propose strategies and policies related to primary and secondary immunodeficiencies that may be detected in Michigan newborns. Specialists representing the fields of allergy and immunology, hematology-oncology and infectious disease serve on the committee.

"I was shocked, in disbelief. The newborn screening found our daughter had SCID. Due to early detection, she had a bone marrow transplant before ever developing a severe infection. Early detection greatly increased her chance for survival. It saved her life."

– Jenna Heady, Mother of a daughter with SCID

Sickle Cell and Other Hemoglobinopathies

Each year, the NBS Program identifies about 60 newborns with sickling conditions or other hemoglobinopathies and approximately 2,700 infants who are not affected but carry sickle cell trait. Sickle cell disease (SCD) is the most common inherited blood disorder in the United States. The condition affects the shape of red blood cells, leading to anemia and increased susceptibility to infections. Some of the other possible complications include severe episodes of pain, stroke, vision loss, pulmonary embolism and damage to the spleen. Timely identification through screening aims to prevent death from infections in early childhood, and to initiate disease-modifying therapies such as hydroxyurea to reduce the risk of future complications. Founded by Dr. Charles Whitten, the Sickle Cell Disease Association of America, Michigan Chapter (SCDAA-MI) has coordinated confirmatory diagnosis and follow-up since 1987 for newborns through age five with hemoglobinopathies detected by NBS. The SCDAA-MI, located in Detroit with patient advocates serving Ann Arbor, Benton Harbor, Flint, Grand Rapids, Jackson, Kalamazoo, Lansing, Pontiac and Saginaw, helps to assure that all newborns with a confirmed diagnosis of SCD receive penicillin prophylaxis and have access to sickle cell counseling, social work services and a medical home to provide ongoing treatment. Hematologists and other medical experts participate in the Hemoglobinopathy Quality Improvement Committee to advise MDHHS on screening and follow-up for sickle cell and related disorders.

"From my perspective, the biggest benefit for Michigan families from newborn sickle cell screening is the early initiation of penicillin treatment to prevent life threatening infections. Prior to newborn screening one of the ways sickle disease was diagnosed was when a baby presented to the emergency room dead on arrival from a devastating infection called pneumococcal sepsis. Diagnosing infants at birth also allows for early education and support services. Families are taught by Patient Advocates from the Michigan Chapter of SCDAA how to recognize complications and the steps to take should they arise."

– Dr. Wanda Whitten Shurney, Chief Executive Officer and Medical Director, SCDAA-MI

Point of Care Screening

In addition to the disorders detectable through blood spot screening, Michigan newborns are also screened for hearing loss and critical congenital heart disease. These "point of care" screens are performed in the hospital or by midwives attending home births.

Ninety eight percent of infants have a hearing screening completed in the hospital prior to discharge. Hearing in infants can be tested using two different methods; the auditory brainstem response or the otoacoustic emission measures. Both tests are accurate, noninvasive, automated and do not require any observable response from the infant. About 150-160 babies are identified with hearing loss each year through newborn hearing screening.

Hospitals and midwives also administer pulse oximetry screening to detect low oxygen levels in the blood that might indicate certain kinds of congenital heart disease. The procedure uses a small sensor placed on a baby's right hand and one foot. It is fast, easy and noninvasive.

Even though the hearing and CCHD screens are performed by hospital staff or midwives, all results are submitted to the state Newborn Screening Program. MDHHS plays an important public health assurance function, providing education on proper screening techniques and making sure every baby not only receives both point of care screens but also receives any follow-up that may be needed.

Hearing Loss

The Michigan Early Hearing Detection and Intervention (EHDI) Program began in 1997, with statewide screening in place by 2007. The EHDI Program goals are to provide better outcomes for Michigan newborns and young children with hearing loss and their families, through early hearing screening, appropriate audiological diagnosis and intervention. The EHDI Program works in collaboration with hospitals, clinics, parents, midwives and audiologists to identify infants with hearing loss and assist families with support services. Once identified, EHDI follows these infants to ensure enrollment in early intervention services to help strive toward achieving the national EHDI 1-3-6 goals. The national EHDI goals are:

Goal 1: All newborns will be screened for hearing loss no later than 1 month of age, preferably before hospital discharge;
Goal 2: All infants who screen positive for hearing loss will have a diagnostic audiologic evaluation no later than 3 months of age;
Goal 3: All infants identified with hearing loss will receive appropriate early intervention services no later than 6 months of age.

Early intervention is important to help each child develop communication and to give families information. Many families choose *Early On*® Michigan to help with family centered coordinated services. Services may be provided in the family's home or professional offices after a hearing loss is found. Other family support is available through the Guide By Your Side™ program from Michigan Hands & Voices™, that provides services for families with infants and young children who are deaf or hard of hearing.

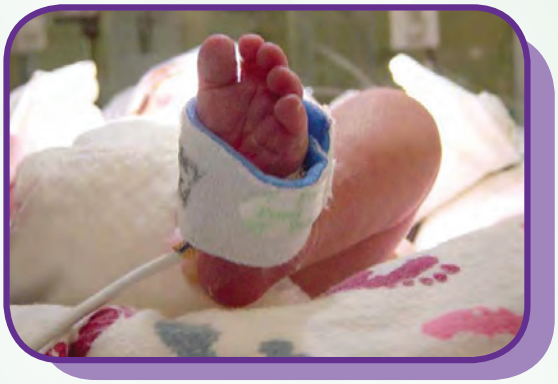
"My daughter was diagnosed close to birth and has had hearing aids and language support from the get-go, thanks to those wonderful newborn hearing screenings!"

– Kim Williamson, Mother of a child with hearing loss

Critical Congenital Heart Disease

More than 1,700 Michigan babies are born with congenital heart disease each year. Some forms of congenital heart disease in the newborn are detectable by point of care pulse oximetry screening. This screening targets twelve specific anomalies classified as critical congenital heart disease (CCHD). Failure to detect such heart defects while in the hospital puts the baby at risk for serious complications within the first few days or weeks of life. Costly emergency room care, potential permanent disability and even death may be the result of delayed treatment.

In 2012, MDHHS received a 3-year grant from the federal Health Resources and Services Administration to develop a CCHD Newborn Screening Demonstration Program. The goals were to: 1) increase the number of Michigan newborns screened for CCHD using a validated screening protocol; and 2) to develop state infrastructure for collection of CCHD screening data through electronic health information exchange to enable effective public health follow-up, quality assurance and evaluation.



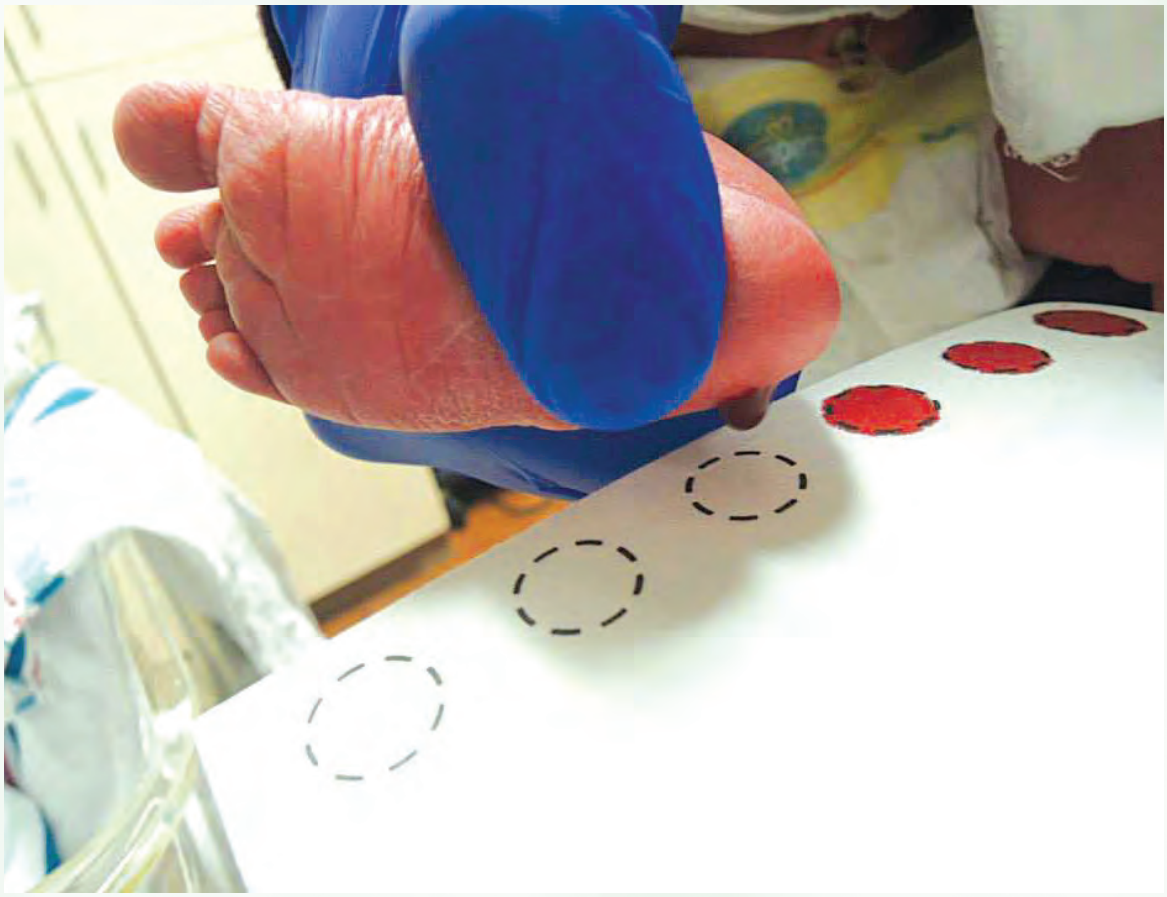
Grant funding enabled expansion of the program to all birthing hospitals, and effective April 1, 2014, CCHD was added to the mandated newborn screening panel so that all Michigan newborns are now screened. The Newborn Screening Program and the CCHD Advisory Committee recommend that newborns be screened as close to 24 hours of age as possible, using the approved MDHHS CCHD Screening Algorithm prior to hospital discharge or following a home birth.

Michigan BioTrust for Health

The ***Michigan BioTrust for Health***, launched in June 2009, is a pioneering program that oversees the storage and use of NBS blood spots. Research using blood spots left-over from newborn screening offers an added public health benefit beyond identifying babies in need of early treatment. The BioTrust allows release of blood spots for medical and public health research after a thorough review and approval process. The samples are important for research because they can provide a population-based snapshot of infants born during a time period and contain over 160 different biomarkers that could provide clues for finding and treating disease. Blood spots from about 5 million individuals dating back to July 1984 have been preserved by the BioTrust program, with over 70,000 samples added each year. After all identifying information is removed and the spots are labelled only with a numerical code, they are stored indefinitely at the Michigan Neonatal Biobank (MNB) in Detroit, managed by Wayne State University. The MNB is a non-profit repository with temperature controls as well as privacy and security protections.

Michigan has led the nation with the first parent consent process for research use of residual NBS blood spots. Since May 2010, parents decide whether their newborn's blood spots can be used in future health research. Blood spots collected before May 2010 are available for research use but can be removed from the BioTrust by a parent or person over the age of 18 years contacting MDHHS to opt-out. Michigan was also the first state to convene a *Community Values Advisory Board* (CVAB), with representation from diverse community and advocacy organizations. Along with the MDHHS Institutional Review Board and BioTrust Scientific Advisory Board, the CVAB provides guidance that helps ensure proper research use of blood spots.

Since 2009, the *BioTrust* has approved approximately 40 studies for use of Michigan dried blood spots. In addition, they have been used by individual families for clinical testing, molecular autopsy and research. They are also used by the laboratory to continue to improve and expand newborn screening so that more babies will benefit from early detection and life-saving treatment.



The Future: Looking Ahead

The last half century has brought incredible changes to newborn screening, with many improvements and advances in technology occurring just in the last decade. This recent, quickening expansion is only expected to continue in coming years. At the end of 2015, Pompe disease will be the first lysosomal storage disorder added to the Michigan panel, with others likely to follow.

The use of genome sequencing as part of newborn screening has been discussed and debated nationally. While sequencing could potentially provide a complete molecular picture of the newborn, the clinical and ethical implications of such technology are not known. Therefore, research studies are underway nationally to evaluate the promise—and challenges—of using whole genome or exome sequencing for newborn screening.

The Michigan Newborn Screening Program's five decades of success is due to constant improvements and incorporation of new technologies throughout the years. With the continuation of these efforts, we will strive towards another 50 years of improving health outcomes for newborns. Our hope for the future is that even more babies and their families will reap the benefits of early detection and treatment to prevent disability and death from rare disorders.

For more information:

Michigan Newborn Screening Program

Phone: 1-866-673-9939

Email: newbornscreening@michigan.gov

www.michigan.gov/newbornscreening

Michigan Newborn Screening Laboratory

Phone: 517-335-8095

Michigan Early Hearing Detection and Intervention Program

Phone: 517-335-8955

www.michigan.gov/ehdi

Michigan BioTrust for Health

Phone: 1-866-673-9939

www.michigan.gov/biotrust

Michigan Department of Health & Human Services

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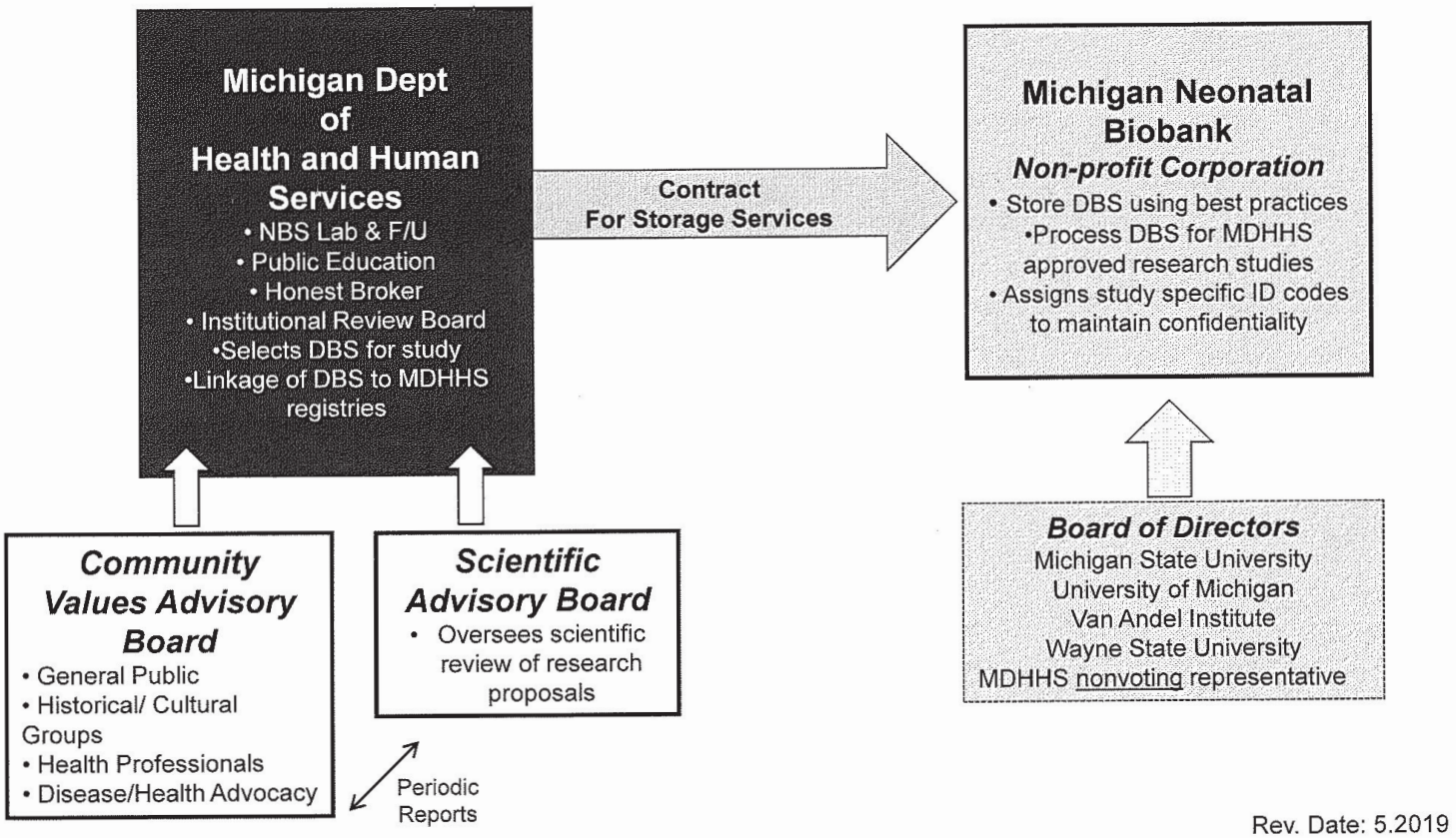
Michigan BioTrust for Health
Governance/Advisory Structure



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Michigan BioTrust for Health - Consent Options

Prior to making a decision about participation in the BioTrust, please make sure you read the Frequently Questions section of this website and get all of your questions answered.

The consent process differs depending on your or your child's date of birth. It is important to take a moment to learn more about the opt-out process for "legacy" blood spots, those collected prior to May 1, 2010. Please also read more about the opt-in process for "prospective" blood spots, those collected after April 30, 2010 through present day.

Background
Blood spots have always been stored for some period of time following newborn screening, but the length of time has changed over the years. In the 1970s, samples were saved for 7 years. In the 1980s, the Michigan Department of Health and Human Services (MDHHS) changed the policy to store each sample for 21.5 years following the receipt of legal advice. In 2008, the policy was revised for indefinite storage of blood spots to align with a recommendation from the Governor's Commission on Genetic Privacy and Progress. Today, blood spots are stored for up to 100 years once newborn screening is completed. The changes in storage policy have allowed for a collection of stored blood spots dating back to July 1984. **Any samples received by the state laboratory on infants born before July 1984 have been destroyed.**

Opt-Out Process for Births Between July 1984 and April 30, 2010

Blood spots collected between October 1987 and April 30, 2010 are stored for up to 100 years. Blood spots collected between July 1984 and September 1987 are scheduled to be destroyed per the MDHHS Bureau of Laboratories' retention schedule. These stored spots are de-identified and may be used in health research under a waiver of informed consent granted by the MDHHS Institutional Review Board. The stored blood spots may also be requested by a parent or person (>18y) for their own use. If you or your child were born between July 1984 and April 30, 2010, and you want to continue allowing the use of the de-identified blood spots in research, you do not need to do anything. If you do not want your or your child's stored blood spots used for future health research, there are two options to **opt-out**. You may fill out a form to: (1) request that the blood spots continue to be stored but not used for research, or (2) request that the blood spots be destroyed. If you ask for the blood spots to be destroyed, the laboratory requires verification that you are the legal representative entitled to make the request. Call 1-866-673-9939 or email newbornscreening@michigan.gov to obtain a form, or download:

- Residual Newborn Screening Blood Spot Directive (Spanish) (Arabic)

Opt-In Process for Births After April 30, 2010

Blood spots from an infant born after April 30, 2010, will be stored for up to 100 years after newborn screening is done. However, the blood spots will not be used in research through the BioTrust unless a signed parental consent form is on file with the state laboratory. This new**opt-in** process began May 1, 2010. Currently, all birthing hospitals and midwives have been instructed to give new parents the option of signing a consent form after delivery if they want their child's remaining blood spots made available for future medical research. One full blood spot will also be saved for future use by the child or family, should it ever be needed. After signing the consent form, parents can still change their mind later using the directive forms above.

****Please note, if a parent declines participation in the BioTrust blood spots are still stored for up to 100 years unless a Residual Newborn Screening Blood Spot Directive requesting destruction is returned to the state laboratory.****

- After Newborn Screening Your Baby's Blood Spots - Michigan BioTrust For Health Consent Brochure (Spanish) (Arabic)
- Audio Recording of BioTrust Consent Brochure
- BioTrust Consent Form English
- BioTrust Alternate Consent Form
- Directive to use DBS for research English

BioTrust Main Page
NBS Main Page

Updated 5-9-2019

Michigan Neonatal BioTrust

Business Plan 2008

Acknowledgments

We wish to thank the members of the Michigan Neonatal BioTrust Steering Committee, Research Committee, Business Plan Committee, and Community Engagement Committee for their contributions to this business plan.

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Table of Contents

1. Executive Summary

This business plan has been produced at the request of the Michigan Department of Community Health. The objectives are to identify alternative storage conditions and space for their archive of dried blood spots that creates more opportunities for health research; to provide linkages between the dried blood spots and other public health data sources; to make the results of research available to the broad research community; and to accomplish these within a framework that protects the identity and ethical treatment of participants and promotes a public health research agenda.

The archive of dried blood spots contains blood samples from almost every child born in Michigan during the last 22 years. As such it has great potential value as a resource for public health and medical research.

It is proposed that a not for profit organization, to be called the Michigan Neonatal BioTrust, be created to implement this business plan and to prepare and make available the archived samples for research. This organization will steward this valuable resource but the Michigan Department of Community Health will retain ownership of the dried blood spots and oversee the use of the samples for research.

Full implementation of the Michigan Neonatal BioTrust requires $3.9 million in funding over a five year period. From year six onward the BioTrust will be self sustaining.

We can achieve self-sustainability with support from Michigan's three major research universities: Wayne State University, Michigan State University and the University of Michigan, as well as the Van Andel Institute.

Wayne State University's TechTown – a growing center of excellence in biobanking - has the storage facility and great expertise in archiving, retrieval, shipping and handling of biological samples for research. Wayne State adds additional value to the dried blood spots for research purposes by amplifying DNA as needed to ensure that this resource is available.

Michigan State University provides extensive experience and expertise in assembling de-identified data from the State's data warehouse, as well as linkage to the National Children's Study and its related data. MSU medical ethics researchers have already initiated projects to determine public acceptance of research uses for dried blood spot archives.

The University of Michigan's School of Public Health has extensive experience in community engagement and public education about the use of newborn blood spots for research purposes as well as experience studying the ethical, legal and social implications of genetics research and practice.

The Van Andel Research Institute has considerable experience with evaluating and identifying ideal storage conditions for biospecimens.

The following plan lays out a phased approach to implementing the Michigan Neonatal BioTrust:

Phase 1

The Michigan Neonatal BioTrust will hire staff, implement contracts and make any purchases needed to begin operations. The dried blood spots will be bar coded, repackaged and moved to a location in TechTown. This phase is estimated take five months to complete.

Phase 2

In order to create a long-term resource for research, it is important to design a sustainable BioTrust that is not dependent on external funding. To do so, the BioTrust will increase the research value of the dried blood spots by first linking to the test results from the Michigan Department of Community Health Newborn Screening Laboratory and later to different registries and databases that detail disorders, diseases, treatments and outcomes.

In Phase 2 the data currently associated with the dried blood spots will be developed into a searchable database. This is estimated to take four months to complete.

Linking information from other databases will greatly increase the value of the dried blood spots for epidemiologic and genetic research. In Phase 2 the BioTrust will establish business use agreements with other programs regarding use of their data.

Phase 3

An Honest Broker function will be introduced to enhance and pilot the merging and de-identification of data from multiple sources.

Optimal sample storage conditions will be identified and implemented by the end of Phase 3.

By the end of Phase three, processes will be in place to create two products developed around the dried blood spot samples and data:

1. **Data Sets**
   To assess the validity, utility and feasibility of linkages data sets will be created from merged data from the Michigan Neonatal BioTrust, selected databases from the Michigan Medicaid Data Warehouse, the birth defects registry and data from other biobanks.

2. **Bio-Sample Cohorts**
   Dried blood spots and possibly other biological material derived from the dried blood spot cohorts can be built from Michigan Neonatal BioTrust resources. Cohorts from other biobanks and the same subjects could also be combined to create a unique resource for research.

The Michigan Neonatal BioTrust (MNB) will carry out community engagement activities that are designed to assess public awareness of the archive of dried blood spots, inform Michigan citizens about the Newborn Screening program, and engage stakeholders in identifying the appropriate uses of the dried blood spots for research.

2. The Problem and Opportunity

The Michigan Department of Community Health's (MDCH) archive of dried blood spots is an archive of leftover blood samples. After a portion of a newborn's dried blood spots (DBS) is used for newborn health screening, the remaining samples are stored in boxes in a document warehouse at ambient temperature. These samples are used from time to time for forensic or diagnostic purposes, and occasionally for research. A portion of the DBS is always left untouched.

The MDCH recognizes that dried blood spots (DBS) have potential value as a resource to support public health and medical research. To develop their archive of DBS into such a resource several changes are needed: the samples must be stored in a physical environment that supports their preservation; the data associated with the DBS must be readily searchable; and researchers must be aware of their availability.

The planned closure of the State of Michigan's current storage facility presents an opportunity to initiate these changes. The DBS must be moved to a new location by the end of the State's FY 2008.

The move presents an opportunity to locate the samples in a facility that can add value to the archive. The proposed new storage facility in TechTown locates the dried blood spots in a major tissue banking center. The samples will be stabilized in a temperature controlled environment and, through its biobanking services. The TechTown location will ensure that the samples are prepared and retrievable for research.

3. Background

For over 40 years, a dried blood sample on filter paper has been collected from newborns in the state of Michigan and screened for a variety of rare disorders. These samples are a potential source of biological material for a wide variety of research applications from epidemiological investigations to research into the origin and cure for disease. The Michigan Department of Community Health (MDCH), together with many partners and stakeholders, seeks to expand the use of the dried blood spots (DBS) to public health and medical research.

Recognizing that newborn screening specimens represent a vital resource for the study and treatment of disease, the Michigan Commission on Genetic Privacy and Progress in its 1999 final report recommended that newborn screening samples be retained indefinitely because of their present and potential value. In the year 2000, the Michigan legislature amended the public health code to allow use of leftover dried blood spots, "as long as the medical research is conducted in a manner that preserves the confidentiality of the test subjects and is consistent to protect human subjects from research risks." MDCH, in collaboration with others, has taken steps to identify the utility of residual dried blood spots and the infrastructure needed to support more widespread use of dried blood spots for public health and medical research in the form of a dried blood spot archive, or neonatal biotrust.

The DBS cards in the repository at the MDCH hold samples from most of the approximately three million children who were born in Michigan since 1986. After a portion of the DBS is used for newborn screening, the remaining samples are stored in a document warehouse at ambient temperature. The samples are used from time to time for forensics or diagnostic purposes, and occasionally for research. The DBS represent an entire birth cohort and would allow population-based studies that overcome shortcomings present in other research designs such as small sample size, selection bias, participation bias, low power due to insufficient sample size, and the limited ability to generalize to a population. Even more compelling as a research resource, these residual dried blood spots can be linked to public health databases such as birth and death records, birth defects and cancer registries, and infectious disease reports to investigate epidemics and reveal important health outcomes.

4. Mission and Vision

The mission of the Michigan Neonatal BioTrust is to create and maintain a bank of valuable research materials from the dried blood spots (DBS) owned by the Michigan Department of Community Health, and to become the most comprehensive and useful bank for research into the origins, prevention and cures for diseases of public health concern with emphasis on the public health concerns of Michigan's citizens.

The overall vision behind the Michigan Neonatal BioTrust (MNB) is to establish a repository that will serve as a unique resource of materials and data for researchers. The potential for insight gained from studies utilizing newborn DBS will expand exponentially when the MNB facilitates linkages with other public health or clinical databases and registries, such as vital records, birth defects and cancer registries, or other disease surveillance systems, making the dried blood spots a unique and valuable resource for research. Marketing and revenue from user fees will generate cost recovery for MNB operations.

The MNB will provide an advantage to academic and commercial researchers because they will have access to an organized, searchable sample collection with associated clinical data that is much larger than any single institute could provide. This will create opportunities for research in basic and translational medicine in Michigan and give academic researchers applying for outside funding a strong advantage. For example funding for research through the National Institute of Health's Whole Genome Association depends on the availability of and access to large numbers of samples. Both academic and commercial discoveries from the resulting research can provide the basis for economic development in Michigan.

5. The Michigan Neonatal BioTrust

The Michigan Neonatal BioTrust (MNB) is a collaboration among the Michigan Department of Community Health, Wayne State University, Michigan State University, the University of Michigan and the Van Andel Research Institute to support the Michigan Department of Community Health (MDCH) in their efforts to develop their dried blood spot archive into a unique resource for research. The MNB is a non-profit organization.

Using the dried blood spots (DBS) and their associated data as the foundation the MNB will develop a biological materials repository that serves as a unique resource for supporting research into diseases of interest to public health. The repository will be a resource for researchers in the private sector as well as those in academic centers. See Appendix A, "Michigan Neonatal BioTrust White Paper".

Decisions about how to use DBS will have community input and approval, and families will have the option to exclude their samples from consideration. The MNB will work with communities expressing Michigan's diverse populations to develop a research agenda and research priorities based on their interests, understanding, acceptance and support for using the DBS for human health research.

There already exist some biorepositories in the State however the MNB will be unique because it begins with samples that represent more than 99% of Michigan's population under the age of 21. The law allows for a revised retention policy for DBS that could allow samples to be held for a longer period of time.

The availability of a resource of this type would greatly advance efforts to develop new disease prevention strategies, treatments and diagnostics for both common and rare diseases such as childhood cancer and those that evolve from genetic variations. The MNB could provide an important resource of materials for researchers.

The MNB will employ new storage and retrieval methods that preserve organic and inorganic compounds in the DBS to increase their value for public health, genomic and environmental research. The storage conditions will optimize the retrieval potential for proteins (e.g., antibodies, enzymes, markers of environmental exposure), nucleic acids and inorganic chemicals. The utility of the DBS will be further increased with linkages to other public health or clinical databases.

The MDCH will retain ownership of the dried blood spots and data, and oversee the use of the samples for research through a contract with the MNB. The MNB and the MDCH will ensure confidentiality and compliance with Federal and State privacy regulations through the use of an Honest Broker. See Appendix B, "Data Confidentiality".

Requests to use the samples or data for research will be reviewed by a Scientific Review Committee whose members are appointed by MDCH. The MDCH Institutional Review Board will review requests that are approved by the Scientific Review Committee (see Appendix F, Workflow Chart).

The MNB will create technical and entry level jobs in Michigan. When fully implemented the MNB will employ full and part time personnel in newly created positions to manage the repository, maintain the data, and perform scientific tasks.

Wayne State University has already been awarded a grant from the State's Core Technology Alliance (CTA) to begin proof of concept work for the MNB. See Appendix C, "CTA Grant Proposal". Based on a conservative projection of revenue from user fees, the MNB is expected to be self supporting after five years.

6. The Collaborators

Michigan Department of Community Health (MDCH) is the State agency charged with protecting, preserving, and promoting the health and safety of the people of Michigan with particular attention to providing for the needs of vulnerable and under-served populations. MDCH currently houses, maintains, and directs the use of the dried blood spots. Their Newborn Screening Section in the laboratory is an important component of the statewide comprehensive Newborn Screening Program that identifies infants with rare inborn errors of metabolism, hemoglobinapathies, cystic fibrosis, and hormonal conditions. The follow up component ensures that those identified as having a disorder receive timely intervention. This mandatory program requires birthing hospitals and attendants to collect blood from the heel on dried filter paper. Current tests screen for more than forty disorders. These conditions can cause illness, developmental delays or death if not detected early. Newborn screening usually detects disorders before they are clinically presented.

Role in the Michigan Neonatal BioTrust: MDCH will maintain ownership of the DBS and will direct their use through a contract with the non-profit Michigan Neonatal BioTrust. The MDCH will serve as the "honest broker" to provide data linkages between the DBS and public health databases. MDCH will retain authority to assure that the MNB functions in the interest of the participants and public health.

Wayne State University (WSU) is Michigan's leading urban research university, the intellectual hub of Detroit, and home to Tech Town and to the Michigan Center for Genomics Technologies. Tech Town, Detroit's only research and technology park, is a developing center of excellence in biobanking and tissue based services. Tech Town has the storage facility and great expertise in the archiving, retrieval, shipping and handling of samples for research. It is currently the home to Asterand, one of the world's largest commercial suppliers of human tissue for research; the biological samples repository for the National Institute of Child Health and Human Development's Perinatology Research Branch; and the biological samples of the Michigan Heritage BioBank. Wayne State is also home to the Michigan Center for Genomics Technologies which, since 1999, has worked to advance the understanding of gene structure/function through an integrated and synergistic consortium of scientists from Michigan biotech, healthcare and academic settings. Their high-throughput information mining of complex gene expression profiles provides a critically important scientific platform in Michigan biotechnology.

Role in the Michigan Neonatal BioTrust: WSU will provide storage space for the DBS, sample preparation and shipping services, database development and maintenance, and financial services for the MNB. WSU's Center for Genomics Technologies will provide quality control and DNA amplification services, as needed.

Michigan State University (MSU) is a leader in the field of perinatal epidemiology, a discipline that examines perinatal events in large populations and synthesizes social, clinical and biological information to better understand diseases and to inform public health policy. MSU has the only NIH-funded training program in the country focusing entirely on this discipline. MSU leads, with WSU and UM, Michigan's activities in the National Children's Study. MSU has developed a biostorage program that stores biological materials from pregnant women and links these to information systems, permitting later studies of pregnancy problems and neurodevelopment. Michigan State's Institute for Health Care Studies (IHCS) has extensive experience in accessing and assembling data from Michigan's Data Warehouse. IHCS staff routinely provides de-identified Medicaid data to researchers on behalf of MDCH through a Business Associates Agreement. The agreement allows IHCS to access the Medicaid data and has streamlined the approval process for researchers who wish to access Medicaid data. MSU's

Center for Ethics and Humanities in the Life Sciences stands at the hub of a variety of resources useful for understanding and responding to the ethical and social challenges that the MNB might face. MSU established the use of rational democratic deliberation as a conceptual model for meaningful community engagement in the development of health policy.

Role in the Michigan Neonatal BioTrust: MSU will provide technical expertise, as needed, to assist the MDCH "honest broker" in fulfilling its responsibilities to link biological materials to Warehouse data and to de-identify data. MSU will also share with the MNB its knowledge of the limitations of the warehouse data and Medicaid or other policies that impact use of the data. Bioethics faculty will be made available to provide expert consultation as needed relative to ethical issues regarding MNB policies.

The University of Michigan (UM) is one of the largest research institutions in the United States, with more than $800 million in research expenditures in the 2006-2007 academic year. UM has long been a leader in both medical and public health research, spearheading the massive clinical trials that showed the safety and efficacy of the Salk polio vaccine more than fifty years ago. The Center for Public Health and community Genomics, based at UM's School of Public Health, is one of two centers funded by the Centers for Disease Control and Prevention to carry out the mission. The Center has for several years been engaged in studying the ethical, legal and social implications of public health genomics, and engaging diverse communities in genomics education and policy development. The School of Public Health has also played a leading national role in advancing education and research to incorporate genomics into public health practice.

Role in the Michigan Neonatal BioTrust: UM will provide technical assistance, training and policy advice to the BioTrust, as needed, in the areas of (1) engaging diverse Michigan communities in understanding the purpose and intended operation of the MNB; (2) the meaningful engagement of representatives of these communities in the planning, development and operation of the MNB; and (3) the ethical, legal and social implications of the MNB including assisting in the development of ethical and legal guidelines for the MNB's operation.

The Van Andel Research Institute (VARI) is one of the founding members of the Life Sciences Corridor in Michigan, and has membership in Michigan's Core Technology Alliance. The Institute's collaborative partnerships among world-class health care, research, and educational organizations have led to dramatic growth in the life sciences sector in the southwest region of the State. Its world-class medical research facility has gained worldwide recognition for research into the genetic and molecular origins of cancer and other diseases. Van Andel's research laboratories and core facilities work to translate discoveries into therapies that will one day conquer illness and enhance lives. VARI recently completed a study that demonstrates the feasibility of using blood spots as a source of RNA.

Role in the Michigan Neonatal BioTrust: The VARI will assist in the determination of what temperature, humidity and conditions are optimal for blood spot preservation.

7. Governance

The Michigan Department of Community Health (MDCH) will maintain ownership, and control the use of, the dried blood spots (DBS) and Newborn Screening data derived from links between the DBS and public health data and registries. MDCH will have responsibility for protecting participant confidentiality and protecting research subjects if the DBS is linked with other, non-MDCH data sources.

MDCH proposes to contract with a non-profit organization - the Michigan Neonatal BioTrust (MNB) - to manage sample storage, retrieval, shipping and tracking; secure, de-identify and merge data; engage and inform the community relative to the use of the DBS for research; organize the samples and data into a valuable tool for public health research; promote the samples and data for scientific research and collect user fees; manage MNB finances; enter into contracts for services, apply for grants and perform other tasks as needed to carry out the duties outlined in the contract.

The contract between MDCH and MNB will define the roles, responsibilities, authorities, limitations, and reporting responsibilities of the MNB, and the circumstances under which the contract can be revoked.

The MDCH will appoint members to a Community Values Advisory Board that will advise MDCH as to the appropriate use of the DBS and on community engagement activities. Board members will include members of the public and of community groups representative of Michigan's population.

The MDCH will appoint members to a Scientific Review Board that is responsible for granting or denying specific requests to use the DBS or data for scientific research. The Scientific Review Board will follow the principles and guidelines provided by the MDCH for approving use of the samples. When requests are received to provide samples or data owned by a non-MDCH source, the Scientific Review Board will secure written approval from the source to use them.

Following approval from the Scientific Review Board, requests to use the DBS for research will be reviewed by the MDCH Institutional Review Board. Approved requests can be filled to the extent that samples and data are available, and after an appropriate materials transfer agreement is in place.

The above relationships and reporting responsibilities are illustrated in Appendix D, "Governance Model".

A functional organization chart is provided in Appendix E, "Functional Organization Chart".

A workflow chart for handling requests for samples or data is provided in Appendix F, "Workflow Chart".

8. Importance to Research

The purpose of creating the Michigan Neonatal BioTrust (MNB) is to formalize a system that will support the use of residual dried blood spots for public health, genomic, and other kinds of health research that ultimately benefits Michigan citizens and the state as a whole. Because the collection of dried blood spots represents nearly complete birth cohorts spanning multiple years, it offers unique opportunities for population research not available using other existing biobanks. While the specific research to be allowed using dried blood spots will be addressed through policies and procedures that are not detailed in this business plan, the potential impact and benefits to Michigan of having such a comprehensive archive available for research include:

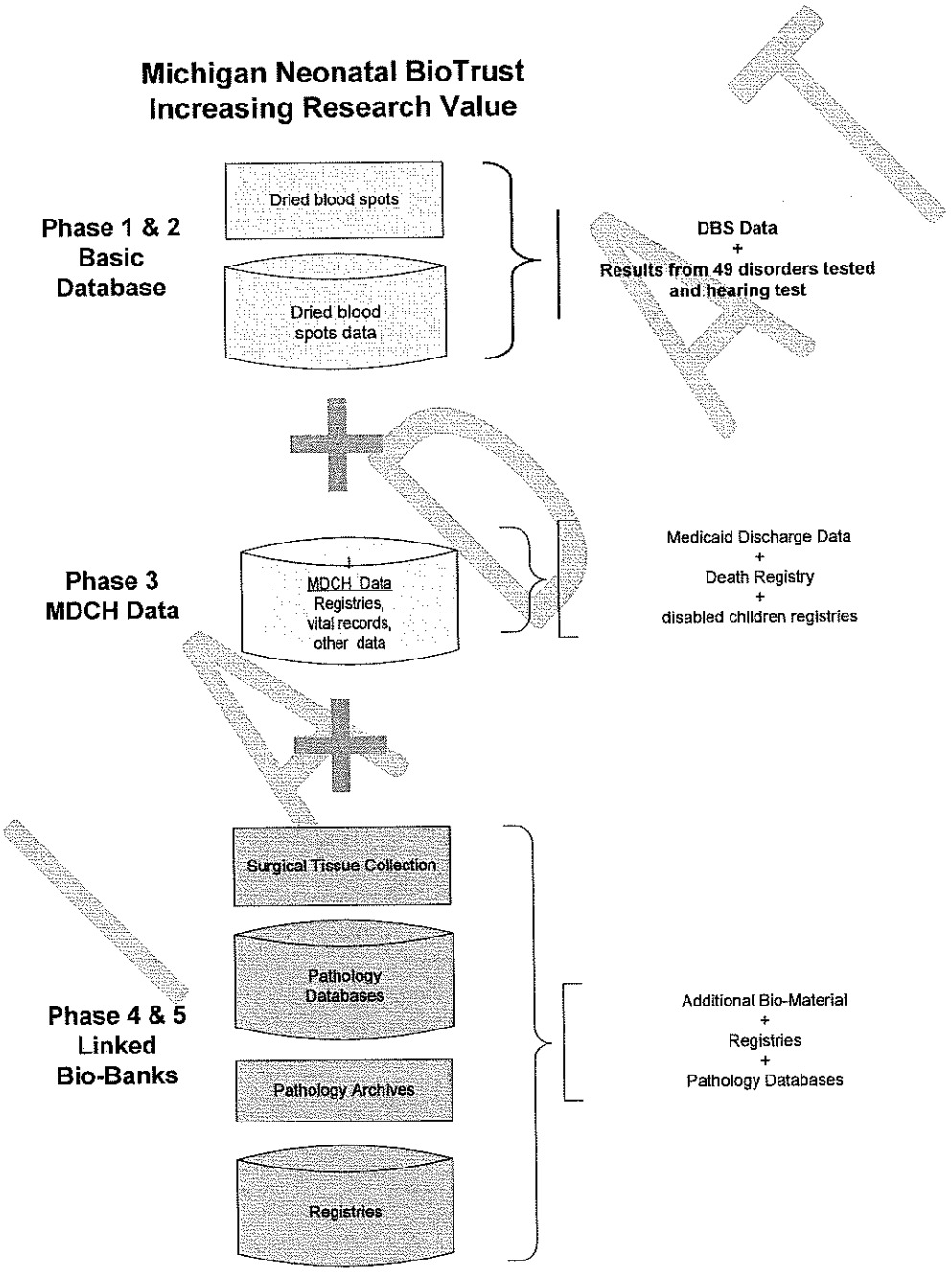
- The ability to identify population-specific mutations and prevalence for both rare disorders and chronic diseases within the Michigan population;
- The possibility of testing current assumptions about disease causation based on underlying genotype frequencies; and addressing racial differences/disparities;
- The use of biological samples to monitor emerging infectious diseases or environmental exposures, and improve screening or diagnostic tests;
- The MNB supports the further development of an intellectual hub that will attract researchers and research funding to Michigan's academic institutions, and scientists and high tech industries to the State. This will position Michigan as a leader in public health and medical research in an era of genomic, informatics and laboratory sciences growth;
- Creating new opportunities for Michigan researchers to obtain National Institutes of Health (NIH) research grants by providing easier access to large numbers of specimens. For example, the NIH Whole Genome Association project, a major funding source for health research, requires researchers to identify a source of specimens before applying for a grant.

A more detailed discussion of possible research uses for dried blood spots appears in Appendix A, "Michigan Neonatal Biotrust White Paper". The potential research value is also reflected in studies which have already utilized Michigan's dried blood spots, three of which are highlighted below:

- Haak PT, Busik JV, Kort EJ, Tikhonenko M, Paneth N, Resau JH: Archived unfrozen neonatal blood spots are amenable to quantitative gene expression analysis. *Neonatology* 2008, in press.
- Barry E, Derhammer T, Elsea, SH: Prevalence of three hereditary hemochromatosis mutant alleles in the Michigan Caucasian population. *Community Genetics* 2005. 8(3):173-9.
- Taub JW, Konrad MA, Ge Y, Naber JM, Scott JS, Matherly LH, Ravindranath Y: High frequency of leukemic clones in newborn screening blood samples of children with B-precursor acute lymphoblastic leukemia. *Blood* 2002. 99(8):2992-96.

8.1 Adding value through data acquisition

The research value of the dried blood spots will increase when the samples are linked first to the test results from the MDCH Newborn Screening Laboratory, then later to public health databases such as birth and death records, birth defects and cancer registries. It may be possible in the future to link information from other biorepositories to further increase the value of the samples in the BioTrust.



9. Location and Storage

A key step in the strategy to develop the dried blood spots archive into a biorepository for research is to locate the samples in a facility that has the resources to build their value for research.

It is proposed that the samples and the Michigan Neonatal BioTrust (MNB) be located in Detroit at the TechOne building in Wayne State University's TechTown, one of Michigan's designated Smart Zone Development areas.

TechTown will provide 8,000 square feet of secure storage and office space for the MNB, including temperature controlled space for storing the dried blood spots. The TechOne building is equipped with significant backup generator capacity to ensure that power is always available to maintain room temperature and freezer operation.

The building is organized not just for storage of biological samples but for shipping and receiving as well. Samples are received and shipped all over the world on a daily basis from the two large biorepositories already located in TechOne – Asterand, one of the world's largest commercial biobanks, and the Perinatology Research Branch of the National Institute of Child Health and Human Development.

The addition of the MNB to Tech One establishes a major tissue banking center in Tech Town that will act as a magnet for the world of biomedical research.

10. Implementation Plan

The archive of dried blood spots (DBS) must be moved to a new location before the State of Michigan closes its storage facility at the end of FY 2008. A timeline for moving the DBS and beginning implementation of the Michigan Neonatal BioTrust (MNB) will be developed by the Michigan Department of Community Health to meet that deadline.

Implementation of the MNB will include activities to:

10.1 Develop and implement a program of community engagement to ensure community understanding for the MNB;

10.2 Move the DBS and develop the archive into a repository of samples that has great value for research;

10.3 Develop and implement a plan to let researchers know that the samples are available;

10.4 Develop sources of external funding for MNB operations.

10.1 Community Engagement

The Michigan Neonatal BioTrust (MNB) is committed to developing an ongoing, transparent process that will not only inform, but also elicit input from Michigan citizens. Meaningful public engagement and community understanding and support are critical to ensure ongoing development of the BioTrust as an important State resource for medical and public health research. The MNB will foster two-way communication with the public and will address any concerns raised by stakeholders.

The MNB will carry out community engagement activities that are designed to assess public awareness of the dried blood spots (DBS) and the MNB; engage stakeholders in ongoing development of the MNB; and inform the public about the MNB.

Assess Public Awareness

The MNB will conduct surveys to assess public awareness and attitudes about the MNB and the use of archived dried blood spots.

Engage the Stakeholders

The MNB will host an annual meeting to communicate national and international trends in biobanking and the use of dried blood spots (DBS); to provide updates on the MNB; and to seek ongoing input from stakeholders, including public health, medical and bioethics researchers, advocacy groups and community representatives.

Through its website, the MNB will encourage the public to submit questions or comments.

The Community Values Advisory Board will represent parents and specimen "donors" as well as the broader community to provide ongoing guidance to MDCH on appropriate use of the dried blood spots.

The MNB will include community representatives on its Scientific Review Board.

Inform the Public

An informational website will include answers to frequently asked questions; a list of current research studies that use the DBS and links to any published results; the MDCH guiding principles and approval criteria for using the DBS for research.

An annual report will summarize MNB activities from the previous year.

The MNB will develop printed informational brochures and distribute them at scientific and medical meetings, community health fairs, and other relevant venues.

The MNB will place articles in newspapers, lay and professional newsletters, and other publications describing the MNB and the types of research it supports, with particular emphasis on informing communities of the studies conducted using DBS and their related research findings.

The Michigan Department of Community Health's existing Community Engagement Work Group will be transitioned to a Community Values Advisory Board that will provide ongoing advice to Michigan Department of Community Health on the development and implementation of the

MNB operating policies and procedures. A nomination process will solicit diverse members who represent the general public, community-based groups, and experts in the field of bioethics.

10.2 Multi-phase plan to move and prepare the dried blood spots for research

Phase 1

This first phase will focus on moving the blood spots into a new storage and retrieval site – an 8,000 square foot area in the Tech One building at Tech Town. All of the samples will be bar coded and repackaged to remove identifying information before they are moved to Tech One.

Phase 2

The second phase focuses on increasing the utility and value of the dried blood spots for research. To create a sustainable BioTrust it is essential to link additional data from other Michigan public health databases and from disease registries that detail disorders, treatments and outcomes.

In Phase 2 the BioTrust will build a flexible, searchable database with the detail data collected by the Michigan Department of Community Health (MDCH) on the 49 disorders currently tested by the Newborn Screening Laboratory. This basic data will allow searches beyond what is currently possible.

In addition, data in other Michigan databases will be identified and be incorporated into the Biotrust where applicable. Opportunities to enhance the Biotrust will be routinely sought and include appending clinical and pathological specimens such as those hold by the Michigan Heritage Biobank or potentially enhancing the newborn screening data through addition of key variables from other databases.

Phase 3

The Honest Broker will be introduced in Phase 3. The Honest Broker is an entity that is separate from the provider of the data and separate from the entity conducting the research. Its sole purpose is to provide a wall of separation isolating the researcher from the organization providing the research data and guarding the privacy of the involved subjects.

In order to add research value to the samples in the BioTrust additional data can be merged with the MNB database. For example, linking to the statewide cancer or birth defects data will make the samples more valuable for research. To do that an entity that performs the Honest Broker function is needed. This activity will be located at MDCH in Lansing, where staff can provide direction on key linkages and where the expertise of Michigan State University's information technology staff is available to provide technical assistance to the Honest Broker effort.

10.3 Promotional Plan

The Michigan Neonatal BioTrust (MNB) will recommend, and the Michigan Department of Community Health will approve, a user's fee for the Dried Blood Spot samples or data. The user fees will help create sustainability and self sufficiency for the MNB.

A plan to make the researcher community and funders aware of the MNB resources and user fees will be developed for implementation and approved by MDCH after an expanded database and enhanced data retrieval methods are implemented.

Through collaboration with another TechTown tenant, Asterand, the MNB has the option to utilize another resource for promoting the samples. Asterand plc is the leader in supplying biological samples to large pharmaceutical companies and the biotechnology industry as well as research institutes worldwide. Asterand also has a successful track record in marketing. For example in 2003 Asterand entered into an agreement with the Karmanos Cancer Institute to organize, quality control and market a collection of breast cancer material and data. Asterand agreed to bear the cost of the work involved in preparing and marketing the material, and there was an agreement regarding the disbursement of revenues that involved cost recovery and a division of any surplus. This arrangement resulted in a significant revenue stream of several million dollars for both parties. A model could be developed for the Michigan Neonatal BioTrust that allows for variable fees based on the type of user, for example academic researchers or private sector researchers.

10.4 External Funding

We have already been successful in obtaining a grant from the Core technology Alliance Fund to carry out further research to establish the value of the archive of dried blood spots. Following approval of the business plan and the agreement of the Michigan Department of Community Health we propose to seek state and Federal support for the Michigan Neonatal BioTrust. We also propose to seek support from foundations, particularly those based in Michigan or with a strong interest in the state.

We believe that the ability to obtain support will be enhanced if the bank is located in Tech Town which is one of 11 designated Michigan Smart Zones. A Smart Zone encompasses an area or buildings that have been designated by the Michigan Economic Development Corporation for special support to incubate new businesses or endeavors of importance. We believe that we can make a powerful case that support for the BioTrust will increase the competitive advantage of the research community in Michigan which will in turn drive the life science industry and the economy.

11. Timeline and Milestones

The table below shows quarterly development activities and accomplishments. For illustration purposes, the schedule begins in January 2008.

ID	Task Name	Duration	2008				2009				2010			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Move dried blood spots	1590d												
2	Develop basic searchable database	120d												
3	Develop enriched database	270d												
4	Append other bioepositories	120d												

12. Consumers

Over 160 biomarkers and compounds have been measured in DBS ranging from genetic material (DNA) to proteins, infectious agents such as viruses, and harmful metals such as lead. Residual DBS are therefore a potential source of specimens for a wide variety of epidemiological investigations such as the frequency of genetic variations in the population or how genes interact with the environment. DBS have already been used to investigate issues such as exposure to environmental pollutants, genetic factors associated with susceptibility to infections, and childhood cancer. Because more than 99% of Michigan newborns are screened, DBS represent an entire birth cohort and would allow population-based studies that overcome the shortcomings, such as small sample size, present in other research designs.

The MNB will provide research material for academic, public health and private sector researchers for:

- Future and growing need of DNA based research.
- Research focused on predictive, diagnostic, therapeutic and biomarker discovery.
- Pharmaceutical research that benefits the public's health.
- Epidemiology research focusing on health outcomes, population studies, environmental exposures and possible gene-environment interaction.

There are thousands of DNA-based and other genetic tests currently available for clinical testing. Most are used for diagnosis of rare single-gene disorders or chromosome abnormalities, with a relatively small number being used for newborn screening at the present time. However, a growing number of genetic tests are likely to have state and population-level implications for medical and public health services. For example, adult onset diseases are responsible for a large majority of the health care costs in this country and a priori knowledge of who is at risk (e.g., predictive testing for cancer or cardiovascular disease), and how they will respond to current therapeutics (e.g. pharmacogenomics) could be a very important contribution to the health of Michigan citizens as well as providing and targeting new prevention strategies that could help to reduce future health care costs. These innovations allow us the unique opportunity to dramatically increase our understanding of genetic factors contributing to disease and response to treatment.

Despite these developments, access to sufficient numbers of DNA samples with associated high quality medical information remains a major obstacle in genetic research. If such a large sample and dataset became available, researchers could efficiently conduct population- and genome-wide scans to identify key genetic factors involved in rare and common, acute and chronic diseases. These samples will exist in the Michigan Department of Community Health's archive of dried blood spots.

13. Competitive Landscape

To gauge current practice in the United States state laboratory directors were surveyed in 2003 by Richard Olney at the Centers for Disease Control to determine how their dried blood spots are being stored and used. The findings include:

- Only twenty states currently store blood spots for more than 12 months.
- Thirteen states have used stored newborn screening samples for epidemiologic studies.
- Fifteen states have a written policy that determines how residual dried blood spots can or cannot be used for purposes outside the newborn screening protocol.
- Ten of these fifteen states reported that their policies specify under what circumstances dried blood spots can be used with or without identifiers.

The State of Michigan is a good candidate to develop their dried blood spots into a valuable resource for academic and commercial researchers. Michigan's blood spot collection program is universal and mandatory, and the Michigan Department of Community Health is much farther ahead than most other states in the retention and use of these samples for research.

Michigan is one of the few states that have stored dried blood spots for more than 20 years. These samples represent 99% of Michigan's population under the age of 21 and, with its revised retention policy, the number of samples will increase each year. Michigan allows access to the samples with strict privacy guidelines that meet Federal human subject protection regulations. As the Michigan Neonatal BioTrust collects and links other clinical, environmental, economic and demographic information the dried blood spots will become even more valuable for research.

Although there are several other biobanks within the State of Michigan that provide some samples for research, they are scattered in a variety of institutes and few are available to researchers outside the institute.

14. Budget

A budget was developed for the first five years of operation. A conservative revenue projection was made based on market-established fees and past user requests for the samples. The revenue model is built around making available two product lines:

- Making data available for studies
- Providing biomaterial for cohorts

proposed five-year budget

Michigan Neonatal BioTrust

Personnel	YEAR 1 - Startup Salary	Fringe Rate	Fringe	Total	YEAR 2 Salary	Fringe	Total	YEAR 3 Salary	Fringe	Total	YEAR 4 Salary	Fringe	Total	YEAR 5 - Update Equipment Salary	Fringe	Total
Executive Director	125,000.00	25.80%	32,250.00	157,250.00	127,500.00	32,895.00	160,395.00	130,050.00	33,552.90	163,602.90	132,651.00	34,223.96	166,874.96	135,304.02	34,908.44	170,212.46
Database Manager	98,000.00	25.80%	25,284.00	123,284.00	99,960.00	25,789.68	125,749.68	101,959.20	26,305.47	128,264.67	103,998.38	26,831.58	130,829.97	106,078.35	27,368.21	133,446.57
Marketing Manager	57,000.00	25.80%	14,706.00	71,706.00	58,140.00	15,000.12	73,140.12	59,302.80	15,300.12	74,602.92	60,488.86	15,606.12	76,094.98	61,698.63	15,918.25	77,616.88
Administrative Asst	40,950.00	25.80%	10,565.10	51,515.10	41,769.00	10,776.40	52,545.40	42,604.38	10,991.93	53,596.31	43,456.47	11,211.77	54,668.24	44,325.60	11,436.00	55,761.60
				403,755.10			**411,830.20**			**420,066.81**			**428,468.14**			**437,037.51**
Travel	**5,000.00**				**5,000.00**			**5,000.00**			**5,000.00**			**5,000.00**		
Contractual																
Finance Manager (.5)	37,485.00	(10 mos in Yr. 1)			45,900.00			46,818.00			47,754.36			48,709.45		
Epidemiologist	69,860.25	(9 mos in Yr. 1)			95,009.94			96,910.14			98,848.34			100,825.31		
Statistician Specialist	69,860.25	(9 mos in Yr. 1)			95,009.94			96,910.14			98,848.34			100,825.31		
Community Coordinator (.5)	40,432.00				41,240.64			42,065.45			42,906.76			43,764.90		
Comm Advisory Board	11,000.00				11,000.00			11,000.00			11,000.00			11,000.00		
Legal Services	25,000.00				15,000.00			15,000.00			15,000.00			15,000.00		
Technicians (3)	206,500.00				210,630.00			214,842.60			219,139.45			223,522.24		
Rent	60,000.00				60,000.00			85,000.00			85,000.00			85,000.00		
Temps	67,200.00				4,000.00			4,000.00			4,000.00			4,000.00		
Moving Expense	5,500.00															
BioTrust research	50,000.00				50,000.00			50,000.00			50,000.00			50,000.00		
Student Interns					10,000.00			10,000.00			10,000.00			10,000.00		
Equipment Maintenance					1,500.00			1,500.00			2,000.00			1,000.00		
Insurance	10,000.00				10,000.00			10,000.00			10,000.00			10,000.00		
Telephone service	5,000.00				3,000.00			3,000.00			3,000.00			3,000.00		
IT services	10,000.00				10,000.00			10,000.00			10,000.00			10,000.00		
Database development	75,000.00															
Scientific Services	25,000.00				100,000.00			100,000.00			75,000.00			75,000.00		
	767,837.50				**762,290.52**			**797,046.33**			**782,497.26**			**791,647.20**		
Equipment																
Server	30,000.00													30,000.00		
Network hardware	5,000.00													5,000.00		
Backup system	5,000.00													5,000.00		
Barcode peripherals	15,000.00													15,000.00		
Document capture	10,000.00													10,000.00		
Security system	35,000.00							10,000.00						10,000.00		
Freezers	35,000.00				35,000.00			35,000.00			35,000.00			35,000.00		
	135,000.00				**35,000.00**			**45,000.00**			**35,000.00**			**110,000.00**		
Supplies																
Computers (17)	17,500.00													17,500.00		
Printers (10)	3,200.00													3,200.00		
Copier	3,500.00													3,500.00		
Fax	250.00										250.00					
Samples punch	500.00				500.00											
Storage Shelves	13,000.00													500.00		
Storage Boxes	66,000.00													2,300.00		
Freezer supplies	3,000.00				3,000.00			3,000.00			3,000.00			3,000.00		
Software license	15,000.00				15,000.00			15,000.00			15,000.00			15,000.00		
Office furniture	10,000.00							3,000.00								
Office supplies	9,000.00				6,000.00			6,000.00			6,000.00			6,000.00		
Shipping	1,000.00				7,000.00			10,000.00			11,000.00			12,000.00		
	143,950.00				**31,500.00**			**37,000.00**			**35,250.00**			**63,000.00**		
Marketing/Outreach																
Postage	4,300.00				4,300.00			4,300.00			4,300.00			4,300.00		
Website	6,000.00				3,000.00			6,000.00			3,000.00			6,000.00		
Printing	20,000.00				15,000.00			15,000.00			15,000.00			15,000.00		
Community Engagement	35,000.00				35,000.00			35,000.00			35,000.00			35,000.00		
Marketing	35,000.00				30,000.00			30,000.00			30,000.00			30,000.00		
Meetings	3,500.00				3,500.00			3,500.00			3,500.00			3,500.00		
	103,800.00				**90,800.00**			**93,800.00**			**90,800.00**			**93,800.00**		
Expense Total	**$ 1,559,343.00**				**$ 1,336,421.00**			**$ 1,397,913.00**			**$ 1,377,015.00**			**$ 1,500,485.00**		
Revenue Total	**(16,500.00)**				**(319,750.00)**			**(559,000.00)**			**(789,500.00)**			**(1,065,000.00)**		
BUDGET TOTAL	**$ 1,542,843.00**				**$ 1,016,671.00**			**$ 838,913.00**			**$ 587,515.00**			**$ 435,485.00**		
FIVE YEAR TOTAL	**$ 3,956,942.00**															

15. Management

To assist with the establishment of the storage facility and the non-profit Michigan Neonatal BioTrust (MNB), the following persons are available to serve on a temporary basis until permanent appointments are made.

Nancy Kraemer Christ, serving as Project Manager
Director for Research Collaborations
Wayne State University
Director for New Project Development
Tech Town

Ms. Christ has considerable experience with developing, implementing and managing large scale multi-million dollar projects for Wayne State University, the State of Michigan and the County of Wayne.

George Azrak, serving as IT Consultant
Lakeshore Life Sciences, Inc.

Mr. Azrak has considerable experience with developing and implementing database security plans and processes to meet Federal requirements for de-identifying data.

Randal Charlton, serving as Site Manager
Interim Executive Director
Tech Town

Mr. Charlton has extensive experience with developing successful non-profit and for-profit businesses, including those in the life sciences. Mr. Charlton has extensive experience with developing, implementing and managing biobanks.

16. Appendices

Michigan Neonatal BioTrust White Paper **Appendix A**

Exploring the Scientific Utility of Residual Newborn Screening Dried Blood Spots

The Michigan Neonatal BioTrust

for

Human Health Research

Michigan Department of Community Health

MDCH

Public Health Administration

Bureau of Laboratories • Bureau of Epidemiology

Executive Summary

For over 40 years, a blood sample has been collected from almost every newborn in the state of Michigan on five spots of filter paper and screened for a variety of rare disorders. The Newborn Screening Program first began in 1965, using a bacterial inhibition assay to detect phenylketonuria (PKU). Over the years, additional disorders have been added to the screening panel, and recent technological advances now allow the state public health laboratory to screen newborns for 48 rare disorders. Identifying children with these disorders early, before symptoms appear, not only improves health and developmental outcomes, but also saves lives in many cases. Typically, unused blood spots remain after newborn screening tests are completed. The Michigan Department of Community Health (MDCH) currently stores residual dried blood spots (DBS) from every newborn for 21.5 years and has over three million specimens in storage.

Recognizing that newborn screening specimens represent a vital resource for the study and treatment of disease, the Michigan Commission on Genetic Privacy and Progress in its 1999 final report recommended that newborn screening samples be retained indefinitely because of their present and potential value. In the year 2000, the Michigan legislature amended the public health code to allow use of leftover DBS, "as long as the medical research is conducted in a manner that preserves the confidentiality of the test subjects and is consistent to protect human subjects from research risks." MDCH, in collaboration with others, has taken steps to identify the utility of residual dried blood spots and infrastructure needed to support more widespread use of DBS for public health and medical research in the form of a dried blood spot archive, or Neonatal BioTrust.

What can be studied with dried blood spots? Over 160 biomarkers and compounds have been measured in DBS, ranging from genetic material (DNA) to proteins (the gene products), infectious agents such as viruses, and harmful metals such as lead. Residual DBS are therefore a potential source of specimens for a wide variety of epidemiological investigations, such as the frequency of genetic variations (polymorphisms) in the population or how genes interact with the environment. In fact, DBS have already been used to investigate issues such as exposure to environmental pollutants, genetic factors associated with susceptibility to infection, and childhood cancer. Because more than 99% of Michigan infants are screened, DBS represent an entire birth cohort and would allow population-based studies that overcome shortcomings present in other research designs such as small sample size.

The State of Michigan is a good candidate to develop a Neonatal BioTrust for health research. It is one of a few states that have stored DBS for over 20 years. Furthermore, MDCH has a nationally recognized genomics program that has already developed collaborations with maternal-child, chronic disease and environmental health programs within the department and strong working relationships with state universities, research institutes and the Centers for Disease Control and Prevention. The laboratory has occasionally used or released stored DBS for epidemiological research; however, it is believed that the potential availability of such specimens is not widely known by the research community.

Currently, DBS are stored in a warehouse at ambient temperature, which limits their utility. To increase the value of DBS for genomic and environmental research, new storage and retrieval methods will need to be employed. The utility of the BioTrust could be further increased with linkages to other public health databases, such as birth and death records, the birth defects registry, or the cancer registry. In addition to the necessary infrastructure improvements,

creation of a more formal BioTrust would need to have public acceptance and support. The current newborn screening program has not been highly visible, and awareness of the current specimen retention policy among the general public is likely to be low. Moreover, more highly publicized research on residual specimens derived from the DBS archive may cause privacy concerns that would need to be addressed.

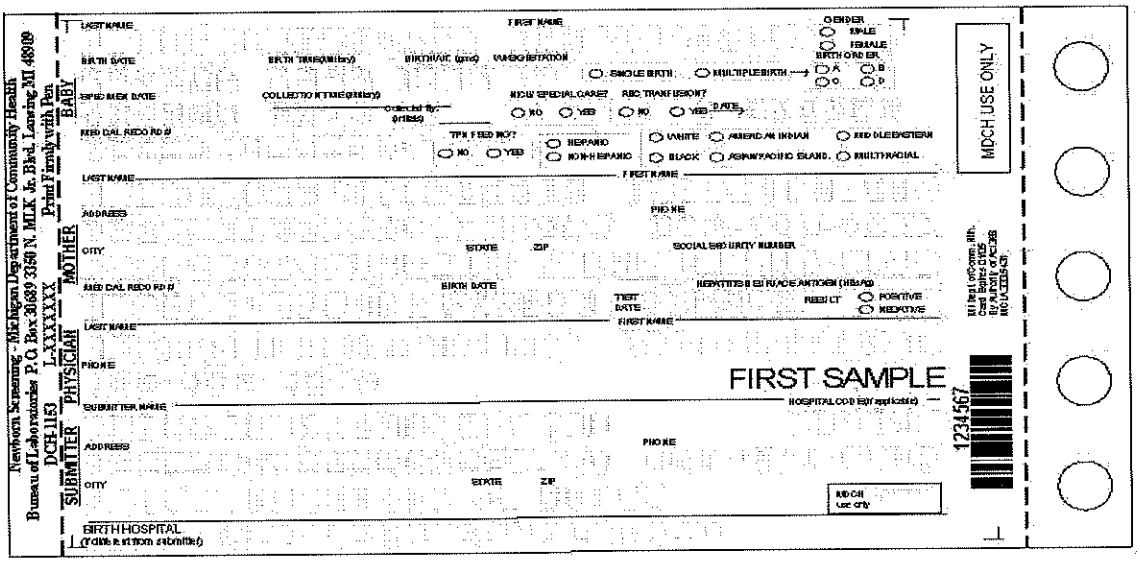
The Department of Community Health, together with many partners and stakeholders, recognizes great value in expanding the use of DBS for public health and medical research. However, MDCH is committed to fostering a transparent process for development of a Neonatal BioTrust for human health research that will be accepted and embraced by citizens of the state. Regardless of the specific framework ultimately chosen, special care must be taken to prevent adverse publicity or backlash that could threaten the public health success story of newborn screening itself. Before the archive becomes reality, a great deal of work must still be done—beginning with meaningful engagement of the public. Further steps will then need to include: development of a business plan to procure start-up funds for additional staff and enhancement of current storage facilities; establishment of policies that assure human subjects protection and incorporate public input in the identification of research priorities; quality control research with possible initiation of new specimen storage and retrieval procedures; and linkages with other databases. Once these issues are appropriately addressed, the Neonatal BioTrust will represent a new and important research tool that is expected to contribute to disease prevention and improved health outcomes for the people of Michigan.

Preface

For over 40 years, a blood sample has been collected from almost every newborn in the State of Michigan on five spots of filter paper (Figure 1) and screened for a variety of rare disorders. Each spot is ½ inch in diameter and contains 75-100 ul of blood. Initial testing typically requires only two of the five spots, with additional spots used in the event further testing is needed to confirm or clarify an initial positive screen. Since the majority of specimens yield negative results and do not require the use of additional blood spots for further testing, unused spots typically remain even after testing is complete. Based on the current retention schedule, the Michigan Department of Community Health (MDCH) Newborn Screening Laboratory saves all newborn-screening cards for 21.5 years, after which they are destroyed.

Over the last decade there has been considerable interest in examining the potential utility of these residual dried blood spots (DBS) for research and public health surveillance. The importance of saving the specimens for further use as an important public health resource was recognized by the Michigan Commission on Genetic Privacy and Progress convened by Governor John Engler in 1997. The Commission's 1999 final report stated: *"The commissioners believe that the newborn screening specimens represent a vital resource for the study and treatment of disease….Because of their present and potential value, the commission recommends that newborn screening samples be retained indefinitely"…*[1] In response to this recommendation, the public health code was amended by the Michigan Legislature in 2000 to allow research on residual samples:

> *"The department shall do all of the following in regard to the blood specimens taken for purposes of conducting the tests required…*
> *(b) Allow the blood specimens to be used for medical research during the retention period… as long as the medical research is conducted in a manner that preserves the confidentiality of the test subjects and is consistent to protect human subjects from research risks"…* [2]



More recently, MDCH, in collaboration with the Centers for Disease Control & Prevention, Michigan Public Health Institute, University of Michigan, Michigan State University, Wayne State University, Van Andel Institute and others, has taken steps to identify the utility of residual dried blood spots and infrastructure needed to support more widespread availability of DBS for public health and medical research. This concept paper reviews issues to consider before an archive

or repository of residual dried blood spot specimens could be established in Michigan. Questions to be addressed include:

- What is the history and importance of newborn screening in Michigan?
- What is the value of DBS for public health beyond newborn screening?
- What can be measured using existing DBS?
- What types of research studies have been conducted and what other questions might be addressed using DBS?
- How could the scientific value of dried blood spot specimens be increased?
- What are other state, federal, or international policies that address the ethical issues related to using DBS for research purposes?
- What is the current MDCH policy for release of DBS and how have they been used?
- What are possible frameworks for long term DBS storage?
- What is the potential impact of the Neonatal BioTrust?
- What are the technical considerations and options for storage?
- What are the research priorities?
- What are the next steps?

Background

In the early 1960's when Dr. Robert Guthrie first pioneered newborn screening (NBS) to detect phenylketonuria (PKU)[3] the use of dried blood spot specimens on cotton filter paper was the most cost effective means of population screening. Little did Guthrie realize that over four decades later such specimens might serve as a vital resource for surveillance and other public health investigations on the determinants of disease.

What is the history and importance of newborn screening in Michigan?

Beginning in 1965, newborn screening was instituted in the State of Michigan using a bacterial inhibition assay for PKU. Since that time the newborn screening program has undergone numerous revisions and expansions as advancing technology has made detection of additional metabolic and other types of disorders possible. In 1977, screening for congenital hypothyroidism (CH) was added, and galactosemia was added in 1984. The panel was further expanded in 1987 to include a total of six disorders with the addition of biotinidase deficiency, hemoglobinopathies (sickle cell anemia and other common sickling disorders), and maple syrup urine disease. The public health code was also revised at that time to mandate addition of these disorders, and the state laboratory was designated as the sole testing site. Prior to that time, hospitals had the option of conducting their own screening tests, but follow-up was not assured. Also in 1987, a fee was instituted to support laboratory and follow-up costs. In 1993, the program again underwent expansion to include screening for an additional endocrine disorder, congenital adrenal hyperplasia (CAH). With the advent of new tandem mass spectrometry technology (MS/MS) and national guidelines for newborn screening issued by the United States Department of Health and Human Services/ Health Resources and Services Administration in 2004, the Department of Community Health has again taken steps to assure that families in Michigan have access to state-of-the-art screening for their infants. In 2006, the program underwent its largest expansion to date with the addition of screens for 35 disorders detectable by MS/MS. As noted in **Table 1**, Michigan newborns are currently screened for 48 disorders, with the hope of adding cystic fibrosis in 2007.

While accurate laboratory screening is a critical step in the early detection process, the newborn screening program would not be effective without assuring diagnosis and treatment for those infants found to have presumptive positive screening tests. MDCH is, therefore, also committed to providing a comprehensive follow-up program that helps to assure every child with a positive screen receives appropriate follow-up. This program supports clinics for metabolic disorders and sickle cell disease at the Children's Hospital of Michigan, as well as a coordinating center for follow-up of endocrine disorders at the University of Michigan. In addition, all children with disorders detected by NBS are medically eligible to receive medical care and treatment through the Children's Special Health Care Services Program. Since 1965, over 3,000 children have been identified through the newborn screening program and received treatment for their disorders, averting illness, disability and even death in many cases. In 2006, the program detected 57 children with CH, 12 with profound or partial biotinidase deficiency, 11 with a classic or variant form of PKU, 8 with Medium-chain acyl-CoA dehydrogenase deficiency (MCADD), 3 with CAH, 1 with galactosemia, and 14 with various other metabolic disorders. The number of infants identified with sickle cell disease in 2006 is expected to approach 60 once confirmatory diagnostic testing has been completed.

Table 1. Disorders Included in the Michigan Newborn Screening Panel (as of February 2007)

Amino Acid Disorders: Phenylketonuria (PKU) Benign hyperphenylalaninemia (H-PHE) Biopterin cofactor biosysnthesis (BIOPT (BS)) Defects of biopterin cofactor regeneration (BIOPT(Reg)) Maple syrup disease (MSUD) Homocystinuria Hypermethioninemia (HCY/MET) Citrullinemia (CIT) Citrullinemia Type II (CIT II) Argininosuccinic acidemia (ASA) Tyrosinemia Type I (TYR I) Argininemia (ARG)	**Fatty Acid Oxidation Disorders:** Carnitine:acylcarnitine translocase deficiency (CACT) Carnitine palmitoyltransferase II deficiency (CPT II) Carnitine uptake defect (CUD) Carnitine palmitoyltransferase I def. (liver) (CPT 1A) Short-chain acyl-CoA dehydrogenase deficiency (SCAD) Glutaric acidemia type II (GA II) Med.-chain acyl-CoA dehydrogenase deficiency (MCAD) Long-chain L-3-OH acyl-CoA dehydrogenase deficiency (LCHAD) Trifunctional protein deficiency (LCHAD/TFP) Very long-chain acyl-CoA dehydrogenase deficiency (VLCAD) Med.-chain ketoacyl-CoA thiolase deficiency (MCKAT) Med./short-chain L-3-OH acyl-CoA dehydrogenase deficiency (M/SCHAD) Dienoyl-CoA reductase deficiency (DE RED)	**Organic Acid Disorders:** Isovaleric acidemia (IVA) 2-Methyl butyryrl-CoA dehydrogenase deficiency (2MBG) 3-Methylcrotonyl-CoA carboxylase deficiency (3MCC) 3-OH 3-CH3 glutaric aciduria (HMG) 3-Methylglutaconic aciduria (3MGA) Beta-ketothiolase deficiency (BKT) Glutaric acidemia type I (GA I) Propionic acidemia (PA) Methylmalonic acidemia (mutase deficiency) (MUT) Methylmalonic acidemia (Cbl A,B) Methylmalonic acidemia (Cbl C,D) Multiple carboxylase deficiency (MCD) 2-Methyl 3 hydroxy butyric aciduria (2M3HBA) Malonic acidemia (MAL) Isobutyryl-CoA dehydrogenase deficiency (IBG)
Endocrine Disorders: Congenital Adrenal Hyperplasia (CAH) Congenital Hypothyroidism (CH)	**Enzyme Disorders:** Galactosemia (GALT) Biotinidase Deficiency (BIOT)	**Hemoglobinopathies:** Sickle cell anemia (Hb SS) Hb S/C Disease (Hb S/C) Hb S/Beta-thalassemia (Hb S/Beta-Th) Variant Hemoglobinopathies (Var Hb)

What is the value of DBS for public health beyond newborn screening?

The use of dried blood spots allows an ideal epidemiological design for many research questions ranging from pregnancy-related outcomes to late-onset adult diseases because the specimens represent entire birth cohorts within a state. In Michigan, approximately 3,260,000 filter paper cards dating back to 1984 are currently in storage-- representing an unparalleled epidemiological resource that can minimize many methodological issues that may be inherent in other non-population based approaches such as:

- Selection bias
- Participation bias
- Low power (the ability to detect an association) due to insufficient numbers
- Limited ability to generalize to the whole population

While many different conditions and substances are theoretically detectable using DBS, how might they be used as a resource to benefit public health? DBS could provide much needed population-level insight for public health decisions and interventions. For example, relatively simple studies on the prevalence of gene variants could be utilized to:

- Form a basis for estimating population attributable fraction in combination with measures of gene-disease association
- Enable assessment of the potential for screening population subgroups for susceptibility genes
- Examine the prevalence of combinations of variants in pathways and at different loci
- Provide a preliminary step before engaging in studies of gene-disease association, gene-environment and gene-gene interactions

There are thousands of DNA-based and other genetic tests currently available for clinical testing. Most are used for diagnosis of rare single-gene disorders or chromosome abnormalities, with a relatively small number being used for newborn screening at the present time. However, a growing number of genetic tests are likely to have state and population-level implications for medical and public health services. For example, adult onset diseases are responsible for a large majority of the health care costs in this country. Knowledge of who is at risk (e.g., predictive testing for cancer or cardiovascular disease), and how they will respond to current therapeutics (e.g. pharmacogenomics) could be a very important contribution to the health of Michigan citizens. Population-based predictive testing might also lead to new prevention strategies that could help to reduce future health care costs.

What can be measured using existing DBS?

In addition to their use in screening newborns for certain rare diseases, dried blood filter paper specimens have been used to detect a number of other conditions and substances. New nanotechnologies make it possible to measure thousands of genes, gene transcripts, proteins, metabolites, infectious agents, drugs, and toxins from small samples *when stored under optimal conditions*. **Table 2** (page 8) provides a partial list of over 160 different analytes or polymorphisms cited in the literature as having been measured from dried blood spot specimens for epidemiological studies. The list includes not only biological markers such as DNA, but also infectious agents and potential environmental contaminants such as heavy metals.

One of the key findings from examining this list of biomarkers is that very wide ranges of molecular weights from the small (amino acids) to the large (enzymes and DNA) have been measured successfully.[4] Because of this wide range, there are cases where the dried blood spot can be used to measure both phenotype (e.g. biochemical marker) and genotype (mutation or polymorphism) from one specimen.[5]

The potential uses and types of molecular measurements that could be made from DBS was one topic of discussion during the symposium, *Newborn Screening Dried Blood Spots BioBank: Implications for Research and Public Health*, held on April 25, 2006 at the Kellogg Center in East Lansing, Michigan with approximately 30 invited guests and speakers. While in theory almost any substance in the blood could be measured, there is a need to demonstrate the research validity and utility of dried blood for any molecular test. One recommendation from symposium attendees was to form a working group of scientists with laboratory expertise from around the state, as well as outside experts, to design studies that would assess the research utility of the blood samples.

Table 2. Analytes measured from human blood collected and dried on filter paper. From the J Nutrition [4]

Acarboxyprothrombin	**DNA** (polymerase chain reaction) acetylator polymorphism Alcohol dehydrogenase Alpha 1-Antitrypsin Cystic fibrosis Duchenne/Becker muscular dystrophy Glucose-6-phosphate dehydrogenase Hemoglobinopathies A,S,C,E; D-Punjab; beta-thalassemia Hepatitis B virus HCMV HIV-1 HTLV-1 Leber hereditary optic neuropathy MCAD mRNA PKU Plasmodium vivax Sexual differentiation 21-deoxycortisol	Glycocholic acid	**Specific antibodies** Adenovirus Antinuclear antibody Arbovirus Aujeszky's disease virus Dengue virus *Dracunculus medinensis* *Echinococcus granulosus* *Entamoeba histolytica* enterovirus *Giardia duodenalisa* *Helicobacter pylori* Hepatitis B virus Herpes virus HIV-1 IgE (atopic disease) Influenza virus Interleukins *Leishmania donovani* *Leptospira* Measles/mumps/rubella *Mycobacterium leprae* *Mycoplasma pneumoniae* *Onchocerca volvulus* Parainfluenza virus *Plasmodium falciparum* Poliovirus *Pseudomonas aeruginosa* Respiratory syncytial virus Rickettsia (scrub typhus) *Schistosoma mansoni* *Toxoplasma gondii* *Trepenoma palladium* *Trypanosoma cruzi/rangeli* Vesicular stomatis virus *Wuchereria bancrofti* Yellow fever virus
Acylcarnitine		Glycosylated hemoglobin	
Adenine phosphoribosyl transferase		Halofantrine	
Adenosine deaminase		Hemoglobin variants	
Albumin		Hexosaminidase A	
Alpha-Fetoprotein		Human erythrocyte carbonic anhydrase	
Amino Acids profiles		17-a Hydroxyprogesterone	
Andrenostenedione		Hypoxanthine phosphoribosyl transferase	
Antipyrine		Immunoreactive trypsin	
Arabinitol enantiomers		Lactate	
Arginase		Lead	
Arginine (Krebs cycle) Histidine/urocanic acid Homocysteine Phenylalanine/tyrosine Tryptophan		**Lipoproteins** (a), B/A-1, B	
Benzoylecgonine (cocaine)		Lysozyme	
Biopterin	Desbutylhalofantrine	Mefloquine	
Biotinidase	Dihydropteridine reductase	Netilmicin	
C-reactive protein	Diphtheria/tetanus antitoxin	Phenobarbitone	
Carnitine	Erythrocyte arginase	Phenytoin	
Carnosinase	Erythrocyte protoporphyrin	Phytanic/pristanic acid	
CD4	Esterase D	Progesterone	
Ceruloplasmin	Fatty acids/acylglycines	Prolactin	
Chenodeoxycholic acid	Free beta-human chorionic gonadotropin	Prolidase	**Specific antigens** Hepatitis B virus HIV-1
Chloroquine	Free erythrocyte porphyrin	Purine nucleoside phosphorylase	
Cholesterol	Free thyroxine (FT4)	Quinine	Thyroxine-binding globulin
Cholinesterase chemokines	Free tri-iodothyronine (FT3)	Reverse tri-iodothyronine (rT3)	Trace elements
Conjugated 1-b hydroxycholic acid	Fumarylacetoacetase	Selenium	Transferrin
Cortisol	Galactose/gal-1-phosphate	Serum pancreatic lipase	Transferrin receptor
Creatine kinase	Galactose-1-phosphate uridyl transferase	Sissomicin	Uridine diphosphate-galactose-4-epimerase
Creatine kinase MM isoenzyme	Gentamicin	Somatomedin C	Urea
Cyclosporin A cytokines	Glucose	Succinylacetone	Uroporphyrinogen I synthase
D-penicillamine	Glucose-6-phosphate dehydrogenase	Sulfadoxine	Vitamin A
De-ethylchloroquine	Glutathione	Theophylline	White blood cells
Dehydroepiandrosterone sulfate	Glutathione perioxidase	Thyrotropin (TSH)	Zinc protoporphyrin
		Thyroxine (T4)	

What types of research studies have been conducted and what other questions might be addressed using DBS?

The 2004 Newborn Screening and Genetic Testing Symposium held in Atlanta, Georgia brought together almost 400 laboratorians, newborn screening follow-up professionals and metabolic specialists from around the world. Attendees from 20 different countries participated in discussions and presentations on many aspects of newborn screening including other uses of DBS, as noted in the examples provided below.

- **Studies on genetic diseases and chronic diseases**: The Molecular Genetic Epidemiology Laboratory in New York has used dried blood spots for genetic studies of sickle cell disease (haplotypes), hemochromatosis, medium chain acyl CoA deficiency, DNA repair genes, cardiovascular disease genes (Methylenetetrahydrofolate reductase [MTHFR], methionine synthase, Factor V Leiden), as well as genetic studies of asthma and deafness.[6]
- **Genetic laboratory issues**: New York also investigated the ability to use genomic amplification techniques to obtain adequate quantities of DNA to enable hundreds of genetics tests from a single hole-punch. About 200ug of DNA could be isolated from one 3mm hole-punch. It was estimated that from a full dried blood spot, thousands of genetic tests could be performed after genomic amplification.[6]
- **Genomics and infectious disease**: Emory University School of Medicine investigated whether genetic factors affect susceptibility to infection of two known pathogens – *Streptococcus pneumoniae* and *Neisseria meningitides*. Using bacterial disease surveillance data collected in the United States, Zimmer conducted a case-control study using newborn DBS from the State of Minnesota over 3 years.[7]
- **Prevalence studies:** The Centers for Disease Control and Prevention examined dried blood spots collected from multiple populations in order to determine the distribution of allele frequencies of the MTHFR 677C-->T mutation that has been associated with an increased risk for neural tube defects. Newborn screens from 7,130 infants from 16 areas in Europe, Asia, the Americas, the Middle East, and Australia were used for the study. Significant variability was in fact discovered; there was 10-fold variability in the TT genotype found across the 16 areas.[8]

While discussion on expanded uses of DBS often focuses on DNA-based genetic methodologies, there is also considerable potential for other kinds of useful studies that should not be overlooked. These non-genetic studies range from surveillance for infectious diseases, to drug detection, to monitoring environmental exposures. Examples of such studies published in the scientific literature include:

- The surveillance of HIV infection among childbearing women[9]
- Serodiagnosis of infection[10,11,12]
- Markers for autoimmune disease and coagulation factors[13]
- Screening for therapeutic drugs[14,15]
- Screening for drugs of abuse[16]
- Exposure to environmental pollutants[17]

How could the scientific value of dried blood spot specimens be increased?

The insight gained from studies utilizing newborn DBS could expand exponentially by linking them with other public health or clinical databases and registries, such as vital records, birth defects, cancer registries, or other disease surveillance systems. A recent publication by Klotz et al[18] describes how residual dried blood spots, population based cancer incidence data and birth

certificate data in New Jersey were linked in order to investigate the association between glutathione S-transferase (GST) variants and acute lymphocytic leukemia (ALL). Incident cases of ALL were ascertained using the New Jersey State Cancer Registry and matched by birth date to population-based controls selected randomly from birth certificates. DNA samples obtained from DBS were assigned a random study ID, and personal identifiers were stripped to maintain anonymity. The New Jersey state laboratory isolated and amplified the DNA, analyzing GSTM1 and GSTT1 variants. Consistent with previous studies, the double null genotype was more common in cases than controls. According to the authors, "the design avoids issues of participation bias by cases and controls and can be used to investigate interactions of susceptibility genes and xenobiotics in semi-ecological studies."

What are other state, federal, or international policies that address the ethical issues related to using DBS for research purposes?

The creation of specimen repositories using dried blood spots from state newborn screening programs raises ethical, legal, and social questions. Strategic planning will, therefore, also need to address the policy and regulatory implications of using stored blood spots for research purposes. This should include not only human subjects protection issues, but also an analysis of existing federal and state policies regarding newborn screening, the use of stored blood and tissue samples, and biobanking. Staff from the University of Michigan, Center for Public Health and Community Genomics has recently reviewed state, federal, and international policies addressing newborn screening and biobanking.[19] While all states in the U.S. offer newborn screening services, the policies and practices regarding implementation of these screening programs vary widely by state. Accordingly, policies on the storage and use of DBS for research purposes are also quite diverse in both content and comprehensiveness. In addition, there are very few systematic reviews of policies regarding storage and use of dried blood spots. One study found that 16 states currently have no written policy regarding storage of samples.[20] To gauge current practice within the United States, state laboratory directors were surveyed in 2003 by Richard Olney and colleagues at the CDC to determine how DBS are being used.[21] The findings include:

- Twenty states store blood spots for more than twelve months.
- Thirteen states have used stored newborn screening samples for epidemiologic studies.
- Fifteen states have a written policy that determines how residual DBS samples can or cannot be used for purposes outside the state NBS protocol.
- Ten of these fifteen states reported that their policies specify under what circumstances residual blood spots can be used with or without identifiers.
- More than 80% of states favored storage of identifiable spots at the state or regional level.
- Twenty states representing 1.74 million annual births would consider participating in an anonymous multi-state epidemiologic study.

Most of the states that allow access to samples do so with strict privacy and confidentiality guidelines that meet federal human subjects protections. They assure the anonymity of samples or require consent for the use of identifiable samples. For example, 28 states currently have explicit privacy or confidentiality guidelines regarding the use of personal information or access to blood spot specimens.[20]

Internationally, many countries have also developed policies and position statements that address the use of biobanked blood specimens for genetic research, and specifically the use of newborn screening blood spots for research. For instance:

- The Danish Neonatal Screening Program recommended full consent for all residual blood spot use.[22]
- The Human Genetic Society of Australia has developed a position paper that outlines the need for research using newborn screening samples to be conducted in line with local ethics and advisory committee recommendations and with written permission or appropriate ethics committee approval.[23]
- New Zealand's National Testing Center's "administration manual" indicates that the samples themselves "are the property of the people from whom they were collected."[24]
- The United Kingdom has more explicit guidelines concerning the storage and use of blood spots for research purposes; after screening and a quality assurance period, samples are physically separated from personal identifying information.[25]

The use of stored blood spots for research also raises ethical, legal, and social challenges related to existing newborn screening practices. Policy development will need to address issues such as: the disclosure of personal information; who will have access to samples and under what conditions; and the potential need for modified models of consent for parents. Moving forward with the development of appropriate policies for DBS storage and research, it will also be important to consider:

- The need for models or federal guidelines regarding the use of blood spots in research protocols across states or potential regional collaborations.
- How other state and/or federal genetics policies relate to the use of blood spots
- The potential effects of private/public partnerships on newborn screening legislation and the use of blood spots
- The need to involve community leaders and the public in the development of appropriate policies and guidelines regarding storage and use of blood spots

Creating the Michigan Neonatal BioTrust

In the 42 years since Michigan first began universal newborn screening for PKU, more than five million infants have been screened, and over 3,500 babies have been identified with disorders for which effective treatments are available to reduce disease burden. The state newborn screening program is truly a public health success story, saving lives and improving the quality of life for Michigan's children and their families. With the passage of time and rapid scientific advances in technology occurring at the close of the 20th century, the capability now exists to utilize DBS for additional public health purposes. As the 21st century unfolds, there are important reasons to consider promoting additional uses of DBS samples-- approximately 135,000 residual dried filter paper specimens that would otherwise be discarded each year. The creation of a permanent archive using DBS would be an important first step in establishing public health infrastructure to support new research and public health practices that will contribute to improving future health outcomes for Michigan residents.

There are several reasons why the Department of Community Health is now in a good position to oversee development of a DBS specimen archive as a public health, clinical and academic resource. These include:

- More than 99.5% of Michigan newborns are screened each year, providing a nearly complete population sample.
- Residual specimens dating back to the 1984 birth cohort are currently available.
- The public health genomics program in the Division of Genomics, Perinatal Health and Chronic Disease Epidemiology is well integrated with nearly all maternal, child and chronic disease programs, and has close collaborations with other relevant programs in the Bureau of Epidemiology, such as Environmental Epidemiology, Communicable Diseases, and Vital Statistics.
- A strong working relationship and collaborations are in place with the University of Michigan School of Public Health, including the Center for Public Health and Community Genomics.
- Partnerships with other university programs, research institutions, and health systems are in place or being developed, including Michigan State University, Wayne State University, the Van Andel Institute, Henry Ford Health System, Oakwood Healthcare System, Spectrum Health and others.
- Ongoing relationships are maintained with the National Office of Public Health Genomics and other programs at the Centers for Disease Control and Prevention.

What is the potential impact of the Michigan Neonatal BioTrust?

The purpose of creating a BioTrust is to formalize a system that will support the use of residual DBS for public health, genomic, and other kinds of health research that ultimately benefits Michigan citizens and the state as a whole. Stakeholders attending the April 2006 symposium were asked to envision a purpose or mission for the blood spot repository. They suggested that the purpose should be to "*provide a statewide, comprehensive, whole population cohort for assessment of genetic and environmental factors and their impact on health and disease.*" Further discussions identified the potential impact of having such an archive available for research. The benefits that were cited for the State of Michigan include:

- Identification of population-specific mutations, associated mutation rates and their prevalence within the Michigan population
- The ability to study rare diseases as well as complex conditions involving gene-environment interactions
- The potential for longitudinal monitoring (i.e. following a cohort for a specific length of time to determine disease outcomes)
- Use as a resource for studying environmental issues over time
- The ability to predict waves of disease by linking with existing environmental tracking efforts, and identifying whether remediation efforts are working (e.g. arsenic studies)
- The study and prediction of severe adverse reactions to pharmaceuticals (pre-symptomatic screening for at-risk polymorphisms)
- The study of epigenetic changes within the genome (by comparing results from the newborn period with testing after disease onset)
- Prevalence studies to test existing assumptions of disease and genotype frequencies among racial groups, assess screening practices, and address racial differences/disparities
- The ability to predict long-term population health burdens (e.g. Alzheimer mutation)
- Better diagnosis of underlying genetic heterogeneity to improve clinical outcomes
- The use of biological samples to monitor emerging infectious diseases and improved diagnostic testing
- Increased support for attracting new research or high tech industry to the state, meeting private health sector needs, or producing research findings that can be used to avert disease and thereby reduce long term health care costs

What is the current MDCH policy for release of DBS and how have they been used?

The Michigan Public Health Code[2] mandates rapid screening of newborns for rare, serious, but treatable disorders, and since 2000, allows for use of the blood spots for medical research during the retention period (currently 21.5 years). The current Newborn Screening Program brochure, available free of charge in three languages, informs parents that specimens are retained and may be used in this manner.[26] Parents can also request that their child's sample be destroyed after screening is completed. In accordance with the legislation, the MDCH Bureau of Laboratories developed a schedule and protocol for the retention and disposal of dried blood spots that has been in place since April of 2000. MDCH also has procedures in place for responding to special requests for use of the dried blood spots. Written requests are submitted to the Chemistry and Toxicology Division Director, reviewed by the Laboratory Director or her designee, and ultimately forwarded to the MDCH Institutional Review Board for final approval. MDCH currently charges $250 per hour to cover retrieval costs for the requested blood spots. Historically, requests for DBS samples fall under one of several broad categories: (1) diagnostic (consent form required); (2) research (need for consent dependent on identifiable vs. de-identified information); and (3) legal or forensic uses (consent form required).

The Newborn Screening Laboratory also utilizes residual specimens for quality assurance of current screening procedures, as well as for evaluating or developing new NBS tests. Residual samples have proven to be especially useful in establishing and evaluating new tandem mass spectrometry procedures. Additionally, residual samples were used to develop alternative laboratory procedures for reliable detection of hemoglobinopathies. Requests are periodically received from individual parents for release of their own child's specimen for medical or forensic

purposes. In addition to participating in a national study on maternal HIV prevalence, MDCH has occasionally used or released stored DBS for other epidemiological research although it is believed that the potential availability of such specimens is not widely known by the research community. Two of these studies are highlighted below.

- Michigan State University conducted a study entitled *Prevalence of Three Hereditary Hemochromatosis Mutant Alleles in the Michigan Caucasian Population*[27]. Polymerase chain reaction (PCR) and Restriction Fragment Length Polymorphism (RFLP) analysis were performed on 3,532 blood samples from newborn screening cards provided by the State of Michigan to investigate the prevalence of the C282Y, H63D and S65C mutations in the HFE gene associated with hereditary hemochromatosis. The study found that more than 30% of Michigan Caucasians carry one HFE mutation, while 6% have two mutations. The allele frequency of the C282Y mutation is 5.7% (significantly higher than expected) and the H63D mutation is 14% (significantly lower than expected). To our knowledge, this was the first publication to examine HFE allele frequencies in an unbiased sample of the Caucasian population.

- Investigators at the Children's Hospital of Michigan conducted a retrospective study entitled *High frequency of leukemic clones in newborn screening blood samples of children with B-precursor acute lymphoblastic leukemia.*[28] The DNA from 17 newborn screening cards of patients with acute lymphoblastic leukemia (ALL) was amplified and analyzed for detectable clonal rearrangements of the immunoglobulin heavy chain (IgH) gene that had been identified in diagnostic leukemia cells. The study's results supported the conclusion that a high proportion of childhood B-precursor ALL cases arise in utero, although postnatal events are also important factors in the development of leukemia.

Other research previously conducted or currently underway within Michigan using dried blood spots includes early investigations on Fragile X syndrome, studies on autism and diabetes, a study on respiratory distress, and a study on biomarkers for cerebral palsy.

What are possible frameworks for long term DBS storage?

Three categories of storage facility have been identified for biological specimens used in human health or medical research.[29] A "biorepository" typically stores specimens of the same or similar cell or tissue types. The focus is on the specimen itself, not on the individual from whom it was obtained. A specimen is kept in storage until needed by an investigator and then it is used up. A "biobank" stores tissue based on the historical characteristics of the individual from whom it came, and each specimen is unique so they cannot be interchanged. Biobanks often store tissues from well-defined diseases and are frequently used in clinical trials. The term "BioTrust" has been suggested to describe the MDCH repository of leftover DBS. A biotrust typically stores specimens from healthy people with the hope of discovering biological variations that may predispose to disease. The specimens may be linked to existing databases or health data that will emerge in the future, and contact with the individuals may be maintained in order to ascertain their health status.

In order to be successful, the Michigan Neonatal BioTrust would need to have public acceptance and support. Although MDCH has improved its outreach efforts in recent years to increase visibility and educate expectant parents and the general public about newborn screening, many people are still unaware of the program, let alone the fact that residual NBS specimens are retained for 21.5 years.[30] A recent analysis of Pregnancy Risk Assessment Monitoring System (PRAMS) survey data showed that in 2004, about 81% of new mothers in Michigan thought their baby had been screened for PKU and other disorders before leaving the hospital, whereas MDCH data matching NBS screens with birth certificates confirms that more than 99% of infants are actually screened. [31]

The news that research is being done, regardless of its anonymized nature, may come as a surprise to some people and raise privacy concerns. Therefore, including a plan for statewide community engagement that encompasses social, ethnic, religious and disability groups who might perceive DBS research as potentially increasing their vulnerability, is an important consideration and key step in developing an appropriate BioTrust framework. Several avenues have been identified for assessing acceptance by the public, including the use of focus groups, community dialogue, written or web-based surveys, and inclusion of relevant questions in the statewide Behavioral Risk Factor Surveillance System (BRFSS) telephone survey conducted each year. It is also important not to make assumptions about the attitudes of Michigan citizens or specific population groups without quantitative data. Once an acceptable framework is identified in partnership with the public, a transparent process should be employed in the development and operation of the BioTrust. The public, and especially the parents of infants whose specimens remain in the archive, should be kept abreast of the BioTrust's status as a resource for research via a public relations campaign that includes local newspaper articles, information provided through prenatal care providers, and possibly a website. Care must be taken to prevent any adverse consequences or backlash against the BioTrust that could threaten the newborn screening program itself.

Another critical issue to be reviewed both within MDCH and with community partners relates to informed consent for future specimen use. While the Michigan public health code allows anonymous research on residual DBS, a more formal and well-publicized repository linked with other data systems might require additional protections to make widespread use more acceptable to the public. Although removing individually identifying information from DBS before they are released for research minimizes individual risk, it should be acknowledged that risks to specific groups may still exist.

What are the technical considerations and options for storage?

Assuming there is community buy-in for the BioTrust and funding is secured, how should Michigan's residual newborn screening DBS be stored? Currently, the cards are stacked together and stored in a warehouse at ambient temperature. After identifying the approximate location based on the card number stored in a database, specimens are manually retrieved from the warehouse. One potential obstacle, to our knowledge not addressed in the literature, is cross-contamination between DBS cards, or between the cards and storage facility environment, particularly with respect to measurement of contaminants such as metals.

There is some reason to be concerned about the potential effects of high temperatures on sample quality. The recent New Jersey study underscores some possible limitations of working with DBS under long-term storage. Cases and controls were selected from 1979-1985. DBS collected prior to 1983 were exposed to high temperatures, and as a result DNA amplification for GST alleles failed for all samples from 1979-1982. However, MDCH did not report any similar failures. In 2003, laboratory staff performed a baseline assay of the HLA-DQ alpha gene on 70 samples, ranging in age from 22 years (1981) to current (2003). Three archived specimens per year were randomly selected from the State of Michigan's long-term storage facility. All extractions yielded useable results for all assays. There was no significant trend indicating a decrease in yield for any samples, regardless of age.[32]

There are a number of storage options if a new archiving system were to be established. The following scenarios are presented as an introduction to debate on preferred methods of storage that will benefit from further discussion by scientists representing a variety of different research interests. Possible options include:

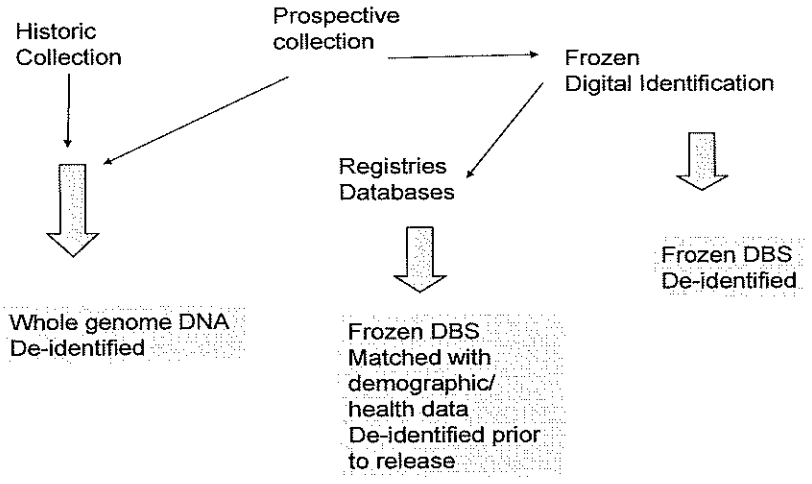
(1) Continued warehouse storage of newborn screening filter paper cards at ambient temperature. The lowest cost option is to simply maintain current storage and retrieval procedures, while fostering a gradual increase in awareness and use by interested researchers. However, in order to maximize the usefulness of DBS specimens, new methods of storage would need to be employed. Current storage procedures largely limit the types of investigations that would be possible to those involving DNA and possibly metals.

(2) Cold storage of newborn screening cards. Under the current practice of storing the newborn screening cards at ambient temperature, only DNA and possibly metals can be measured reliably in cards stored for longer periods of time. If cold storage at –70 C were utilized prospectively, it may be possible to measure a wider array of analytes as noted in Table 2—like mRNA, or proteins (such as antibodies and enzymes), and other organic compounds (such as pesticides). Robotic technology could be utilized to streamline retrieval and prevent deleterious effects from freeze/thaw cycles. (Note: The state records facility is scheduled to move beginning in the summer of 2008. Since a new location for storing DBS will need to be identified, this may present an opportunity to find cold-storage space.)

(3) Storage of amplified genomic DNA. This option would involve isolating DNA from the filter paper cards, and storing it in a freezer. DNA could be extracted prospectively from future specimens as well as from a subset of existing filter paper cards. This may be attractive from the standpoint of volume, and because DNA is a potentially renewable resource. It may also be an attractive option for researchers who require only DNA, as it would eliminate their need to first isolate DNA from the sample(s). A drawback is that only DNA could be analyzed, and would eliminate the possibility of other kinds of research not involving genes. However, one potential way to minimize this issue would be to perform an aqueous and/or organic extraction on the DBS to release non-DNA biomarkers. Another drawback is that it transfers this labor and financial burden to the state laboratory, possibly resulting in increased fees to access specimens from the BioTrust.

(4) A combination strategy. This would involve a hybrid approach yielding multiple products available to research investigators. All NBS filter paper cards would be frozen prospectively in addition to storing genomic DNA from a random sample of each year's birth cohort. This would allow researchers interested in a random sample of Michigan newborns easy access to this resource while preserving the potential for non-DNA based research or research on more specific populations within a birth cohort. Even under cold storage, DBS may lose their utility beyond DNA studies after a certain amount of time. If this proves to be the case, then costs could be reduced somewhat by returning the cards to warehouse storage at the point in time when they are no longer a reliable source of analytes other than DNA.

Option 4: Multiple Products



What are the research priorities?

In addition to a storage model, the research model must also be considered. There are a number of questions surrounding the parameters for research. Should the Neonatal BioTrust accept all research applications, or should a specific list of research priorities be developed? Should the specimens be made available to any researcher, or only to those based within the state? If specimens are provided to researchers outside of Michigan, should they be charged a higher access fee? Should commercial companies be charged the same, or different fees than academic research institutions? Should there be limits on the number of samples provided to any one researcher or institution? What are the key interest areas? Some possible subject areas for research include:

- Improvements and potential additions to the newborn screening panel
- Maternal and child health research
- Analyte stability under various storage conditions
- Environmental toxins that are an issue to Michigan citizens and government
- Pharmaceutical research
- Prevalence studies
- Gene expression profiles using chip-based technologies
- Proteomic profiles
- Metabolomic profiles
- Epigenetic studies

Community input will also be important in determining research priorities. MDCH is committed to developing the BioTrust as a partnership with Michigan citizens. One potential method of assuring continued community involvement in setting research priorities is the creation of a scientific advisory board, in addition to an IRB, that would include community members and be responsible for reviewing all applications for potential studies utilizing dried blood spots.

While there is clear utility of the dried blood spots for prevalence studies in the Michigan population, the opportunities could expand exponentially if these resources were linked to already available population based and vital statistic databases. Data from other MDCH sources such as the live birth certificates, death certificates, cancer registry and birth defects registry are possible examples of linkable files to the dried blood spots, as noted in Table 3. The information provided in this table is not complete. A more thorough review of existing databases, along with the costs of the labor intensive linkage process, and the potential privacy issues that would need to be addressed could be prepared as one of the crucial steps in establishing the BioTrust. Each of the data sources has its own statutes and/or regulations governing access and use that would need to be carefully taken into account. Some linkages might occur routinely while others might be performed only per request. The cost for linkages would need to reflect staff expertise and qualifications, the complexity of the data files, the method used for linkage and thus the hours of work, as well as other associated fees in instances where specific data files must be purchased by MDCH. This cost for linkages could be embedded into the overall BioTrust budget or added as a corresponding fee for the linked file, with the first option assuring a more continuous process to expedite research studies and prevent delays in meeting data requests.

A data advisory board composed of MDCH experts in the existing databases could also be established to review incoming applications from the data need perspective, so as to recommend the most useful linkages. This advisory board could be either a subcommittee of the research board or stand alone if there is a need for more expertise. Another responsibility of this board would be to continuously assess the cost for linkages based on the resources used and

the timeliness in meeting researchers' needs. It could also develop the schedule of routine linkages and establish fees, including the cost of special requests. The details for linking different databases would be essential for marketing if the BioTrust is to become a major resource for biomedical, public health, and health care research sectors, as well as scientifically necessary to ensure that high epidemiological standards for phenotypic data are in place. Moreover, it is expected that other population databases would be developed and used in further linkages with DBS that would thus increase the data sources available for researchers.

All of the above would not be possible without storing information from the DBS specimens in a well-developed and secured database. To protect individual privacy, an ID must be assigned to each specimen. The confidential information corresponding to each ID would be provided only to a very limited number of personnel responsible for linkages, who would be required to sign a special form and assume full responsibility for the security and confidentiality of the stored data. Corresponding security measures would be in place to protect the confidential information.

Table 3. Examples of existing public health databases

Source:	*Variables include:*
Birth records	Birth date, birth weight, sex, mother/father age, address, maternal prenatal care and behaviors
Birth defects registry	ICD-9 diagnostic codes; procedure codes (already linked with live births and thus additional variables also available)
Cancer registry	Patient demographics, cancer site and stage, family history information, laboratory information, method of confirmation, treatment data
Children's Special Health Care Services (CSHCS) database	Mother's name, address, primary enrollment diagnosis (ICD-9 codes), treatment and procedures (CPT codes)
Childhood Lead Screening	Child name, address, test results
Death records	Age, birth date and place, death date, immediate and underlying cause of death, ancestry, race, education, occupation, parents' names, autopsy
Early Hearing Detection and Intervention (EHDI) database	Hearing screen results (pass/fail); confirmed hearing loss (linked with live births and thus additional variables also available)
Medicaid	Birth date, address, racial heritage, diagnosis (ICD-9 codes), providers, procedures (CPT codes), pharmacy claims
Michigan Care Improvement Registry (MCIR)	Birth date, address, sex, immunizations received, immunizations overdue, provider who administered, adverse reactions
Michigan Disease Surveillance System (MDSS)	Infectious disease reports
Newborn Screening (metabolic)	Birth date, birth weight, specimen date/age, sex, single/multiple birth order, NICU, transfusion status, ethnicity, mother's address, hepatitis antigen
WIC	Child and maternal data, pregnancy and post partum health history, breastfeeding, medications, weight, medical/nutritional conditions, marital status, education level

Another avenue for enhancing utility of the BioTrust would be to establish a database for collecting information generated by studies using DBS specimens. As a condition for accessing

the samples, and/or receiving a linked file, investigators would be required to submit their final results to a common database. While protections for intellectual property would need to be implemented, such a database could be a valuable resource for other researchers, as well provide an avenue for the public to remain informed about research conducted with DBS.

What are the next steps?

The Department of Community Health, together with many partners and stakeholders, recognizes great value in expanding the use of DBS for public health and medical research. MDCH is committed to fostering a transparent process for development of a Neonatal BioTrust for genome, environmental, and other health research that will be accepted and embraced by citizens of the state. Regardless of the specific framework ultimately chosen, special care must be taken to prevent adverse publicity or backlash that could threaten the public health success story of newborn screening itself. The University of Michigan, Center for Public Health and Community Genomics, a key MDCH partner, has already assumed a leadership role in beginning to assess public awareness and recommending a process that will assure meaningful community engagement. In addition, partners from Michigan State University, Wayne State University, Van Andel Institute, Michigan Public Health Institute, and others have expressed interest in assisting with development of a strategic plan.

Before the archive becomes reality, a great deal of work must still be done—beginning with meaningful engagement of the public. Further steps will then need to include: development of a business plan to procure start-up funds for additional staff and enhancement of current storage facilities; establishment of policies that assure human subjects protection and incorporate public input in the identification of research priorities; quality control research with possible initiation of new specimen storage and retrieval procedures; and linkages with other databases. Once these issues are appropriately addressed, the Neonatal BioTrust will represent a new and important research tool that is expected to contribute to disease prevention and improved health outcomes for the people of Michigan.

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Data Confidentiality

Appendix B

When research is conducted on a variety of bio-Samples and / or data related to individuals, it is imperative to maintain the privacy of the individuals. Protection of personal data is described under HIPAA. Protected Health Information (PHI) is any of 18 specific data elements that could be used to identify an individual.

The details of the PHI will be described later.

HIPAA

Protected Health Information (PHI) is any of 18 specific data elements that could be used to identify an individual.

HIPAA 18 Identifiers

1. Names
2. All geographic subdivisions smaller than a State, including street address, city, county, precinct, zip code, and their equivalent geocodes
    a. Except for the initial three digits of a zip code if according to the currently available data from the Bureau of the Census:
    b. The geographic unit formed by combining all zip codes with the same three initial digits contains more than 20,000 people; and
    c. The initial three digits of a zip code for all such geographic units containing 20,000 or fewer people are changed to 000;
3. All elements of dates (except year) or dates directly relating to an individual, including:
    a. birth date, admission date, discharge date, date of death;
    b. and all ages over 89 and all elements of dates (including year) indicative of such age, except that such ages and elements may be aggregated into a single category of age 90 or older;
4. Telephone numbers;
5. Fax numbers;
6. Electronic mail addresses;
7. Social security numbers;
8. Medical record numbers;
9. Health plan beneficiary numbers;
10. Account numbers;
11. Certificate/license numbers;
12. Vehicle identifiers and serial numbers, including license plate numbers;
13. Device identifiers and serial numbers;
14. Web Universal Resource Locators (URLs);
15. Internet Protocol (IP) address numbers;
16. Biometric identifiers, including finger and voice prints;
17. Full face photographic images and any comparable images; and
18. Any other unique identifying number, characteristic, or code.

Accessing Research Data
Short of obtaining individual permissions from beneficiaries, PHI can only be obtained through the use of one of the following mechanisms:

- **Business Associates Agreement**
  This is perhaps the easiest way to obtain the PHI but 'pure research' rarely falls in this category.

- **Data Use Agreement**
  This allows access to a Limited Data Set (LDS) which is limited to the following PHI:
  - Five-digit zip code
  - Dates of service (e.g., admission / discharge)
  - Dates of birth and death
  - Geographic subdivision (e.g., state, county, city, precinct), but not street address
  - This Data Use Agreement will typically be the means used to obtain individually identifying information for pure research purposes.

- **Waiver of Authorization**
  This is what is required if you want access to any or all of the remaining 16 individually identifying data elements.
  - An Institutional Review Board (IRB) or a Privacy Board must approve this waiver.
  - Only the minimum PHI necessary to accomplish the intended purposes can be disclosed.
  - It is likely that most research will not need this level of identification.

The Role of the Honest Broker

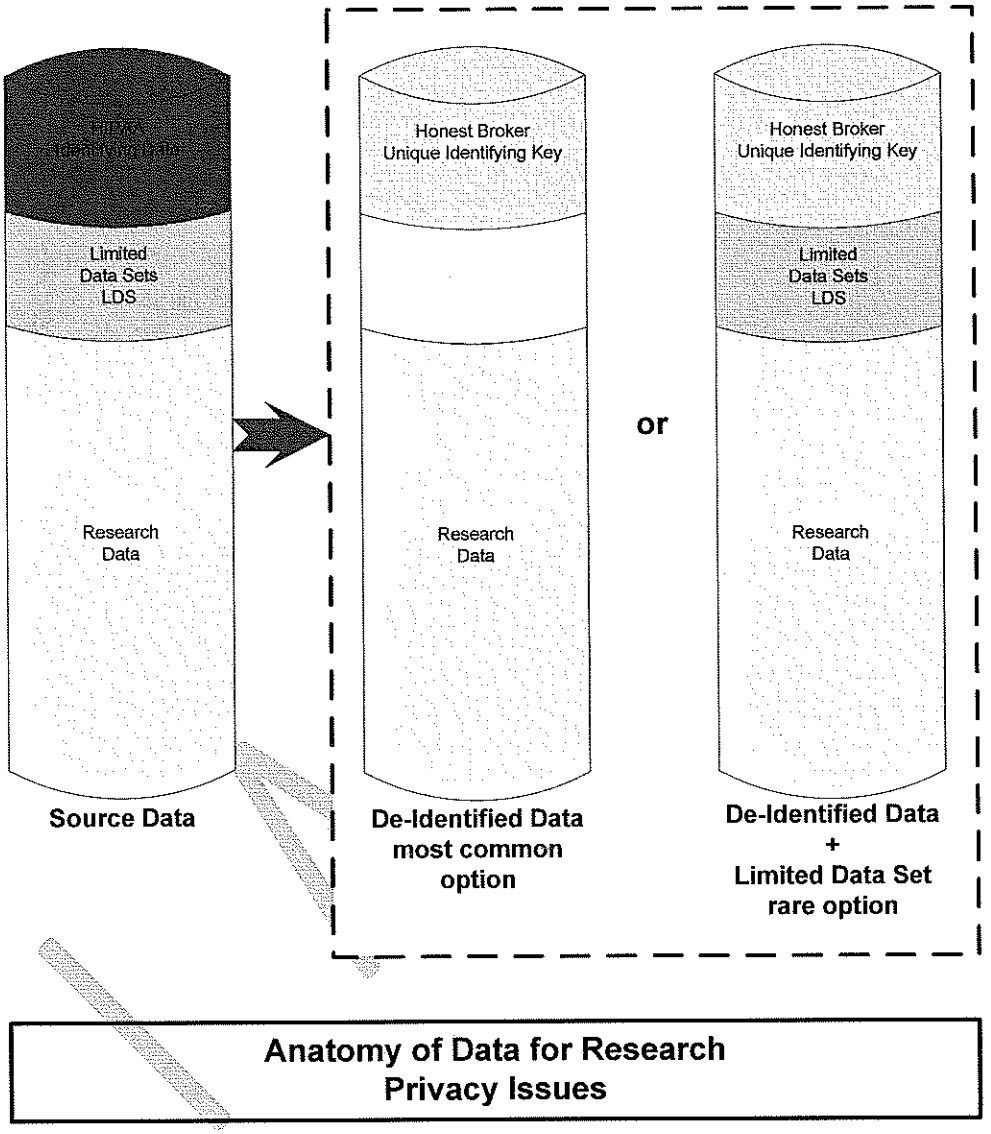
When data needed comes from multiple sources, it is necessary to be able to access the PHI before it is replaced by a Unique Case Identifier (UCI) that corresponds to the PHI. The primary goal of the UCI is the development of procedures for accurately linking person-level records from multiple sources and to accomplish the linking with a minimum of human intervention.

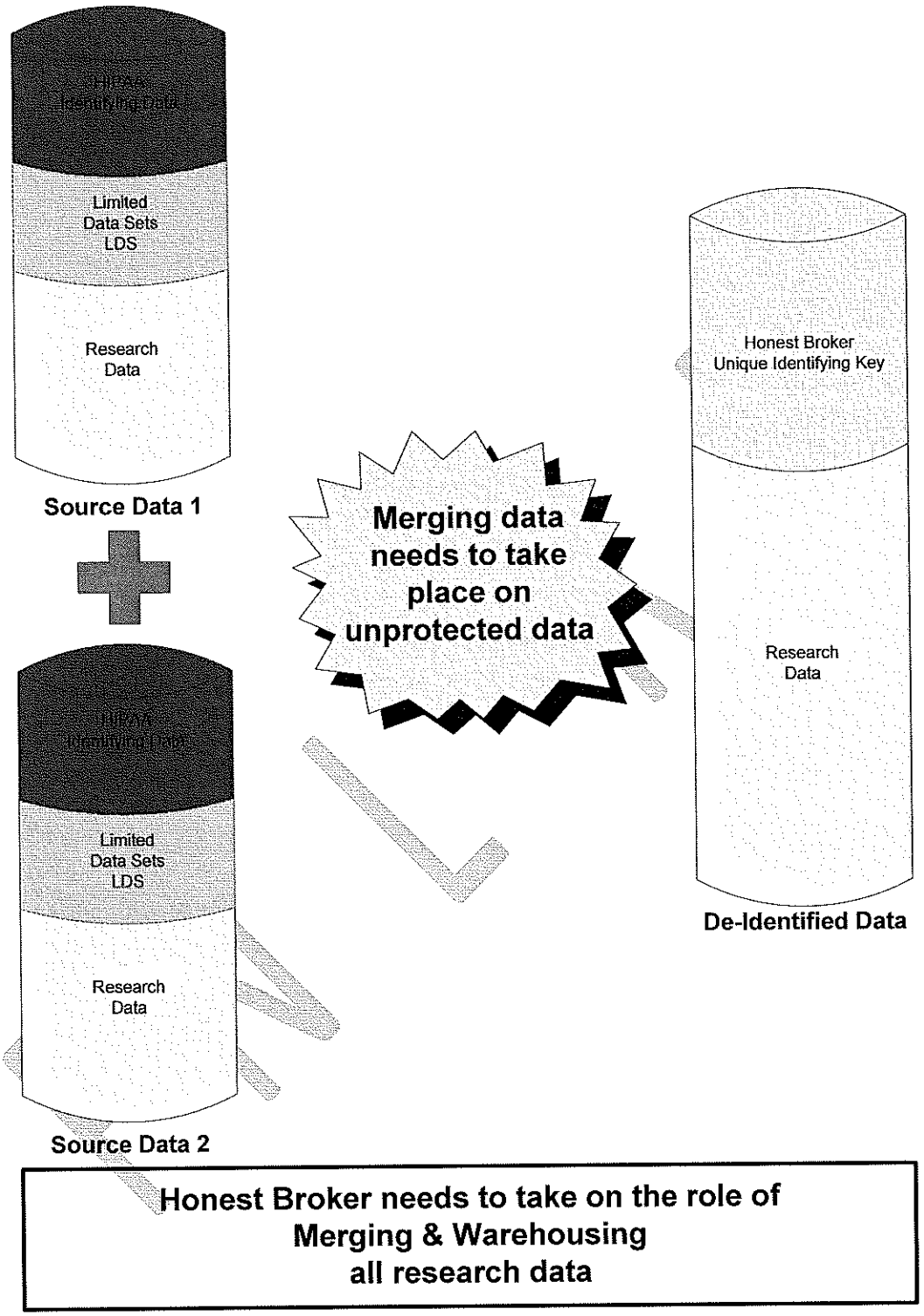
To that end the NIH/NCI recommends the concept of the Honest Broker. The Honest Broker is an entity that is separate from the provider of the data and separate from the entity conducting the research. Its sole purpose is to provide a wall of separation isolating the researcher from the organization providing the research data and guarding the privacy of the involved subjects.

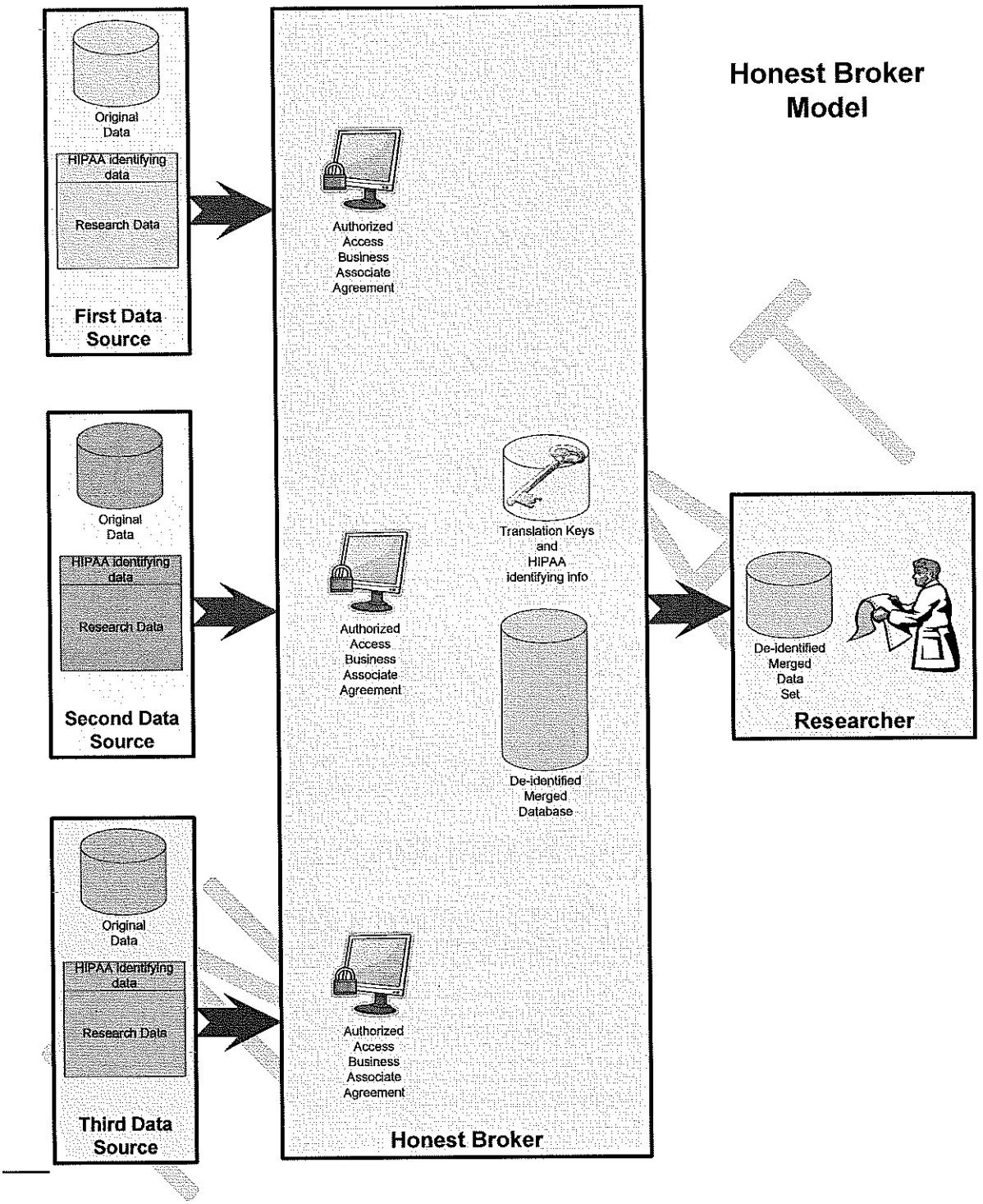
The Honest Broker is the steward of the translation keys linking the data and/or samples to the original personal identifying data.

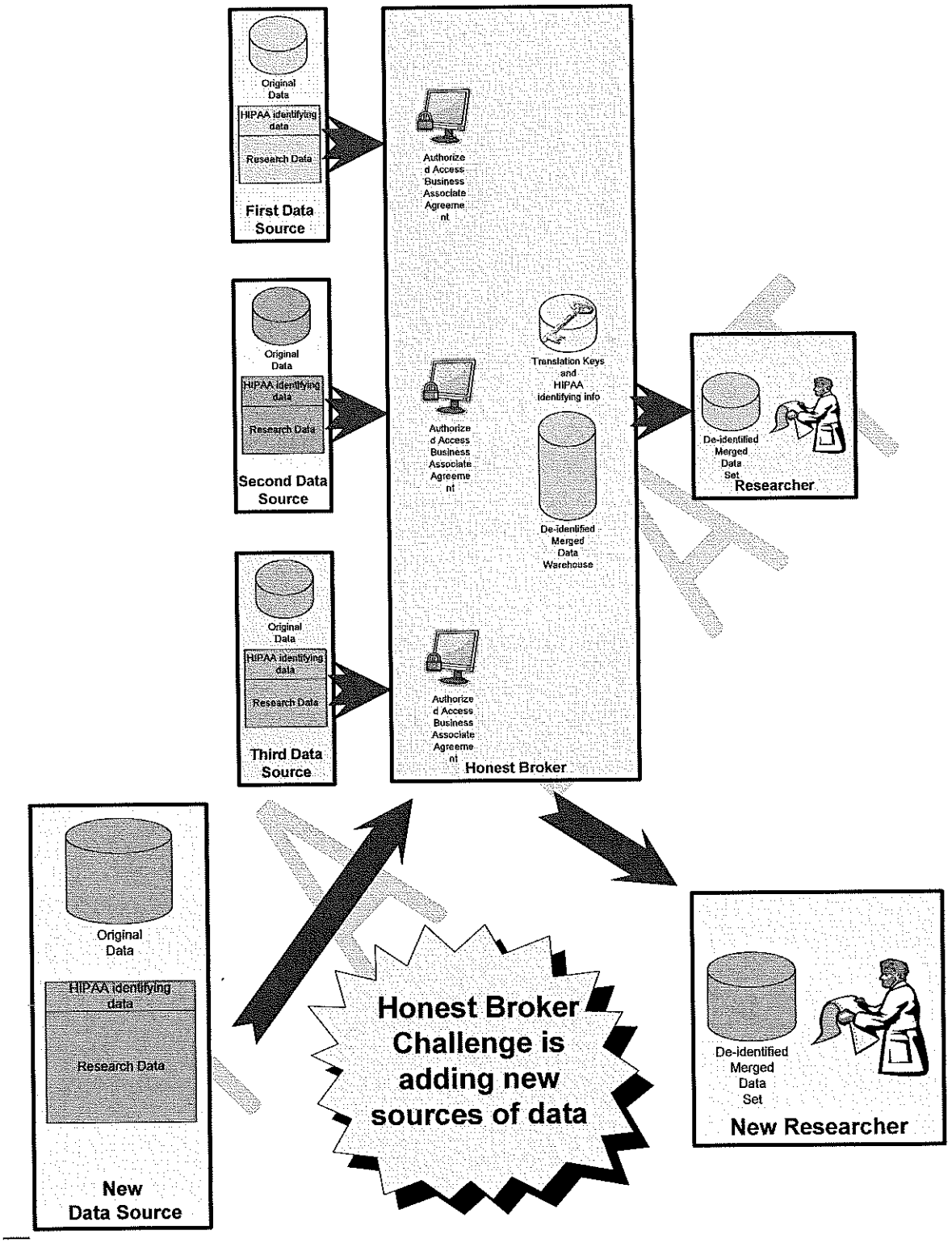
The role of the Honest Broker becomes even more obvious and important when the research requires data from several entities. In this case the Honest Broker accesses the unblinded data at the source, merges it and then provides the blinded data and maintains the translation keys in case a linking back is necessary to get additional data.

The following pages provide visual representations of the role of the Honest Broker.




Limited
Data Sets
LDS
Research
Data
Source Data 1
Limited
Data Sets
LDS
Research
Data
Source Data 2
Merging data needs to take place on unprotected data
Honest Broker
Unique Identifying Key
Research
Data
De-Identified Data
Honest Broker needs to take on the role of
Merging & Warehousing
all research data


Honest Broker Model
Original Data
HIPAA identifying data
Research Data
First Data Source
Original Data
HIPAA identifying data
Research Data
Second Data Source
Original Data
HIPAA identifying data
Research Data
Third Data Source
Authorized Access Business Associate Agreement
Authorized Access Business Associate Agreement
Authorized Access Business Associate Agreement
Translation Keys and HIPAA identifying info
De-identified Merged Database
Honest Broker
De-identified Merged Data Set
Researcher


Original Data
HIPAA identifying data
Research Data
First Data Source
Original Data
HIPAA identifying data
Research Data
Second Data Source
Original Data
HIPAA identifying data
Research Data
Third Data Source
Authorized Access Business Associate Agreement
Authorized Access Business Associate Agreement
Authorized Access Business Associate Agreement
Translation Keys and HIPAA identifying info
De-identified Merged Data Warehouse
Honest Broker
De-identified Merged Data Set
Researcher
Original Data
HIPAA identifying data
Research Data
New Data Source
Honest Broker Challenge is adding new sources of data
De-identified Merged Data Set
New Researcher

CTA Grant Proposal Appendix C

Objective

The Core Technology Alliance Genomics Core together with the Michigan Department of Community Health and Wayne State University's Tech Town, proposes to develop the Michigan BioTrust - a unique resource of biological materials for a wide range of research areas including the basis for genetic diseases, genetic diversity, surveillance of infectious diseases, chronic disease intervention and outcome, monitoring environmental exposures, and study of biomarkers.

Background

For over 40 years, a blood sample has been collected from almost every newborn in the state of Michigan on five spots of filter paper and screened for a variety of metabolic disorders. Typically, unused blood spots remain after newborn screening tests are completed. The Michigan Department of Community Health currently has over three million of these Dried Blood Spot (DBS) specimens in storage representing the past 21 years, and collects approximately 135,000 new blood spots per year.

Over 160 biomarkers and compounds have been measured in DBS, ranging from genetic information to proteins, infectious agents such as viruses, and harmful metals such as lead. Residual DBS are therefore a potential source of specimens for a wide variety of research. In fact, DBS have already been used to investigate issues such as exposure to environmental pollutants, genetic factors associated with susceptibility to infection, and childhood cancer. Because more than 99% of Michigan infants are screened, DBS represent an entire birth cohort and would allow population-based studies that overcome shortcomings present in other research designs such as small sample size, selection bias, participation bias, low power due to insufficient sample size, and the limited ability to generalize to a population. Even more compelling as a research resource, these residual DBS can be linked to public health databases like birth and death records, birth defects and cancer registries, and infectious disease reports to reveal important health outcomes.

Program Description for the Michigan BioTrust

The Michigan BioTrust proposes a phased plan to prepare the dried blood spots for use in research. The overall plan is to stabilize the blood spot collection by moving the samples to a temperature controlled environment; to implement a sample management system; and to use the Genomics Core to perform a quality review on existing samples. Concurrently the Michigan BioTrust will conduct studies to determine the optimal long term storage environment for the samples. During its first year of operation the Michigan BioTrust will complete the following tasks on approximately 3,000 of the existing dried blood spot cards:

- move the samples to a temperature controlled environment for stabilization of the nucleic acids, proteins and chemicals (Dept of Community Health and Tech Town);
- implement a sample management system that includes a searchable database and sample tracking capability (Dept of Community Health and the WSU Computer Science Department);
- link with other available databases (Dept of Community Health and WSU Computer Science Department);
- explore storage conditions to optimize the scientific utility of the dried blood spots (Dept of Community Health, Tech Town, and the Genomics Core)

- perform a quality review to explore the scientific utility of the existing dried blood spots (Genomics Core).

Wayne State University will cost share this project by paying for the bioinformatics work (see Dr. Sokol's letter). The budget for this proposal represents the costs for the Genomics Core.

Technical Proposal

Two 6 mm (1/4 in) punches will be taken from an estimated 3000 blood spots and the DNA isolated with a Qiagen BioSprint 96 robot utilizing magnetic-particle technology. This is a high throughput system designed specifically for small sample size. The workstation controls an array of magnetic rods that attract and release magnetic particles and transfers them from well to well. The sequential transfer of magnetic particles allows rapid purification, from the initial binding of DNA to the particles, through washing of the particles and elution of pure DNA. Since the workstation transfers magnetic particles instead of liquids, it uses minimal amounts of reagents, enabling cost-efficient sample preparation with chemicals and disposables estimated at $3.20 per sample. The estimated total yield is 200 ng with DNA sizes ranging up to 50 kb. The quality and quantity of the DNA will be assessed using standard techniques (spectrophotometry, PicoGreen fluorescence, gel electrophoresis, and performance in PCR reactions).

As the DBS is a limited resource, our first priority will be to amplify the DNA. We propose to use Multiple Displacement Amplification (MDA). MDA utilizes isothermal genome amplification with Phi29 DNA polymerase, a processive DNA polymerase capable of replicating 100 kb without dissociating from the genomic template and has 3' to 5' exonuclease proofreading activity. The average amplified DNA is from 2 to 100 kb with an average length of 10 kb and provides uniform DNA amplification across the genome (Hosono et al., 2003). Qiagen offers both in house MDA (REPLI-g) and REPLI-g kits. We propose to start with the Qiagen in house service on a limited number of samples to test the technology and then amplify the same samples at the MCGT hub lab to compare quality and cost. This MDA procedure starts with 100 ng of gDNA and amplifies up to from 40 to 100 ug wgaDNA depending on the procedure.

wgaDNA amplified with the MDA technology has been tested for utility in PCR reactions, Southern blots, and sequencing reactions with success (Luthra and Medeiros, 2004). A recent paper by Berthier-Schaad et al, 2007 gave promising results using high-throughput genotyping. They started with from 1 ng to 25 ng gDNA, used MDA amplification (Qiagen) in house, and then ran the Illumina GoldenGate with a custom 1536 SNP panel. They found the wgaDNA genotyping failed for slightly more than the gDNA (6%) but that the successful genotyping was 0.99 concordant between sample types. The SNPs that failed tended to be close to the telomeres and in GC-rich areas. The MGTC lab will test the wgaDNA with DNA sequencing, 5'-nuclease genotyping, and high throughput genotyping technologies (Illumina GoldenGate and Infinium platforms).

After the testing phase, the BioTrust would consider requests from Michigan scientists to use the wgaDNA in research projects. The MCGT will continue to partner with the BioTrust and researchers for DNA isolation, amplification, and genotyping with the standard chargeback mechanism.

A future direction to consider will be to develop a database of genotyping information on these samples that investigators can search. This would further expand the research that can be accomplished using this limited but very powerful resource.

References

Hosono, S. et al. (2003) Unbiased whole-genome amplification directly from clinical samples. Genome Res. 13, 954.

Luthra R, Medeiros LJ (2004) Isothermal multiple displacement amplification: a highly reliable approach for generating unlimited high molecular weight genomic DNA from clinical specimens. Cytometry 3:236-242.

Berthier-Schaad Y, Kao WH, Coresh J, Zhang L, Ingersoll RG, Stephens R, Smith MW. (2007) Reliability of high-throughput genotyping of whole genome amplified DNA in SNP genotyping studies. Electrophoresis. 28(16):2812-2817.

Governance Model

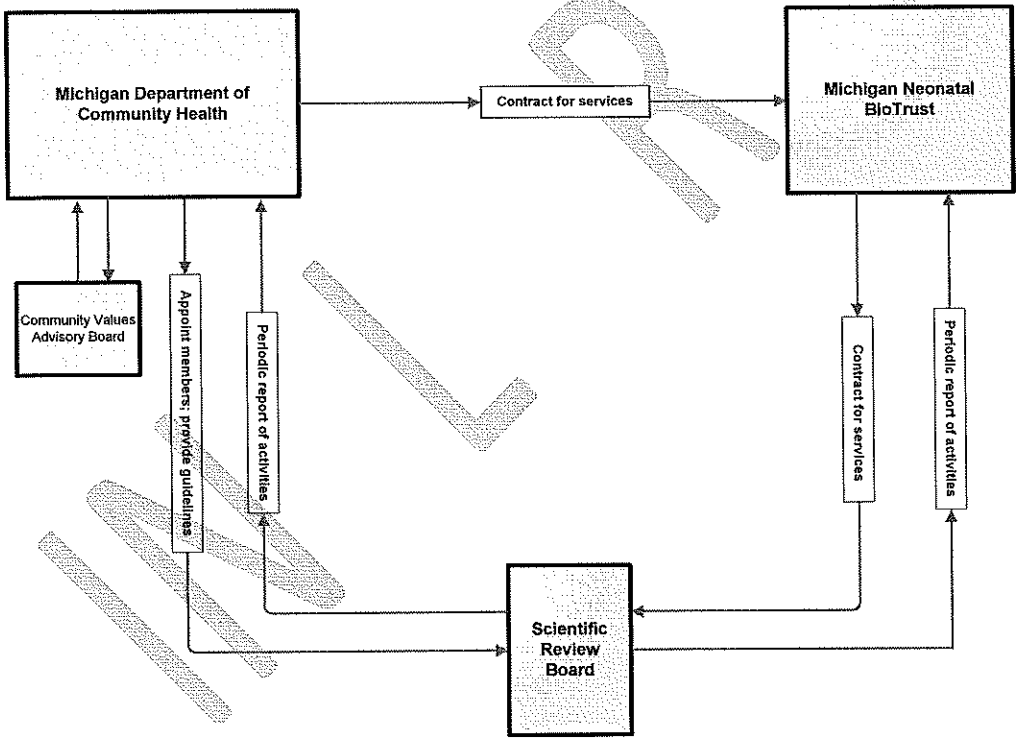
Appendix D

The Michigan Department of Community Health (MDCH) will maintain ownership, and control the use of, the dried blood spots (DBS) and data derived from links to the DBS. MDCH will contract with the Michigan Neonatal BioTrust – a not for profit organization - to manage the BioTrust and its samples.

A Community Values Advisory Board, appointed by MDCH, will advise MDCH on the appropriate use of DBS.

A Scientific Review Board, appointed by MDCH, will review all requests to use the samples for research. The Scientific Review Board will follow the principles and guidelines provided by the MDCH for approving use of the samples.

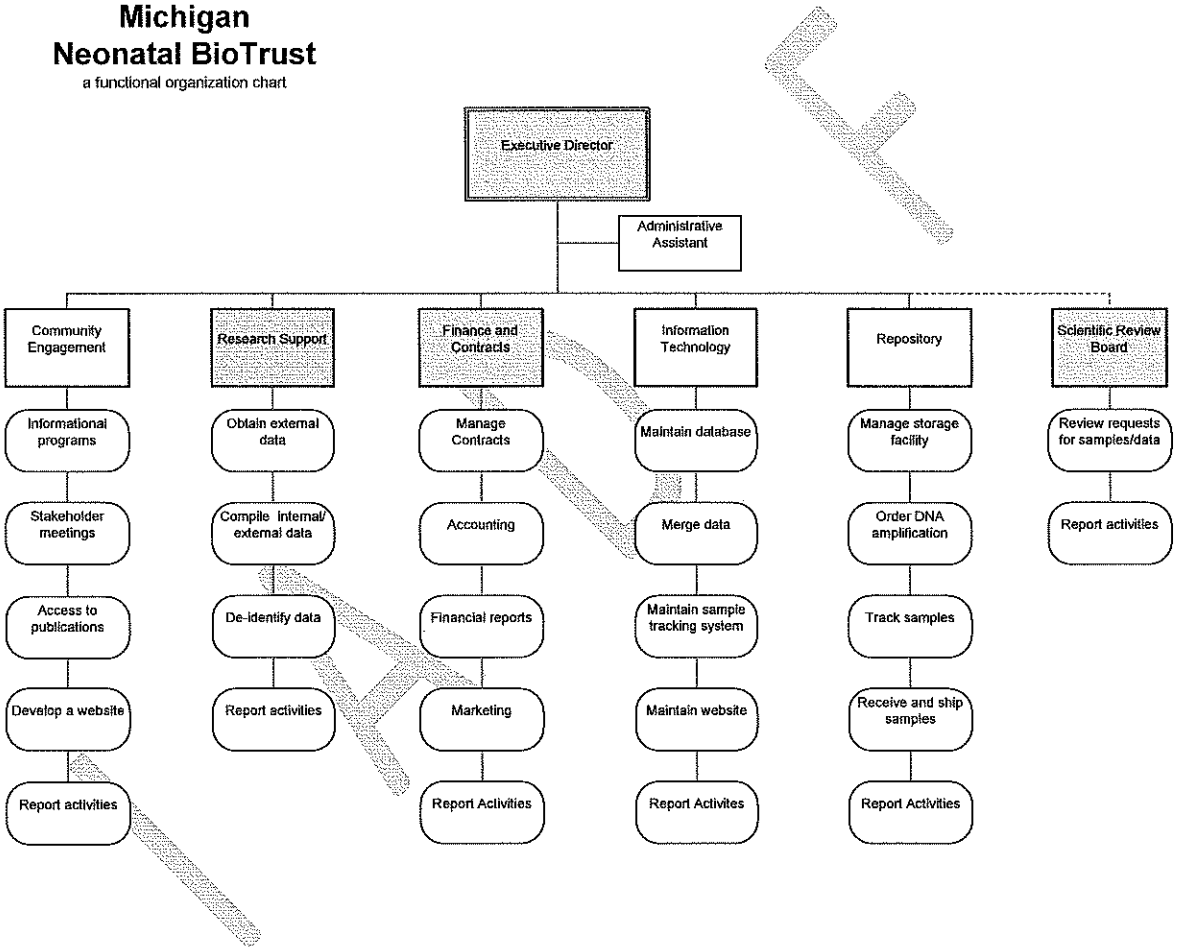
Michigan Neonatal BioTrust
Governance Model



Page 1

Functional Organization Chart — Appendix E

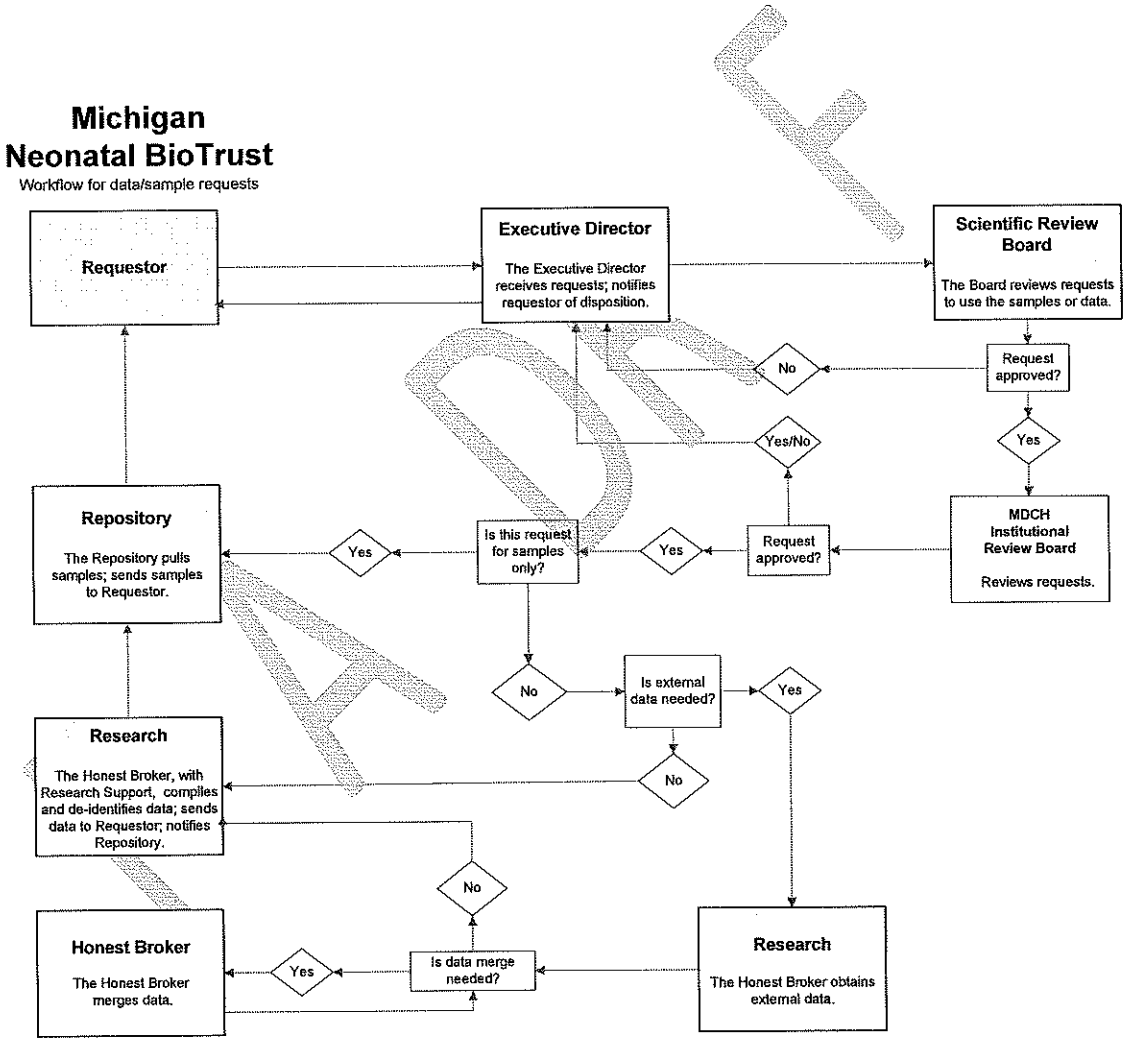
The chart below shows the functional organization of the Michigan Neonatal BioTrust.



Workflow Chart

Appendix F

The workflow chart below shows how the Michigan Neonatal BioTrust (MNB) will process requests to use the dried blood spots or data for research. No request will be filled without prior approval from both the MNB Scientific Review Board and the Michigan Department of Community Health's Institutional Review Board.



Information in the Current MDCH Database Appendix G

The following disorders are currently tested for in the Newborn Screening program.

Amino Acid Disorders:
Phenylketonuria (PKU)
Benign hyperphenylalaninemia (H-PHE)
Biopterin cofactor biosysnthesis (BIOPT(BS))
Defects of biopterin cofactor regeneration (BIOPT(Reg))
Maple syrup disease (MSUD)
Homocystinuria (HCY)
Hypermethioninemia (MET)
Argininosuccinic acidemia (ASA)
Citrullinemia (CIT)
Citrullinemia Type II (CIT II)
Tyrosinemia Type I (TYR I)
Argininemia (ARG)

Fatty Acid Oxidation Disorders:
Carnitine:acylcarnitine translocase deficiency (CACT)
Carnitine uptake defect (CUD)
Carnitine palmitoyltransferase IA deficiency (liver) (CPT 1A)
Carnitine palmitoyltransferase II deficiency (CPT II)
Short-chain acyl-CoA dehydrogenase deficiency (SCAD)
Glutaric acidemia type II (GA II)
Med.-chain acyl-CoA dehydrogenase deficiency (MCAD)
Long-chain L-3-OH acyl-CoA dehydrogenase deficiency (LCHAD)
Trifunctional protein deficiency (TFP)
Very long-chain acyl-CoA dehydrogenase deficiency (VLCAD)
Med.-chain ketoacyl-CoA thiolase deficiency (MCKAT)
Med./short-chain L-3-OH acyl-CoA dehydrogenase deficiency (M/SCHAD)
Dienoyl-CoA reductase deficiency (DE RED)

Organic Acid Disorders:
Isovaleric acidemia (IVA)
3-Methylcrotonyl-CoA carboxylase deficiency (3MCC)
3-OH 3-CH3 glutaric aciduria (HMG)
Beta-ketothiolase deficiency (BKT)
Glutaric acidemia type I (GA I)
Propionic acidemia (PA)
Multiple carboxylase deficiency (MCD)
2-Methyl 3 hydroxy butyric aciduria (2M3HBA)
Methylmalonic acidemia (mutase deficiency) (MUT)
Methylmalonic acidemia (Cbl A,B)
Methylmalonic acidemia (Cbl C,D)
Malonic acidemia (MAL)
Isobutyryl-CoA dehydrogenase deficiency (IBG)
2-Methyl butyryl-CoA dehydrogenase deficiency (2MBG)
3-Methylglutaconic aciduria (3MGA)

Endocrine Disorders:
Congenital Adrenal Hyperplasia (CAH)
Congenital Hypothyroidism (CH)

Enzyme Disorders:
Galactose-1-Phosphate Uridyl Transferase (GALT)
Biotinidase (BIOT)

Hemoglobinopathies:
Sickle cell anemia (Hb SS)
Hb S/C Disease (Hb S/C)
Hb S/Beta-thalassemia, (Hb S/Beta-Th)
Variant Hb-pathies (Var Hb)

Cystic Fibrosis

The scope of the newborn screening tests has changed over the years. The test results that are kept in the Blood Spot Bank database may include the following:

54	PKU
55	T4
70	MSMS
71	Leu
58	GALT
59	TSH
62	CAH
63	MSUD
64	HGB
65	BIO
66	GAO
67	IEF
72	Phe
73	Phe/Tyr
74	C8
75	C10
76	C8/C10
77	Tyr
78	C6
79	Val
80	Hearing
81	PKU Cofactor Screen
82	PKU Plasma Amino Acids
83	PKU Mutation Analysis
84	PKU DHPR Analysis
85	GAL TLC
87	PKU DBS PHE level
88	MSUD DBS BCAA Analysis
89	MSUD BCDKA Enzyme Analysis
90	MSUD Plasma Amino Acids
91	GALT Galactose 1 phospate uridyltransferase
92	GALT Genotype
96	GALT Total Galactose
97	BIO -Biotinidase enzyme Activity Assay

98	BIO Mutation Analysis
99	MCAD Mutation Analysis
100	MCAD Urine Organic Acids
103	MCAD Acylcarnitine Profie
104	CH Serum TSH
105	CH Serum Free T4
106	CH Thyroid Scan
107	CH Thyroid Ultrasound
108	CAH Serum 17 OHP
109	CAH Serum Electrolytes
110	CAH ACTH Stimulation Test
111	CAH Serum Cortisol
112	Hemoglobin Electrophresis
113	Met
114	HearingDiagnosis
115	Cit
116	ASA
117	Met/Phe
118	Cit/Arg
119	Cit/Tyr
120	TGAL
122	CIT Urine Organic Acids
123	CIT Urine Amino Acids
124	CIT Plasma Amino Acids
125	HCU Homocysteine
126	HCU Methionine
127	HCU MET/PHE
129	Arg
130	Gly
131	Orn
132	C0
133	C10:1
134	C10:2
135	C12
136	C12:1
137	C14
138	C14-OH
139	C14:1
140	C14:2
141	C16
142	C16-OH
143	C16:1
144	C18
145	C18-OH
146	C18:1
147	C18:1-OH
148	C2
149	C3
150	C3DCfs
151	C4

152	C4DCfs
153	C5
154	C5-OH
155	C5:1
156	C5DCfs
157	C6DCfs
158	C16:1-OH
159	C3DC
160	C4DC
161	C5DC
162	C6DC
163	C4-OH
164	Ala
165	C18:2
166	Leu/Ala
167	Leu/Phe
168	Tyr/Phe
169	Val/Phe
170	C0/(C16+C18)
171	CUD-Ratio
172	C3/C2
174	C3/C16
175	C3DC/C10
176	C4/C2
177	C4/C3
178	C4/C8
179	C5/C0
180	C5/C2
181	C5/C3
182	C5DC/C5-OH
183	C5DC/C8
184	C5DC/C16
185	C5-OH/C8
186	C8/C2
189	Met
190	Phe
191	Tyr
192	Val
193	C6
194	C8
195	C10
196	Cit/Tyr
197	Met/Phe
198	Phe/Tyr
199	C8/C10
200	C14:1/C4
201	C14:1/C12:1
128	CIT Ammonia
187	Cit
188	Leu

225	OTHER
226	PKU Neopterin/Biopterin Analysis
227	AA Plasma Amino Acids
228	AA Urine Amino Acids
204	PKU
205	MSUD
206	ARGD
207	HCY
208	CITD
209	C4C5G
210	C5G
211	CPT1
212	CPT2
213	CUD
214	DERED
215	GA1
216	MCAD
217	HMG
218	LCHAD
219	MAL
220	MCD
221	PA
222	M/SCHAD
223	VLCAD
224	TYRD
229	AA Urine Organic Acids
230	AA Ammonia
231	FA Urine Organic Acids
232	FA Acylcarnitine Profile
233	FA Urine Acylglycine Profile
234	FA Free Carnitine
235	FA Total Carnitine
236	FA Creatinine Phosphokinase
237	OA Urine Organic Acids
238	OA Acylcarnitine Profile
239	OA Urine Acylglycine Profile
240	OA Free Carnitine
241	OA Total Carnitine
242	Hb Electrophoresis
243	IRT
244	DNA
245	Chloride Sweat Chloride
246	Weight of Sweat
247	Gene Sequencing
202	C14:1/C16
203	C16-OH/C16

Community Health Databases and Registries — Appendix H

- Medicaid Beneficiary & Provider Contact Tracking System
- Community Mental Health
- Children's Special Health Care Services
- Hearing Screening
- MI-Child Eligibility Data
- Lead Screening
- Michigan Care Improvement Registry
- Medicaid Fee-for-Service
- Medicaid Beneficiary Eligibility
- Medicaid Provider Eligibility
- Medicaid Managed Care
- Medicaid MI Choice Minimum Data Set
- Maternal & Infant Health Advocacy Services
- Newborn Metabolic Screening
- Nursing Home Minimum Data Set
- OASIS Minimum Data
- Substance Abuse
- Vital Record - Death/Birth
- Women Infants & Children (WIC)
- Reportable Communicable Diseases

Title: The Michigan BioTrust for Health
MDCH IRB Project Description
PIs: Bonita Taffe, Janice Bach, Carrie Langbo

Michigan Neonatal Biobank

Security Measures
March 2014

Security exists on several levels.

Building Security: The Tech Town building itself is locked down (entrance by swipe card only) from 6:00 pm to 8:00 am. There is drive-by security throughout the night. During the day, all visitors must register at the front desk and wear a "Visitor" name tag.

Biobank Security: There are three doors you must go through, in order to get to the blood samples: (1) the front door, (2) the lab door, and (3) the repository door.

1. Front door: To get in the front door you either use a key or you enter a code on a keypad. The door is locked at all times. Visitors either knock or ring the doorbell to be let in. It is a glass front door so we can easily see who is outside. The student interns have a code they use to enter the front door; the three managers have a completely different code. Only the managers have a key to the front door.

2. Lab door: During working hours, the door going from the office area into the lab is left open. The students work in the lab. During off-hours, the lab door is locked. Only the managers have a key to the lab door.

3. The repository door: The only entrance to the samples repository is through the lab. To open the repository door you either use a key or enter a code on a keypad. Only the managers have the code to enter the repository, and it is different from the code that is used to open the front door. No one can get into the repository without a manager. I have the only key.

    - ✓ The back door: There is a back door/delivery door into the lab. To get in the back door you either use a key or you enter a code on a keypad. Only the managers have a code and a key to the back door. The students cannot get in that way.

At the end of each work day any samples the students are working on in the lab, are put into the repository. No samples are left in the lab, and samples are not allowed in the office area.

The Tech Town building manager has - MUST have - a key to get into all areas of the Biobank in case of fire (he lets the fire dept in) or other emergency.

Michigan Department of Labor & Economic Growth

Filing Endorsement

This is to Certify that the ARTICLES OF INCORPORATION - NONPROFIT

for

MICHIGAN NEONATAL BIOBANK, INC.

ID NUMBER: 70407D

received by facsimile transmission on June 13, 2008 is hereby endorsed

Filed on June 13, 2008 by the Administrator.

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, in the City of Lansing, this 13TH day of June, 2008.

, Director

Bureau of Commercial Services

Sent by Facsimile Transmission 08165

BCS/CD-502 (Rev. 12/05)

MICHIGAN DEPARTMENT OF LABOR & ECONOMIC GROWTH
BUREAU OF COMMERCIAL SERVICES

Date Received	(FOR BUREAU USE ONLY)
	This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Name: Kendra Law Firm
Address: 143 Cady Centre #319
City: Northville, MI 48167 State: Zip Code:

EFFECTIVE DATE:

Document will be returned to the name and address you enter above. If left blank document will be mailed to the registered office.

ARTICLES OF INCORPORATION

For use by Domestic Nonprofit Corporations
(Please read information and instructions on the last page)

Pursuant to the provisions of Act 162, Public Acts of 1982, the undersigned corporation executes the following Articles:

ARTICLE I

The name of the corporation is: MICHIGAN NEONATAL BIOBANK, INC.

ARTICLE II

The purpose or purposes for which the corporation is organized are:

See attached Article II

ARTICLE III

1. The corporation is organized upon a Nonstock basis. (Stock or Nonstock)

2. If organized on a stock basis, the total number of shares which the corporation has authority to issue is _____. If the shares are, or are to be, divided into classes, the designation of each class, the number of shares in each class, and the relative rights, preferences and limitations of the shares of each class are as follows:

06/13/2008 12:46PM

ARTICLE III (cont.)

3. a. If organized on a nonstock basis, the description and value of its real property assets are: (if none, insert "none")

None

b. The description and value of its personal property assets are: (if none, insert "none")

None

c. The corporation is to be financed under the following general plan:

See attached Article 3c.

d. The corporation is organized on a Directorship (Membership or Directorship) basis.

ARTICLE IV

1. The address of the registered office is:

440 Burroughs (Street Address) Detroit (City), Michigan 48202 (ZIP Code)

2. The mailing address of the registered office, if different than above:

_____ (Street Address or P.O. Box) _____ (City), Michigan _____ (ZIP Code)

3. The name of the resident agent at the registered office is:

James F. Eliason

ARTICLE V

The name(s) and address(es) of the incorporator(s) is (are) as follows:

Name	Residence or Business Address
Gary A. Kendra	143 Cady Centre #319, Northville, MI 48167

06/13/2008 12:46PM

Use space below for additional Articles or for continuation of previous Articles. Please identify any Article being continued or added. Attach additional pages if needed.

See attached Articles VI and VII

I, (We), the incorporator(s) sign my (our) name(s) this 11th day of June, 2008.

Gary A. Kendra
GARY A. KENDRA

06/13/2008 12:46PM

ARTICLE II

The mission of the Corporation is to assist in increasing the capacity of the Michigan Department of Community health to prevent disease, prolong life and promote public health. The Corporation is organized for charitable, educational and public exempt purposes and to provide, on a non-profit basis, support to the Michigan Department of Community Health in their efforts to maintain their archive of newborn dried blood spots as a unique resource for research. The Corporation's activities will be conducted within a framework that protects the identity and ethical treatment of participants and promotes a public health research agenda.

Using the dried blood spots and their associated data as the foundation, the Corporation will sustain a biological materials repository that will:

1. Serve as a unique resource of materials and data for supporting research into the origins, prevention and cures for diseases of public health concern with emphasis on the public health concerns of Michigan's citizens.
2. Exist as a resource for researchers in the private sector as well as those in academic centers.
3. Provide an advantage to academic and commercial researchers because they will have access to an organized, searchable sample collection with associated clinical data that is much larger than any single institute could provide.
4. Provide a linkage between dried blood spots and other public health data resources.
5. Make the results of research available to the broad research community.
6. Accomplish the foregoing within a framework that protects the identity and ethical treatment of participants and promotes a public health research agenda.

The Corporation will pursue tax exempt status under Sections 501(c)(3) and 509(a)(1) of the Internal Revenue Code of 1986, as amended, (the "Code") or appropriate tax exempt provisions of the Code. The Corporation may acquire, own, lease, administer and dispose of real and personal property at below market rates for the accomplishment of the foregoing purposes. In addition, the Corporation may receive contributions, gifts, devises and bequests to hold, administer and utilize for the accomplishment of the foregoing purposes. The Corporation may engage in any lawful activities and exercise any and all powers as may be necessary, incidental or helpful to achievement of the foregoing purposes with all powers as may be determined to be appropriate and not forbidden by Sections 501(c)(3) and 509(a)(3) of the Code, with all powers conferred on non-profit corporation under the laws of the State of Michigan, except as otherwise restricted by these articles.

ARTICLE III
Section 3.c.

The Corporation will be financed under the following general funding plan:

The Corporation's activities will be funded through public funding, grants, awards and cash, equipment and in-kind donations and contributions from third parties as well as revenue from operations.

ARTICLE VI

A. Limitation of Director's Liability to Corporation. A volunteer member of the Board of Directors of Michigan Neonatal BioBank, Inc. shall not be personally liable to the Corporation or its members for monetary damages for a breach of the director's fiduciary duty except for the liability for any of the following:

1. A breach of the director's duty of loyalty to the corporation or its members;

2. Acts or omissions not in good faith or that involve intentional misconduct or knowing violation of law;

3. A violation of Section 551 (1) of the Michigan Nonprofit Corporation Act;

4 A transaction from the Director derived an improper personal benefit; or

5. An act or omission that is grossly negligent.

B. Assumption of Third Party Liability on Non-director Volunteers. The Corporation shall assume all liability to any person other the Corporation for all acts or omissions of a volunteer director occurring on or after the date of these Articles of Incorporation if all of the following are met:

1. The volunteer was acting or reasonably believed he or she was acting within the scope of his or her authority;

2. The volunteer acted in good faith; and

3. The volunteer's conduct did not amount to gross negligence, willful and wanton misconduct or an intentional tort.

ARTICLE VII

Upon dissolution, the Corporation shall only distribute its net assets after payment of debts to organizations qualifying for tax-exempt status under Internal Revenue Code § 501(c)(3) and qualified organizations allowed to receive distributions from non-profit corporations.

MNB
michigan neonatal biobank

440 Burroughs
Suite 320
Detroit MI 48202

Tel: 313.483.0386

The Michigan Neonatal Biobank together with the Michigan Department of Community Health and Michigan's three major research universities is seeking funds to continue developing the Michigan Neonatal Biobank - a unique resource of biological materials for a wide range of research areas including the basis for genetic diseases, genetic diversity, surveillance of infectious diseases, chronic disease intervention and outcome, monitoring environmental exposures, and study of biomarkers.

Project Summary

An opportunity exists to develop an important public health resource for research into the origin and cure for children's health problems.

For over 45 years a blood sample has been collected from newborns in the state of Michigan and screened for a variety of rare disorders, through the Michigan Department of Community Health's Newborn Screening Program. The Michigan Department of Community Health has retained the unused portion of these blood samples – residual dried blood spots on special filter paper - for the past 27 years. These four million archived blood spot samples have great value for public health and medical research including research into the causes and cures for childhood and adult onset disorders.

The Michigan Neonatal Biobank was developed to inventory, store and manage the samples and to make them readily available for research. This proposal is submitted to request funds to support the Biobank's inventory work and operations while it grows into a self-sufficient organization.

The Michigan Neonatal Biobank

The Michigan Neonatal Biobank ("the Biobank") is a rare archive of residual neonatal dried blood samples that represent nearly every child born in Michigan since 1985. The purpose of the Biobank is to formalize a system that will support the use of residual dried blood spots for public health, genomic and other medical and health research.

The Biobank is housed in Wayne State University's Tech Town - a developing Center of Excellence in Biobanking and the State's largest single site biobanking facility - with onsite expertise in the storage, management, inventory and shipping of biological samples. Tech Town built offices, a laboratory, temperature and humidity controlled storage space and freezer capacity for the Biobank. A state of the art inventory system tracks the samples from receipt to distribution.

The Biobank was developed as a non-profit corporation in 2008 through a collaboration of the Michigan Department of Community Health, Michigan's research universities, and private industry. Currently collaborators from Wayne State University, Michigan State University, the University of Michigan and the Van Andel Institute provide biobanking and community engagement expertise to support the activities of the Biobank.

The Biobank is innovative because it makes available to public health researchers for the first time more than 27 years of well documented blood samples from a cohort of millions of Michigan newborns. Across the United States, only Michigan and California have successfully developed biobanks to make their dried blood spots available for public health and medical research. Most States retain their samples for five years or less, and only a few States have begun taking steps to develop banks for their own samples.

Research and the Michigan Neonatal Biobank

The increasing efficiency and sophistication of techniques in genetics, proteomics, mass spectrometry and other fields has made it possible to use archived biological samples for many different research purposes, unrelated to the circumstances that led to their collection. At the same time, efforts to identify genetic markers - predictors of disease - and to understand how these are affected by other genetic components, environmental, social or medical conditions, or other factors require large numbers of cases to generate meaningful results. This requires the combination of specimens – and sometimes the clinical data derived from them — from many different sources. Such research programs on collections of representative samples promise very significant advances in better understanding the frequency, distribution, and causes of a variety of illnesses, providing the scientific foundations for new diagnostic, preventive, and therapeutic approaches.

Biological samples that can meet these needs exist in the Michigan Neonatal Biobank. Over 160 biomarkers and compounds have been measured in dried blood spots, ranging from genetic material to proteins, infectious agents such as viruses, and harmful metals such as lead. Residual dried blood spots are therefore also a potential source of specimens for a wide variety of epidemiological investigations, such as the frequency of genetic variations in the population or how genes interact with the environment. In fact, dried blood spots have already been used to investigate issues such as exposure to environmental pollutants, genetic factors associated with susceptibility to infection, and childhood cancer. Because more than 99% of Michigan infants are screened at birth, dried blood spots represent an entire birth cohort and would allow population-based studies that overcome shortcomings present in other research designs such as small sample size.

The Biobank's samples have also been used for studies of spinal muscular atrophy, Sudden Unexplained Infant Death Syndrome, congenital heart defects, autism, cerebral palsy, and fetal alcohol syndrome – some of the most intractable childhood disorders in the nation – as well as to develop a newborn screening test for Severe Combined Immune Deficiency (SCID). The samples enable researchers to do studies that were not possible before, to solve complex health issues using human rather than animal samples.

The research value of the samples increases greatly when the Michigan Department of Community Health links them to information in the State's public health databases. The Department of Community Health functions as an Honest Broker to match the samples with their associated clinical data while removing identifying information about the donor. By matching the blood samples against the birth defects registry, the cancer registry, live births, death records or the disease surveillance system, for example, a researcher can study a newborn blood sample that is associated with a known health outcome.

The Biobank offers a unique solution to the problems associated with locating, identifying, preparing, storing and mining high quality biological samples for research.

Privacy

In the year 2000 Michigan's Public Health Act was amended to allow residual neonatal dried blood samples to be used for medical research as long as it is conducted in a manner that preserves the confidentiality of the subjects and protects human subjects from research risks under title 45 of the Code of Federal Regulations.

All of the Biobank samples are de-identified and assigned a barcode number by the Department of Community Health before they are sent to the Biobank for storage. Unless the parent has given written consent to provide identifying information the samples will undergo a second de-identification process, receiving a different barcode number that is assigned by the Biobank to any sample that is provided for research. In this way the samples are "double de-identified" before a researcher receives them.

The Need for Support

The Biobank has taken the first steps toward self-sufficiency by putting two million samples into inventory and charging a fee to researchers to use the samples. What is needed now are the funds to prepare and move the remaining two million samples into the Biobank, and to inform hundreds of potential users across the nation that the samples are available for approved research.

Inventory

Biobanking is a labor intensive industry, and establishing a new Biobank requires months and even years of work to put samples into inventory. Historically Michigan's residual neonatal dried blood samples have been stored in a State warehouse in Lansing, Michigan at ambient temperature. About half of the archive's four million samples are still there. Sample by sample, the blood spot cards are being prepared and transferred from the Lansing warehouse to the Biobank in Detroit where they are preserved in temperature and humidity controlled space and archival quality storage containers. Card by card, the samples are added to the Biobank's state of the art inventory system to make them readily available for approved research.

Although work to transfer the samples from the warehouse to the Biobank is already underway using seed money from Michigan's research institutions and a foundation grant, additional funds are needed to move the remaining two million samples to the Biobank. The Biobank hires 10-12 part time students each semester to work in Lansing and Detroit to prepare the samples and add them to inventory.

User Fees

In 2010 the Biobank's business plan projected that it would become self-sufficient in five years. To achieve this goal the Biobank charges a User Fee to cover the costs to inventory, store and manage the blood samples. Last year the revenue from User Fees supported about 20% of the Biobank's expenses.

To increase revenue to 100% of costs the Biobank needs to make researchers across the country aware of the existence and availability of the samples. Funds from this grant will be used to implement informational and promotional programs that target researchers from every major academic and private research institution in the country.

Funds Needed for this Project

The overall funding needed for this project is $184,000 over two years. The funds will be used to support part time students and their supervisor to inventory the samples, and to implement a promotional program to draw more users to the Biobank.

We are asking for $5,000 from the Build A Bear Workshop Foundation, to be combined with other funding requests to reach the total of $184,000.

Budget

The overall funding needed for this project is projected to be $184,000 total for 2 years. These funds will be used primarily for supporting positions and for implementing a promotional program to draw more researchers to the samples.

Budget

		Year 1	Year 2
Staff	Biobank Assistants	30,600.00	30,600.00
	Repository Manager	36,855.00	37,960.65
	Fringes @ 10%	3,685.50	3,796.07
		71,140.50	**72,356.72**
Proposed Promotional Program	Major Conference Exhibit	5,300.00	
	Community Research Meeting	2,000.00	
	Website	2,200.00	1,400.00
	Meetings Around Michigan		2,000.00
	Conference for Researchers	6,400.00	
	Webinars	500.00	250.00
	Researcher Presentations	2,500.00	1,250.00
	Videos	2,000.00	1,000.00
	Printing	1,200.00	600.00
	Mailing lists	800.00	
	Shipping	400.00	200.00
		23,300.00	**6,700.00**
		94,440.50	79,056.72
	Indirect Costs @ 6%	5,666.43	4,743.40
	Yearly Totals	**100,106.93**	**83,800.12**
	Two Year Total		**$ 184,000.00**

MNB
michigan neonatal biobank

An opportunity exists to develop an important public health resource for research into the origins and cures for childhood [illegible]

For over 45 years a blood sample has been collected from newborns in the state of Michigan and screened for a variety of rare disorders through the State's Newborn Screening Program. The Michigan Department of Community Health has stored the unused portion of these blood samples – dried blood spots on special filter cards – in a Lansing warehouse for the past 28 years. These four million archived samples have great value for public health and medical research including research into the causes and cures for childhood and some adult onset disorders.

The Michigan Neonatal Biobank was developed as a non-profit organization in 2008 with responsibility to formalize a system that will support the use of these residual dried blood samples for public health, genomic and other medical and health research. Since late 2008 half of the State's four million blood samples have been transferred from storage in the Lansing warehouse to the Biobank where they are imaged, inventoried, stored in a climate-controlled repository, and made available for approved research.

The Biobank's samples have already been used for more than two dozen research studies, including:

- *Disease-specific research that looks for the causes and cures for autism; cerebral palsy; congenital heart defects; ADHD; neuroblastoma; SIDS; leukemia; and hearing disorders.*
- *Environmental exposure studies that look at mercury, tobacco, lead and alcohol exposure in specific populations.*
- *Developing new or improved newborn screening tests for cystic fibrosis, spinal muscular atrophy, muscular dystrophy, galactosemia, and severe combined immunodeficiency disorder (SCID).*

As more samples are transferred into the Biobank and more researchers hear about the availability of these samples, many more such studies will be possible.

The Biobank is innovative because it makes available to public health researchers for the first time more than 28 years of well documented blood samples from a cohort of millions of Michigan newborns. Across the United States, only Michigan and California have successfully developed biobanks to make their dried blood spots available for public health and medical research, and Michigan is viewed as the national leader in setting policies for maintaining the privacy of donors, securing consent for research, and storing and managing the samples.

Funds are needed to support sample preparation, transfer and inventory work; for frozen storage; and to implement a nationwide promotional program to let more researchers know the samples exist.

The Center of Excellence will address the growing need for high quality, well characterized biospecimens for human health and medical research by providing links and core services to five existing biobanks. Together these repositories will create a new industry in Detroit.

The new biobanking industry will use existing resources that are currently underutilized or Ignored. It particular the center of excellence will be housed in buildings which are both highly suitable and immediately available. Millions of biological samples that have been collected in the state over many years will be catalogued and made available for research. New approaches to extracting useful information will be applied to make these samples and data extremely valuable.

A biobanking center of excellence will drive both research acitivity and the development of new life science companies based in the area.

The plan to create a Center of Biobanking Excellence is part of a campus wide commitment at Wayne State University to focus on applied research that will result in the creation of new entrepreunerial opportunities and new jobs.

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The Need for Biospecimens

Biobanking addresses a basic research need that cuts across the entire life sciences industry. Just as a builder needs raw materials, researchers need human biospecimens representative of a spectrum of diseases for medical research, drug discovery and developing medical devices.

The National Biospecimen Network reports that recent advances in the fields of genomics and proteomics are providing new ways to derive more valuable data for research from human biospecimens. Advances in informatics can now support the compilation and analysis of genetic and clinical data on an unprecedented scale. The application of these new technologies to query biospecimens represents unparalleled opportunities for the discovery and development of new diagnostic, therapeutic and preventive agents.

The challenge for researchers lies in finding sufficient numbers of high quality biospecimens with their associated clinical data to meet their increasing demand. In particular biospecimens from rare diseases are often hard to obtain in numbers sufficient for definitive research.

Although there are several biobanks within the State of Michigan that provide some samples for research, they are scattered in a variety of institutes and few are available to researchers outside the home institute. A centralized repository is a way to address the gap in research resources, both for Michigan and the nation.

In its report the National Biospecimen Network concluded that the time has come to develop centralized and accessible repositories of biospecimens that can support human health research. These case be considered "cumulative knowledge hubs" that provide critical resources for future research. The Center of Biobanking Excellence at Tech Town is well positioned to meet that need.

A Wayne State Solution

One of the long-term objectives of Wayne State University has been to create a world recognized center of excellence in human tissue biobanking and biobanking services at Tech Town. Such a center will enhance the reputation of Wayne State University and bring research dollars and research contracts into Detroit.

Wayne State University has a unique opportunity to develop a biobanking industry because Tech Town is already home to three biobanks – the Michigan Heritage Biobank, Asterand, and the Perinatology Research Branch of the National Institutes of Health - and two more will move in later this year. The opportunity exists to create a major biobanking center at Tech Town that will act as a magnet to draw the world of biomedical research to Detroit.

The proposed Center of Excellence for Biobanking at Tech Town (CEBATT) will implement a new approach to providing biospecimens for research by developing central services to support multiple biobanks. This scalable approach will accommodate additional repositories while ensuring that each retains ownership and control of its own samples and data.

CEBATT will also address the increasing demand for high quality biospecimens for research. Such samples already exist in Michigan but to date they have not been readily available to researchers. The proposed Center of Excellence for Biobanking at Tech Town will take a resource that has not been widely used and turn it into something of great value to the state of Michigan.

Wayne State University proposes to address the need for a centralized and accessible repository of biospecimens for research by establishing the Center of Excellence for Biobanking at Tech Town (CEBATT). A key step in the strategy to develop CEBATT is to locate it in a facility that has the resources to build biobanks into valuable resources for research.

Infrastructure

CEBATT will be located in Detroit at the Tech One building in Wayne State University's Tech Town - one of Michigan's designated Smart Zone Development areas.

Tech One is well suited for biobanking. The building was originally used for auto design work, and cars were moved through the building from floor to floor as the design progressed. Today it is home to nearly 175 biospecimen freezers and has the load capability to support hundreds more.

The Tech One building is equipped with significant backup generator capacity to ensure that power is always available to maintain room temperature and freezer operation, and the building has a multi-level security system to ensure the protection of biospecimens and data.

The building is organized not just for storage of biological samples but for shipping and receiving as well. Samples are received and shipped all over the world on a daily basis from two large biorepositories already located in Tech One – Asterand, one of the world's largest commercial biobanks, and the Perinatology Research Branch of the National Institute of Child Health and Human Development.

Access to Services

There are a number of activities that can enhance the research value of samples from biobanks, such as quality control services to validate the quality of the samples. Many of the research studies also require molecules from the samples to be analyzed. For example, DNA may need to be amplified or analyzed for genotyping; RNA expression to be analyzed on gene arrays or by quantitative PCR; or proteins to be analyzed by a variety of methods. Purification and analysis of these molecules can be performed by a core lab since it is not cost effective for individual biobanks to employ scientists and purchase specialized equipment to perform these tasks. These key biobanking services are usually purchased from outside sources, and the samples have to be shipped to and from the service provider.

The Tech Town location affords CEBATT's biobanks ready access to all of these services through Wayne State University and the laboratories of the Henry Ford Health System – both located just two blocks away from Tech One. In addition to DNA amplification, genomic and proteomic services, the biobanks have access to bioinformatics services at Wayne State's Bioinformatics Laboratory.

The presence of these core services can be a powerful feature to attract other biobanks to establish themselves in Detroit.

Biobanking is an emerging industry with great potential for job creation. It is a labor intensive undertaking that involves cataloguing samples and data, shipping and receiving samples, developing and managing large databases – skills that are well represented in Detroit.

As an example during the first six years of its existence one new job was created every 30 days at Asterand. The company became public in 2006 and continues to grow.

The existence of CEBATT will also add strength to Tech Town's Fall 2008 bid to house the national biorepository for the NIH National Children's Study, and the early 2009 bid to provide biobanking services to the repository of the Armed Forces Institute of Pathology. Successful bids will create more jobs in Detroit's new biobanking industry.

To ensure that the region will be able to produce individuals in the future who are trained in this emerging industry CEBATT will establish a biobanking internship program in

collaboration with the Department of Biological Sciences at Wayne State University. Student interns will rotate through CEBATT as part of their training in Biotechnology.

Impact on Wayne State University

Wayne State's association with the Center of Excellence will enhance the reputation of the University and Detroit as major players in medical research, and the broad array of readily available biospecimens will help Wayne State attract researchers and research contracts. Already the efforts at biobanking at Wayne State have attracted national and international attention. The nationally syndicated PBS Nightly Business Report featured biobanking at Techtown in 2007. In Europe the same biobanking advances were featured in a documentary film called Safer medicines that was premiered at the British Houses of Parliament.

A Center of Excellence in Biobanking can help create centers of excellence in other areas that rely heavily on biospecimens for research such as cardiovascular, inflammatory and musculo-skeletal disorders. Undoubtedly the availability of samples will increase grant funding opportunities for investigators in these areas.

The Center of Excellence in Biobanking could bring a significant amount of work to Wayne State University's Center for Genomics Technologies, a Core component of the Core Technology Alliance on Michigan, as well as the Bioinformatics Laboratory at Wayne State.

Impact on Detroit's Economy

Fifteen years ago Governor Engler envisioned a Michigan that led the world in the life sciences industry. That vision never became a reality and now, with the closing of Pfizer, Michigan's economy lost its last major foothold in the life sciences. A biobanking industry in Detroit will help Michigan recapture its position and will provide a foundation for new life science industries in the State.

Biobanking is an emerging industry with great potential for job creation. It is a labor intensive undertaking that involves cataloguing samples and data, shipping and receiving samples, developing and managing large databases – skills that are well represented in Detroit. Wayne State's internship program in Biotechnology will ensure that the region can produce individuals who are trained in the industry.

The New Economy Initiative can have an impact on Detroit's economy as early as 2009 by supporting this proposal. Wayne State, Tech Town and all five of the Center's biobanks are ready to begin developing coordinated operations as soon as funding is awarded.

The Collaborators

The Michigan Neonatal Biobank ("Biobank") was conceived by the Michigan Department of Community Health (MDCH) and implemented by consortium of MDCH, Wayne State, U of Michigan, Michigan State and the Van Andel Institute.

Each of the collaborating organizations contributes knowledge to the Biobank at no cost, cash or in-kind support, as follows:

- WSU provides management services, and has contributed $233,000 cash plus $240,000 for my salary since 2008;
- UM provides assistance with Community Engagement activities, and contributed $150,000;
- MSU provides expertise and assistance with data linkages, and contributed $4,000;
- Van Andel provides their propriety inventory software, valued at $180,000 over four years.

Although not an ongoing collaborator, Tech Town built the space for the Biobank and provided cash support for the first year. Total support is estimated at $1 million.

Why Create a Bank of Newborn Screening Samples

Biobanking addresses a basic research need that cuts across the entire life sciences industry. The challenge for researchers lies in finding sufficient numbers of high quality biospecimens with their associated clinical data to meet their increasing demand. In particular biospecimens from rare diseases are often hard to obtain in numbers sufficient for definitive research.

The following is taken from a 2007 white paper from the Dept of Community Health.

"Recognizing that newborn screening specimens represent a vital resource for the study and treatment of disease, the Michigan Commission on Genetic Privacy and Progress in its 1999 final report recommended that newborn screening samples be retained indefinitely because of their present and potential value. In the year 2000, the Michigan legislature amended the public health code to allow use of leftover DBS, "as long as the medical research is conducted in a manner that preserves the confidentiality of the test subjects and is consistent to protect human subjects from research risks." MDCH, in collaboration with others, has taken steps to identify the utility of residual dried blood spots and infrastructure needed to support more widespread use of DBS for public health and medical research in the form of a dried blood spot archive, or Neonatal BioTrust."

"Currently, DBS are stored in a warehouse at ambient temperature, which limits their utility. To increase the value of DBS for genomic and environmental research, new storage and retrieval methods will need to be employed. The utility of the BioTrust could be further increased with linkages to other public health databases, such as birth and death records, the birth defects registry, or the cancer registry."

"The Department of Community Health, together with many partners and stakeholders, recognizes great value in expanding the use of DBS for public health and medical research."

Why Michigan

Michigan is one of the few states that store their samples indefinitely **and** make them available for research. California has also created a biobank but until recently their samples were not widely available to researchers outside their state. Texan and Minnesota each attempted to create a biobank of their residual Newborn Screening samples but both were stopped by citizen lawsuits. [Ed Goldman, who will be at the meeting, knows details; you won't need to know them.]

Why Tech Town

Tech Town is a Center of Excellence in Biobanking. It is home to six biobanks with a concentration of expertise in storing and managing every type of human biological sample. The six biobanks: Asterand, PRB, Michigan Neonatal Biobank, the Stem Cell Commercialization Center, the Michigan Heritage Biobank, and the smaller banks of the Henry Ford Health System.

Tech Town is well suited for biobanking. The building was originally used for auto design work, and cars were moved through the building from floor to floor as the design progressed. Today it is home to more than 200 biospecimen freezers and has the load capability to support hundreds more.

The Tech Town is equipped with significant backup generator capacity to ensure that power is always available to maintain room temperature and freezer operation, and the building has a multi-level security system to ensure the protection of biospecimens and data.

Research Using Samples from the Biobank

Consent: The MDCH's IRB gave a waiver of consent and HIPAA to allow pre-May 2010 samples to be used for research. Beginning in May 2010 consent to store the samples and make them available for approved research is taken at the hospital at birth. For all samples, consent is required in appropriate circumstances.

Research: The samples have been used for more than two dozen research projects, 22 of them since the Biobank opened in 2008. We have provided more than 10,000 samples to researchers. The research focus areas include disease-specific studies; measurement of toxins; and assay development. Examples:

Nigel Paneth, MSU: NIgel will talk about his early, interesting findings in cerebral palsy;

John Hannigan, WSU: Has an early, interesting finding that points to a possible marker for FASD.

Doug Ruden, WSU: Is conducting the first intergenerational study that uses our samples. His study uses newborn samples from consented mothers who are age 28 or younger, paired with the newborn samples from their babies, to look at the reversibility of lead-associated gene expression.

The URC invested $300,000 for research that use the Biobank's samples to study environmental exposures and their effect on health outcomes. Funded studies look at the gene-environment interplay and its outcome on hearing, executive functioning, and adolescent behaviors.

Biobank Development and MDCH Funding

July 2008:	Dept of Management and Budget (on behalf of Dept of Community Health) put out a bid for housing the Biobank.
Aug 2008:	Jean Chabut emailed that no one submitted a bid, so Community Health was free to move forward with Tech Town.
Sep 2008:	In an email from Jean she asks that we allocate space inside the Biobank for a freezer that will be used in the future.
Oct 2009 with to date:	MDCH provides support for the Biobank of $100,000 per year, through a contract WSU.
Jul 2012:	Email from Jean saying that it looks like she as a commitment from DCH to provide $360,000 for the freezer.
Sep 2012:	Email from Jean says that due to the change in Director the money is no longer available; said "we're going to have to go with the $40k for FY 2013".

Board of Directors

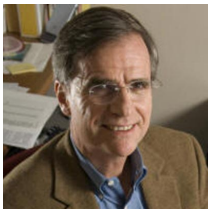
Antonio Yancey
Director
Michigan Neonatal Biobank
Detroit, Michigan

Scott Jewell, Ph.D.
Van Andel Institute
Grand Rapids, Michigan

Sonia Hassan, M.D.
Wayne State University
Detroit, Michigan

Ed Goldman
University of Michigan
Ann Arbor, Michigan

Sandip Shah
Michigan Department of Community Health
Lansing, Michigan



Nigel Paneth, Ph.D.
Michigan State University
Lansing, Michigan

Disorders List

The Newborn Screening Laboratory screens all Michigan Infants for more than fifty

Amino Acid Disorders

1. Argininemia (ARG)
2. Argininosuccinic acidemia (ASA)
3. Citrullinemia Type I (CIT-I)
4. Citrullinemia Type II (CIT-II)
5. Homocystinuria (HCY)
6. Hypermethioninemia (MET)
7. Maple syrup urine disease (MSUD)
8. Phenylketonuria (PKU)
9. Benign hyperphenylalaninemia defect (H-PHE)
10. Biopterin cofactor biosysnthesis defect (BIOPT-BS)
11. Biopterin cofactor regeneration defect (BIOPT-REG)
12. Tyrosinemia Type I (TYR-1)
13. Tyrosinemia Type II (TYR-II)
14. Tyrosinemia Type III (TYR-III)

Fatty Acid Oxidation Disorders

15. Carnitine acylcarnitine translocase deficiency (CACT)
16. Carnitine palmitoyltransferase I deficiency (CPT-1A)
17. Carnitine palmitoyltransferase II deficiency (CPT-II)
18. Carnitine uptake defect (CUD)
19. Dienoyl-CoA reductase deficiency (DERED)
20. Glutaric acidemia type II (GA-2)
21. Long-chain L-3-hydroxy acyl-CoA dehydrogenase deficiency (LCHAD)
22. Medium/short-chain L-3-hydroxy acyl-CoA dehydrogenase deficiency (M/SCHAD)
23. Medium-chain acyl-CoA dehydrogenase deficiency (MCAD)
24. Medium-chain ketoacyl-CoA thiolase deficiency (MCKAT)
25. Trifunctional protein deficiency (TFP)
26. Very long-chain acyl-CoA dehydrogenase deficiency (VLCAD)

Organic Acid Disorders

27. 2-Methyl-3-hydroxy butyric aciduria (2M3HBA)
28. 2-Methylbutyryrl-CoA dehydrogenase deficiency (2MBG)
29. 3-hydroxy 3-methylglutaric glutaric aciduria (HMG)
30. 3-Methylcrotonyl-CoA carboxylase deficiency (3-MCC)
31. 3-Methylglutaconic aciduria (3MGA)
32. Beta-ketothiolase deficiency (BKT)
33. Glutaric acidemia type I (GA1)
34. Isovaleric acidemia (IVA)
35. Malonic Acidemia (MAL)
36. Methylmalonic acidemia cobalamin disorders (Cbl A,B)
37. Methylmalonic aciduria with homocystinuria (Cbl C,D)
38. Methylmalonic acidemia methylmalonyl-CoA mutase (MUT)
39. Multiple carboxylase deficiency (MCD)
40. Propionic acidemia (PROP)

Hemoglobinopathies

41. S/Beta thalassemia
42. S/C disease
43. Sickle cell anemia
44. Variant hemoglobinopathies
45. Hemoglobin H disease

Endocrine Disorders

46. Congenital adrenal hyperplasia (CAH)
47. Congenital hypothyroidism (CH)

Lysosomal Storage Disorders

48. Glycogen Storage Disease Type II (Pompe)
49. Mucopolysaccharidosis Type I (MPS I)

Other Disorders

50. Biotinidase deficiency (BIOT)
51. Galactosemia (GALT)
52. Cystic fibrosis (CF)
53. Severe combined immunodeficiency (SCID)
54. T-cell related lymphocyte deficiencies
55. X-linked Adrenoleukodystrophy (X-ALD)
56. Spinal muscular atrophy (SMA)
57. Hearing
58. Critical Congenital Heart Disease (CCHD)

Disorders Coming Soon

This condition has been approved for addition to Michigan's panel but implementation is in progress and screening has not yet begun.

•Guanidinoacetate methyltransferase (GAMT) deficiency

Updated March 2020

EXHIBIT
K
OUTSIDE LEGAL COUNSEL PLC
www.olcplc.com

STATE OF MICHIGAN 12TH JUDICIAL DISTRICT 4TH JUDICIAL CIRCUIT & COUNTY PROBATE	SUBPOENA Order to Appear and/or Produce	CASE NO. [redacted]

Plaintiff(s) Petitioner(s)		In The Matter Of:
X People of the State of Michigan	V	[redacted]
__ Civil __ X Criminal		Charge: Open Murder
__ Probate In the matter of		

In the Name of the People of the State of Michigan. To: [redacted]

If you require special accommodations to use the court because of disabilities, please contact the court immediately to make arrangements.

YOU ARE ORDERED:

__1. To appear personally at the time and place stated below: You may be required to appear from time to time and day to day until excused.

__ The court address above __ Other:

Day		

__2. Testify at trial / examination / hearing / Jackson County Courthouse, 312 S. Jackson Street, 2nd Floor, Jackson, MI.

X 3. Produce and deliver copies of the following items: The PKU Card of [redacted] born at [redacted] on [redacted] to mother [redacted] Please deliver to [redacted] Police Department before [redacted] can be contacted by phone number [redacted]

__4. Testify as to your assets, and bring with you the items listed in line 3 above.
__5. Testify at deposition.
__6. MCL 600.6104(2), 600.6116, or 600.6119 prohibitions against transferring or disposing of property attached.
__7. Other:

__8.

Person requesting subpoena	Telephone no.
[redacted]	[redacted]
Address: [redacted]	
City State Zip: [redacted]	

SEAL OF THE MICHIGAN SUPREME COURT · LANSING ·

FAILURE TO OBEY THE COMMANDS OF THE SUBPOENA OR APPEAR AT THE STATED TIME AND PLACE MAY SUBJECT YOU TO PENALTY FOR CONTEMPT OF COURT

[redacted]
Date

Circuit/District Court Judge/Magistrate

Court use only
__ Served __ Not Served

MC 11 (6/99) SUBPOENA, Order to Appear and/or Produce

MCL 600.1455, 600.1701, 600.6110; 600.6119;
MSA 27A.1455, 27A.1701, 27A.6110, 27A.6119, MCR 2.506

STATE OF MICHIGAN 12TH JUDICIAL DISTRICT 4TH JUDICIAL CIRCUIT & COUNTY PROBATE	SUBPOENA Order to Appear and/or Produce	CASE NO. [redacted]

Plaintiff(s) Petitioner(s)		In The Matter Of:
X People of the State of Michigan	V	[redacted]
__ Civil __ X Criminal		Charge: Open Murder
__ Probate In the matter of		

In the Name of the People of the State of Michigan. To: **Michigan Department of Community Mental Health**
State Public Health Lab, Lansing, Michigan
C/O Harry Hawkins

If you require special accommodations to use the court because of disabilities, please contact the court immediately to make arrangements.

YOU ARE ORDERED:

__1. To appear personally at the time and place stated below: You may be required to appear from time to time and day to day until excused.

__The court address above __Other:

Day		

__2. Testify at trial / examination / hearing / Jackson County Courthouse, 312 S. Jackson Street, 2nd Floor, Jackson, MI.

X 3. Produce and deliver copies of the following items: **The PKU Card of [redacted] on [redacted] Please deliver to Detective [redacted] Police Department before [redacted] can be contacted by phone number [redacted]**

__4. Testify as to your assets, and bring with you the items listed in line 3 above.
__5. Testify at deposition.
__6. MCL 600.6104(2), 600.6116, or 600.6119 prohibitions against transferring or disposing of property attached.
__7. Other:

__8.

Person requesting subpoena	Telephone no.
[redacted]	[redacted]
Address: [redacted]	
City: [redacted] State Zip	

SEAL OF THE MICHIGAN SUPREME COURT · JUSTITIAE REGNI FUNDAMENTUM · LANSING ·

FAILURE TO OBEY THE COMMANDS OF THE SUBPOENA OR APPEAR AT THE STATED TIME AND PLACE MAY SUBJECT YOU TO PENALTY FOR CONTEMPT OF COURT

[redacted] [signature]

Date Circuit/District Court Judge/Magistrate

Court use only
__ Served __ Not Served

MC 11 (6/99) SUBPOENA, Order to Appear and/or Produce

MCL 600.1455, 600.1701, 600.6110; 600.6119;
MSA 27A.1455, 27A.1701, 27A.6110, 27A.6119, MCR 2.506

[redacted] 08:08 P.01

RECEIVED

MDCH LEGAL

FEDERAL BUREAU OF INVESTIGATION

FACSIMILE COVER SHEET

[redacted]

PRECEDENCE

(•) Immediate ( ) Priority ( ) Routine

CLASSIFICATION

( ) Top Secret ( ) Secret (•) Confidential ( ) Sensitive ( ) Unclassified

TO

Name of Office:	Facsimile Number:	Date:
Michigan Department of Community Health	517-241-1200	[redacted]
Attn:	**Room:**	**Telephone Number:**
Carrie Waggoner		517-373-2049

FROM

Name of Office:		Number of Pages: (including cover)
[redacted]		3
Originator's Name:	**Originator's Telephone Number:**	**Originator's Facsimile Number:**
[redacted]	[redacted]	[redacted]

Approved: [redacted]

DETAILS

Subject:

Please find attached to this fax cover sheet a Federal Grand Jury Subpoena for Residual neonatal dried blood spot cards.

Special Handling Instructions:

Please contact sender to arrange for pick-up or delivery of these samples.

Brief Description of Communication Faxed:

WARNING

Information attached to the cover sheet is U.S. Government Property. If you are not the intended recipient of this information disclosure, reproduction, distribution, or use of this information is prohibited (18.USC, § 641). Please notify the originator or local FBI Office immediately to arrange for proper disposition.

[redacted] 08:08 P.02

AO 110 (Rev 06/09) Subpoena to Testify Before a Grand Jury

UNITED STATES DISTRICT COURT

for the

Eastern District of Michigan

SUBPOENA TO TESTIFY BEFORE A GRAND JURY

To: Michigan Department of Community Health
c/o Carrie Waggoner

Grand Jury No. [redacted]

YOU ARE COMMANDED to appear in this United States district court at the time, date, and place shown below to testify before the court's grand jury. When you arrive, you must remain at the court until the judge or a court officer allows you to leave.

Place: Theodore Levin U.S. Courthouse 231 W. Lafayette Detroit, Michigan 48226	Date and Time: [redacted]

You must also bring with you the following documents, electronically stored information, or objects *(blank if not applicable)*:

Residual neonatal dried blood spot cards for:

[redacted]

DAVID J. WEAVER, CLERK OF COURT

Date: [redacted]

Signature of Clerk or Deputy Clerk

The name, address, e-mail, and telephone number of the United States attorney, or assistant United States attorney, who requests this subpoena, are:

[redacted]

TOTAL P.02

[redacted] [redacted] # 17 2

Page 1
State of Michigan

SS

[redacted]

SEARCH WARRANT

To the Sheriff or any peace officer of said county: [redacted] the affiant, having subscribed and sworn to an affidavit for a Search Warrant, and I having under oath examined the affiant, am satisfied that probable cause would exist:

THEREFORE, IN THE NAME OF THE PEOPLE OF THE STATE OF MICHIGAN, I COMMAND THAT YOU SEARCH THE FOLLOWING DESCRIBED PLACE:

Michigan Department of Health & Human Services 3350 N MLK Blvd., P.O. Box 30689, Lansing Michigan 48906. The records department for Newborn Screening.

And to there seize, tabulate and make return according to the law the following property or things.

PKU Card (Blood Card) for [redacted] This card will only be used for victim identification.

SUBSCRIBED AND SWORN TO BEFORE ME AND ISSUED UNDER MY HAND THIS [redacted] DAY OF [redacted] IN THE YEAR [redacted]

[redacted]

[redacted]

print

JUDGE/MAGISTRATE [redacted]

[redacted]

Date Time

[redacted] [redacted] # 21 2

State of Michigan

SS

[redacted]

AFFIDAVIT FOR SEARCH WARRANT

The following facts are sworn to by affiant in support of the issuance of this warrant:

1. The affiant is a member of the [redacted] Department for the past fifteen years and is currently assigned to the [redacted] Missing person Unit.

2. Affiant, along with members of the Homicide Unit (Special Assignment Squad), are investigating the a double fatal fire of [redacted] and an unknown minor child believed to be [redacted] This incident is documented on [redacted]

3. On [redacted] at approximately [redacted] members of the [redacted] Fire Department responded to [redacted] and found the house engulfed in flames. Once the fire was extinguished two bodies were discovered [redacted] Police [redacted] manned by Police Officers [redacted] and [redacted] responded to the scene and observed an adult and minor child [redacted] non-responsive. The crew held the scene and made notifications.

4. [redacted] was identified through morgue photo however the minor child sustained severe burns to the facial area and has not been positively identified.

5. [redacted] had been the subject of an amber alert prior to the victims being discovered.

SWORN BY ME THIS 4TH DAY OF FEBRUARY IN THE YEAR [redacted]

[redacted]
AFFIANT
Sergeant [redacted]
[redacted] Police Department
[redacted]
Sign
[redacted]
Print
ASSISTANT PROSECUTING ATTORNEY
[redacted] Michigan

Newborn Screening and BioTrust Frequently Asked Questions

MICHIGAN Newborn Screening

Michigan BioTrust for Health
research for the future

Why is Newborn Screening (NBS) important to Public Health?

Each year around four million babies are born in the United States. Some of these babies are born with conditions which, left untreated, can rapidly result in death or permanent disability. NBS can catch some of these disorders in time for them to be effectively treated. NBS is so beneficial to public health that all 50 states, Washington D.C., and Puerto Rico have implemented screening programs.

Nationwide, NBS saves or improves the lives of about 12,000 babies annually. Every year, Michigan's NBS program, administered by the Michigan Department of Health and Human Services (MDHHS), identifies approximately 250-280 babies afflicted by one of the 54 blood-spot-testable disorders included on the NBS panel. Of the 111,725 Michigan babies screened in 2015, 270 were diagnosed with one of these disorders, a rate of about one in every 414 babies.

Does NBS require parental consent?

No. Under Michigan Law (MCL 333.5431), parental consent is not required to perform NBS. This is in recognition of the tremendous public health value of NBS.

Where is NBS performed?

NBS is performed at the MDHHS Laboratory in Lansing. MCL 333.5431(2) permits the Department to require that NBS be performed in the state laboratory. Centralizing screening in one location improves the quality, efficiency, and accuracy of the NBS program, better protecting Michigan's babies.

What happens to residual dried blood spots after NBS?

One of the dried blood spots is de-identified, assigned an anonymous numeric code, and securely stored at the MDHHS Laboratory for parental use, if needed (e.g., future disease diagnosis).

The other dried blood spots are likewise de-identified, assigned the same anonymous numeric code, and stored at a secure site. MDHHS contracts with Wayne State University (WSU) to store these spots. WSU in turn subcontracts with a non-profit charitable organization, the Michigan Neonatal Biobank, to store the spots in a climate-controlled specimen management facility.

As part of the NBS process, some of the residual dried blood spots are used by the MDHHS Laboratory for NBS quality assurance, test improvement, and test development. This helps to ensure accurate and timely screening for other babies.

As described below, dried blood spots can also be used for de-identified medical research and crime victim identification.

How are dried blood spots made available for research?

Dried blood spots are valuable for public health research because they provide information about environmental and biological factors that can affect human health. MDHHS created the Michigan BioTrust for Health, a program designed to oversee and facilitate researcher access to dried blood spots following careful review of each proposed study. At MDHHS's direction, the Biobank makes de-identified dried blood spots available to public health researchers.

Michigan was the first state to secure consent from all new parents for de-identified medical research using NBS dried blood spots. Beginning on May 1, 2010, hospitals and midwives began providing a consent form to new parents. Parents are empowered to choose whether or not they want their baby's residual dried blood spots to be used for de-identified medical research benefitting public health. Spots collected prior to May 1, 2010, can be used for de-identified medical research unless a parent submits a request to mark their child's spots as unavailable for research. Adults can make this request on their own behalf.

Parents who do not want their child's spots to be kept by MDHHS can submit a request to have those spots destroyed. Adults can make this request on their own behalf.

Who reviews requests from researchers for de-identified dried blood spot research?

Research requests to use de-identified blood spots are submitted to the BioTrust, where they undergo multiple levels of review by the Bureau of Laboratories, Bureau of Epidemiology and Population Health, the MDHHS Institutional Review Board, and a panel of three Scientific Advisory Board members. The review process ensures that the proposed research study has scientific merit; that the research complies with departmental policy; that the researchers are qualified to conduct the research; and that human subjects and data are protected.

Why is de-identified dried blood spot research important?

Research performed using Michigan dried blood spots has helped improve NBS techniques. For example, use of dried blood spots through the BioTrust has been instrumental in developing NBS tests for the debilitating disorders Spinal Muscular Atrophy and Niemann-Pick C Disease. Research facilitated by the BioTrust has also contributed to advancements in the study of cancers and environmental exposure. A summary of approved studies is available on MDHHS's website.

Are dried blood spots sold to anyone?

No. The Biobank charges a small administrative fee to fulfill researcher requests for de-identified dried blood spots in MDHHS-approved research projects, but not for the blood spot itself. The fee helps offset the cost of storage, labor, and shipping. Neither the Biobank nor MDHHS receives a profit from the BioTrust program.

How does MDHHS protect privacy?

The NBS process and storage of dried blood spots includes many layers of security to protect the dried blood spots. Only authorized employees are permitted to access the dried blood spots. The facilities which store dried blood spots are well secured. Stored dried blood spots are deidentified.

Researchers are only provided dried blood spots in a deidentified form. This means researchers don't know whose blood spots they are using. The only exception is if you specifically grant permission to a researcher to use your dried blood spots in an identified form.

The dried blood spots are also protected under the law - MDHHS is only permitted to use dried blood spots for quality improvement and test development of NBS disorders, parent- or guardian-directed medical research, crime victim identification, and de-identified medical research.

Does MDHHS ever provide a dried blood spot to law enforcement?

MDHHS will only provide a dried blood spot to law enforcement for the purpose of crime victim identification. Most of the time, this means someone has been killed or gone missing.

The Department will only release a dried blood spot to law enforcement if: 1) approval is granted by a family member authorized to act on the crime victim's behalf, or 2) law enforcement obtain a valid judicial warrant or subpoena which clearly states that the dried blood spot will be used for crime victim identification only.

MDHHS rigorously follows its policy of providing a dried blood spot to law enforcement only for the purpose of crime victim identification.

To learn more, please reach us by telephone (toll free 1-866-673-9939) or email (newbornscreening@michigan.gov for questions about newborn screening or biotrust@michigan.gov for questions about the BioTrust for Health).

Last revised April 2018

LEXOLOGY®

Texas to destroy 5.3 million illegally obtained blood samples

USA | December 26 2009

As part of the settlement of a federal court action, the State of Texas has agreed to destroy more than 5 million blood samples taken from babies without parental consent and stored indefinitely for the purpose of scientific research. The Texas Department of State Health Services announced earlier this week that it would destroy the samples in connection with the settlement of a federal lawsuit filed in March 2009 by the Texas Civil Rights Project on behalf of five parents of children whose blood was being held for use in research without their consent.

The parents' complaint alleged that the state's failure to ask parents for permission to store and possibly use the blood - originally collected lawfully in order to screen for birth defects - violated constitutional protections against unlawful search and seizure. The parents also expressed fears that their children's private health data could be misused and that the disclosure of that data could lead to discrimination against them later in life. Under the settlement, the blood samples collected without parental consent must be destroyed by early next year. State authorities estimated that some 5.3 million samples would be destroyed as part of this process. The State of Texas also is required to publish a list of all research projects that used the blood specimens.

Foley Hoag LLP - Colin J. Zick

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF TEXAS
SAN ANTONIO DIVISION

ANDREA BELENO, GEOFFREY N. COURTNEY, MARYANN OVERATH, on behalf of their her infant children and on behalf of the class similarly situated, and KEITH A. TAYLOR, on behalf of his infant daughter Plaintiffs v. TEXAS DEPARTMENT OF STATE HEALTH SERVICES, DAVID L. LAKEY, M.D., in His Official Capacity as Commissioner of the Texas Department of State Health Services, TEXAS A&M UNIVERSITY, and NANCY W. DICKEY, M.D., in Her Official Capacity as Vice Chancellor for Health Affairs of Texas A&M University System and President of the Texas A&M University System Health Science Center, Defendants	§	CIVIL ACTION NO. SA-09-CA-0188-FB **FIRST AMENDED COMPLAINT**

Plaintiffs respectfully file this amended complaint, pursuant to the Court's order of September 17, 2009, and complain that Defendants have unlawfully and deceptively collected blood samples from their children at time of birth and stored those samples indefinitely for undisclosed research purposes, without Plaintiffs' knowledge or consent, and would show:

STATEMENT OF CLAIM

1. Plaintiffs bring this civil action for declaratory and injunctive relief on behalf of themselves, their infant children, and the class, alleging discriminatory and unlawful deprivation of their children's constitutional rights by Defendants (and of the class) under color of law and in violation of the Fourth and Fourteenth Amendments to the U.S. Constitution.

JURISDICTION AND VENUE

2. This Court has jurisdiction over Plaintiffs' federal claims, pursuant to 42 U.S.C. §1983 and 28 U.S.C. §1331, and over their state claims, pursuant to 28 U.S.C. §§1332 and 1367.

3. This Court is the proper venue, pursuant to 28 U.S.C. §1391 because most of the events complained of occurred within this Court's jurisdiction. Plaintiff Geoffrey Courtney resides in Bexar County. Plaintiffs Andrea Beleno and Maryann Overath are residents of Travis County. Plaintiff Keith Taylor lives in Harris County. Defendant Lakey has his principal office in Travis County.

PARTIES

Plaintiffs

4. Andrea Beleno is a resident of Austin, Texas, and the mother of an infant, born on November 4, 2008.

5. Geoffrey Courtney resides in San Antonio, Texas, and is the father of children born December 12, 2003 and May 31, 2007 respectively.

6. Maryann Overath lives in Austin, Texas, and is the mother of children born December 23, 1993 and December 6, 1998 respectively.

7. Keith Taylor is a resident of Houston, Texas, and the father of an infant daughter, born January 10, 2009.

8. Nancy Pacheco, originally a Plaintiff, has been dismissed from the case by the Court.

Defendants

9. David L. Lakey, M.D., is sued in his official capacity as Commissioner of the Texas Department of State Health Services (TDSHS) and has answered herein.

10. Nancy W. Dickey is sued in her official capacity as Vice Chancellor for Health Affairs of Texas A&M University System and President of the Texas A&M University System Health Science Center (TAMU) and has answered herein.

11. In all actions described herein and relevant times, Defendants Lakey and Dickey were acting under color of law and were charged with, responsible, for upholding the Constitutions and laws of the United States. The Court has dismissed the institutional Defendants TDSHS and TAMU from the case.

STATEMENT OF FACTS

12. Since 2002, Defendants have routinely and unlawfully collected blood samples from all babies in Texas at time of birth and stored those samples or "spots" indefinitely at the Texas A&M Health Science Center School of Rural Public Health for purposes of undisclosed research unrelated to the purposes for which the infants' blood was originally drawn, without the knowledge or consent of the infants' parents. And Defendants continue to do so.

13. Although Defendants claim they do this for research purposes, they have never disclosed specifically the purposes or methodologies of such research other than that they are unrelated to the purposes for which the infants' blood was originally drawn. Nor is there any compelling state justification for such secretive and non-consensual activity.

14. Defendants, without any authority or legal justification, have added this practice onto the state's 44-year-old mandated newborn screening program in which hospitals, birthing centers, and midwives draw blood from a baby's heel — no parental consent is required — so the state can test for a variety of birth defects. Babies, who show detectable disorders, often can be treated early to prevent disabling disorders from developing.

15. Plaintiffs do not object to the state's mandated newborn screening program so long as safeguards are in place to destroy an infant's samples within a reasonable period of time. They

object to Defendants expropriating an infant's blood sample indefinitely, without their knowledge or consent, effectively making it their property for undisclosed non-consensual purposes, unrelated to the purposes for which the infants' blood was originally drawn. .

16. Moreover, since the blood spots contain deeply private medical and genetic information, Plaintiffs are concerned about the potential for misuse of that information and fear the possibility of discrimination against their children and perhaps even relatives through the use of such blood samples and research activity thereon.

17. Under Defendants' policy and practice, researchers can use the infants' samples, which consist of five blood spots on a card, for cancer research, lab equipment calibration, and other undisclosed matters indefinitely, without the knowledge or consent of their parents, which are unrelated to the purposes for which the infants' blood was originally drawn.

18. Not only does this violate the law, but it violates standard, mandatory medical research protocols of first obtaining informed consent from subjects before they are studied, using a method that explains all the privacy facets of the study. For example, the appropriate standards and protocols with regard to minor children in this instance are set out in 45 CFR §§46.116, 46.408, regulations promulgated by the U.S. Department of Health and Human Services, and include providing, among other things:

(a) A description of the research's purpose and procedure;

(b) Disclosure of privacy implications of the research;

(c) Whom to call if questions arise about the research;

(d) Parental consent; and,

(e) A statement of no reprisals for declining to participate in the research

19. At the time of the filing of this lawsuit, Defendants observed no accepted professional protocols whatsoever in this regard. Nor have they disclosed what kind of financial

interests or transactions are involved, such as taxpayer expense or whether the samples are sold.

20. Prior to 2002, Defendants engaged in the same practice, but claim they kept the infant blood spots for a period of limited duration. Plaintiff Maryann Overath had two children born prior to 2002, but she has no assurance or confidence that Defendants have actually destroyed her children's blood sample. Nor does she have any idea whatever what kind of research was performed on her sons' blood samples and spots.

21. Subsequent to the filing of this lawsuit and because of it, the Texas Legislature passed HB-1672 to amend the law at the time. HB-1672 is codified in Chapter 33 of the Texas Health and Safety Code. How Defendants implement this statute will shape part of Plaintiff's request for prospective relief.

FIRST CAUSE OF ACTION

FEDERAL AND STATE EARCH AND SEIZURE PROTECTIONS

22. Defendants' actions, stated above, violated the rights of Plaintiffs' children and of the class under the Fourth Amendment to the U.S. Constitution and Article I, Section 9 of Texas Constitution, and continue to do so.

23. Defendants' actions, done under color of law and official authority, intentionally, and with complete, deliberate, conscious and callous indifference to the constitutional rights of Plaintiffs' children and of the class, deprived them of their right to be free from unlawful search and seizure, and continue to do so.

SECOND CAUSE OF ACTION

FEDERAL LIBERTY AND PRIVACY PROTECTIONS

24. Defendants' actions, stated above, violated the rights of Plaintiffs' children and of the class under the Fourteenth Amendment to the U.S. Constitution, and continue to do so.

25. Defendants' actions, done under color of law and official authority, intentionally, and

with complete, deliberate, conscious and callous indifference to the constitutional rights of Plaintiffs' children and of the class, deprived them of their fundamental federal liberty and privacy interests, and continue to do so.

CLASS ACTION

26. Pursuant to Federal Rules of Civil Procedure 23(a) and (b), Plaintiffs Andrea Beleno, Maryann Overath, and Geoffrey Courtney bring this action for all other persons similarly situated whose joinder in this action is impracticable because the class is so numerous. The anticipated number of class members is in the millions since there are approximately 370,000 live births in Texas annually. Indeed, Defendants have stored 4.2 million samples since July 2002.

27. There are questions of law or fact common to the members of the class that predominate over questions of law or fact affecting only individual members. The questions of law or fact common to all members of the class are whether Defendants' have violated the federal constitutional rights of the class.

28. The claims of Plaintiffs Beleno, Overath, and Courtney are typical of the class and representative of all persons in the class who were injured by Defendants' actions, and will be so injured in the future.

29. The maintenance of this action as a class action is superior to other available methods of adjudication in promoting the convenient administration of justice. Plaintiffs do not seek damages for the class.

30. Plaintiffs Beleno, Overath, and Courtney and their counsel will fairly and adequately protect the interests of the other class members. Plaintiffs' counsel is capable of zealously representing class interests and is qualified to litigate this type of action. Plaintiffs Beleno, Overath, and Courtney and their counsel will adequately assert and support the legal claims that

form the basis of this action. Plaintiffs Overath and Courtney themselves are attorneys, who have managed class actions in the part and this bring that knowledge and expertise to this case. Plaintiffs and the class will benefit equally by virtue of this action, if the Court recognizes and vindicates their federal.

31. This class action may be properly maintained under Federal Rule of Civil Procedure 23(b)(2) because Defendants' conduct, pursuant to their procedures, policies, and/or practices, denied Plaintiffs' children and the class members their constitutional and final declaratory and injunctive relief will settle the legality of Defendants' challenged procedures, policies, and actions for the class as a whole.

32. The class is comprised of all similarly-situated parents whose infants' blood samples or "spots" were and will be collected by Defendants and stored at the Science Center for purposes unrelated to the statutorily-required purposes for which the infants' blood was originally drawn, without the knowledge or consent of the parents.

ATTORNEYS' FEES

33. Plaintiffs are entitled to recover attorneys' fees and costs, pursuant to 42 U.S.C. §1988.

DECLARATORY RELIEF

34. This suit involves an actual controversy within the Court's jurisdiction, and the Court may declare the rights of Plaintiffs and the class under the Constitution and laws of the United States and grant such necessary and proper relief.

INJUNCTIVE RELIEF

35. Plaintiffs' claim for injunctive relief is authorized by Federal Rule of Civil Procedure 65 and by the general legal and equitable powers of this Court.

36. Because Plaintiffs and class members will continue to suffer harm due to

Defendants' disregard of their fundamental federal rights, injunctive relief is necessary to prevent Defendants from continuing to collect and/or store blood samples and spots from newborn babies without informed parental consent.

37. Plaintiffs and the class will suffer irreparable harm, if injunctive relief is not granted.

38. There are no adequate, measurable damages available to Plaintiffs and the class for the deprivation of their fundamental rights in this case, making injunctive relief necessary.

39. Plaintiffs and the class seek injunctive relief, commanding Defendants to stop collecting blood samples and spots from newborn infants and keeping such indefinitely without informed parental consent and further commanding Defendants to destroy all blood samples and spots of Plaintiffs' children and those of the class, which Defendants have gathered without informed parental consent and guarantee to the Court within times periods prescribed by the Court that they have done so. Plaintiffs also ask the Court to compel Defendants to disclose for what purpose they used the blood samples and spots of Plaintiffs' children and of the class and disclose all financial transactions

40. Plaintiffs do not object to the state's mandated newborn screening program so long as safeguards are in place to destroy an infant's samples within a reasonable period of time.

PRAYER FOR RELIEF

Therefore, Plaintiffs respectfully prays that this Court:

A. Enter declaratory judgment for the Plaintiff individuals that:

1. Acting under authority of law, Defendants intentionally, and with complete and deliberate indifference to the rights of Plaintiffs' children, unlawfully deprived them of their right to be free from unlawful search and seizure, guaranteed by the Fourth Amendment to the United States Constitution; and,

2. Acting under authority of law, Defendants intentionally, and with complete and deliberate indifference to the rights of Plaintiffs' children, unlawfully deprived them of their liberty and privacy interests, guaranteed by the Fourteenth Amendment to the U.S. Constitution;

B. Issue an injunction, commanding Defendants to forthwith destroy all blood samples and spots of Plaintiffs' children, which Defendants have gathered and stored indefinitely without informed parental consent and guarantee to the Court within ten days of the order that they have done so;

C. Issue an injunction, commanding Defendants to advise Plaintiffs for what purposes Defendants used the blood samples and spots of Plaintiffs' children and disclose all financial transactions involved with the use of such samples and blood, within ten days of the order;

D. Certify this action as a class action on behalf of all similarly-situated parents whose infants' blood samples or "spots" were and will be collected by Defendants and stored at the Texas A&M Science Center for purposes unrelated to the statutorily-required purposes for which the infants' blood was originally drawn, without the knowledge or consent of the parents, and thereafter:

1. Enter the same declaratory relief as to class, as prayed for above for the Plaintiff individuals and determine the extent to which HB-1672, as codified in Chapter 33 of the Texas Health and Safety Code and implemented by Defendants, satisfies the requirements of the Fourth and Fourteenth Amendments to the federal constitution.;

2. Issue an injunction, commanding Defendants to stop collecting blood samples and spots from newborn infants and keeping such indefinitely without informed parental consent;

3. Issue an injunction, commanding Defendants to forthwith destroy all blood samples and spots gathered since 2002 without informed parental consent or otherwise secure informed consent from affected parents to maintain such blood samples and spots, and guarantee to the Court with ninety days of the order that they have done so;

4. Issue an injunction, establishing a procedure by which Defendants re-acquire informed consent from those children whose parents give consent, when such child reaches the age of 18 and becomes an adult, or otherwise destroy such blood samples and spots, and guarantee to the Court within thirty days of the order that they have established such a procedure; and,

5. Issue an injunction, commanding Defendants to advise each class member for what purposes Defendants used the blood samples and spots of the class member and disclose all financial transactions involved with the use of such samples and blood, within ninety days of the order;

H. Order Defendant to pay Plaintiff's attorneys' fees and costs; and,

I. Grant all other and additional relief to which Plaintiffs may be entitled in this action, at law or in equity.

Dated: September 29, 2009

Respectfully submitted,

/s/ James C. Harrington

James C. Harrington
State Bar No. 09048500

TEXAS CIVIL RIGHTS PROJECT
1405 Montopolis Drive
Austin, Texas 78741-3438
(512) 474-5073
(512) 474-0726 (FAX)

ATTORNEY FOR PLAINTIFFS

CERTIFICATE OF SERVICE

I certify that a true copy of this document was served on September 29, 2009, to counsel for Defendants, Nancy K. Juren, Assistant Attorney General, Attorney in Charge, via the Court's electronic filing system.

/s/ James C. Harrington
James C. Harrington

The prices below are for samples that have already been transferred to the Biobank.

	Random Sample			Lookup Only			Minimum Charges for Data		Linked
	Punch	Half Spot (4 punches)	Whole Spot (10 punches)	Punch	Half Spot (4 punches)	Whole Spot (10 punches)	Punch	Half Spot (4 punches)	Whole Spot (10 punches)
Michigan Academic	6.30	25.20	63.00	9.80	39.20	98.00	14.00	56.00	140.00
Mich Government	6.30	25.20	63.00	9.80	39.20	98.00	14.00	56.00	140.00
Out of State Academic	6.75	27.00	67.50	10.50	42.00	105.00	15.00	60.00	150.00
Out of State Government	6.75	27.00	67.50	10.50	42.00	105.00	15.00	60.00	150.00
For Profit Companies	9.00	36.00	90.00	14.00	56.00	140.00	20.00	80.00	200.00

The starting cost is the price per punch that is charged to <u>for-profit</u> companies. All other charges are calculated based on this price.

Michigan academic and government agencies receive a 30% discount.

Out of State academic and government agencies receive a 25% discount.

Optional: For orders of 100 or more samples, subtract 10%.

Optional: For samples that are still in the State Warehouse, add 10%.

Kind regards,
-Sophie

Trans-Hit Bio will participate at the Precision Blood Cancer World R&D Summit
November 14-15, 2017 - San-Francisco – USA

Sophie Dahan, *PhD, PMP*
Project Director

Office: +1 514 739 0670 ext. 850

Trans-Hit Biomarkers Inc.
525 Cartier Blvd. West
Laval, QC, H7V 3S8
Canada
www.trans-hit.com

From: Sophie Dahan
Sent: November-01-17 12:06 PM
To: 'ak7682@wayne.edu' <ak7682@wayne.edu>
Subject: Trans-Hit Bio - Process, MSA and MTA

Hi Antonio,

Thank you for taking the time to speak to me today! I am very happy to have found the samples that I am looking for for my Client at the Michigan Neonatal Biobank!

As discussed on the phone, Trans-Hit Bio (THB) (www.trans-hit.com) is a CRO that works on behalf of academic and industrial partners that need high quality human biosamples for Research & Development programs in in vitro diagnostics (IVD), biomarker validation, drug discovery and development. The samples could be retrospective or prospective, depending on the specific study. We facilitate direct interaction between biobank members in our network and industrial partners. Our strict policy of transparent access to biospecimen sources ensures that you are always informed about what the biospecimens you provide will be used for and by whom. In addition, we always encourage our partners to properly acknowledge biobanks and individual experts who contributed to the study advancement.

We currently have more than **70 biobank partners globally** with whom we have signed a Master Services Agreement (MSA) and to whom we send regular Client sample requests. Some of them are commercial biobanks and others are academic/hospital-based biobanks or collection sites.

Below are the two agreement templates (in attachment) that will need to be reviewed please:
MSA – this agreement is signed between the Biobank and THB

MTA – this agreement is signed between the Biobank and the End-User, and witnessed by THB

Please make your edits in Tracked Changes and send back to me.

For your information, the process of Sample Procurement at Trans-Hit Bio is the following:

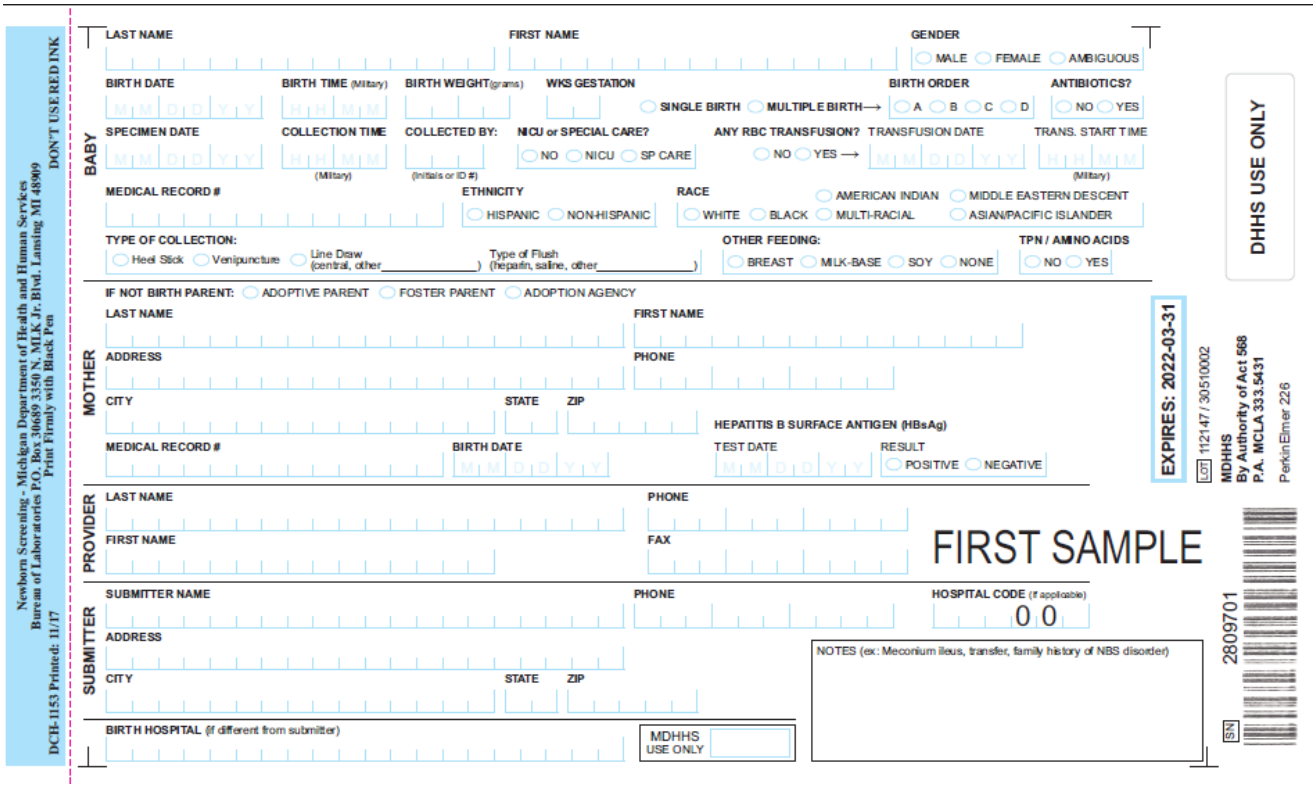
1. Pharma Client contacts Trans-Hit Bio (THB) for a samples
2. THB contacts Partnered Biobanks (BB) to ask if they have samples that satisfy the sample request criteria
3. BBs respond by providing:
    a. the number of samples available that meet all the criteria of the sample request
    b. the cost/sample
    c. the timeline for getting the samples ready for shipment to the client's site
4. THB adds a % margin on the BB cost
5. THB asks Client if price and timeline is OK with them
6. Client says yes, price and timeline are OK
7. THB then sends a formal quote to the Client
8. Client sends a PO for the sample order to THB
9. Then THB sends a Work Order to the BB
10. BB starts sample collection for the required number of samples that meet all sample request criteria
11. BB informs THB that samples are ready to ship
12. BB sends data manifest to THB to QC
13. THB gives GO to BB to ship samples
14. BB ships samples directly to Client's facilities (with THB or Client FedEx account)
15. BB provides Tracking Number of shipment to THB
16. Client receives samples and QC's samples
17. Client informs THB that they have received samples in good shape
18. THB informs BB that samples have been received by Client
19. THB invoices Client
20. Client pays THB
21. BB invoices THB
22. THB pays BB

If you have any questions at all, please feel free to call me (514-739-0670 X850) or e-mail me!

Kind regards,
-Sophie

Recording the NBS Card Number

The hospital NBS protocol should include instructions to ensure that the NBS card numb forwarded to the staff person responsible for submitting the electronic birth certificate (EB NBS card ("kit") number is referred to as the "metabolic number" on the EBC. This number is in the middle right-hand side of the card (as shown below) and goes in the upper right-hand box on the EBC.



Newborn Screening - Michigan Department of Health and Human Services
Bureau of Laboratories P.O. Box 30639 3350 N. MLK Jr. Blvd. Lansing MI 48909
Print Firmly with Black Pen
DON'T USE RED INK
DCH-1153 Printed: 11/17

BABY
LAST NAME | FIRST NAME | GENDER (MALE FEMALE AMBIGUOUS)
BIRTH DATE | BIRTH TIME (Military) | BIRTH WEIGHT(grams) | WKS GESTATION | SINGLE BIRTH MULTIPLE BIRTH→ | BIRTH ORDER (A B C D) | ANTIBIOTICS? (NO YES)
SPECIMEN DATE | COLLECTION TIME (Military) | COLLECTED BY: (Initials or ID #) | NICU or SPECIAL CARE? (NO NICU SP CARE) | ANY RBC TRANSFUSION? (NO YES →) | TRANSFUSION DATE | TRANS. START TIME (Military)
MEDICAL RECORD # | ETHNICITY (HISPANIC NON-HISPANIC) | RACE (WHITE BLACK MULTI-RACIAL AMERICAN INDIAN MIDDLE EASTERN DESCENT ASIAN/PACIFIC ISLANDER)
TYPE OF COLLECTION: (Heel Stick Venipuncture Line Draw (central, other_____) Type of Flush (heparin, saline, other_____))
OTHER FEEDING: (BREAST MILK-BASE SOY NONE) | TPN / AMINO ACIDS (NO YES)

DHHS USE ONLY

IF NOT BIRTH PARENT: ADOPTIVE PARENT FOSTER PARENT ADOPTION AGENCY

MOTHER
LAST NAME | FIRST NAME
ADDRESS | PHONE
CITY | STATE | ZIP
MEDICAL RECORD # | BIRTH DATE | HEPATITIS B SURFACE ANTIGEN (HBsAg) TEST DATE | RESULT (POSITIVE NEGATIVE)

EXPIRES: 2022-03-31
LOT 112147 / 30510002
MDHHS
By Authority of Act 568
P.A. MCLA 333.5431
PerkinElmer 226

PROVIDER
LAST NAME | PHONE
FIRST NAME | FAX

FIRST SAMPLE

SUBMITTER
SUBMITTER NAME | PHONE | HOSPITAL CODE (If applicable) 0 0
ADDRESS
CITY | STATE | ZIP

NOTES (ex: Meconium ileus, transfer, family history of NBS disorder)

BIRTH HOSPITAL (If different from submitter)
MDHHS USE ONLY

2809701
SSN

- **Digital Microfluidics**: Pompe disease and Mucopolysaccharidosis Type I (MPSI) screened using a digital microfluidics platform. If a screen is positive for Pompe d MPSI, a secondary screen is performed by the Mayo Biochemical Genetics Labor

Disorders Identified in Michigan Newborn Residents via Newborn Screening, 1965-2019 (preliminary numbers for 2019)

Type of Disorder Classification (Year Screening Began)	Cases in 2019 (N)	Cases Through 2019 (N)	Cumulative Detection Rate
Galactosemia (1985)	9	219	1:20,438
Biotinidase deficiencies (1987)	6	358	1:11,733
Amino acid disorders (1965)	12	792	1:9,387
Organic acid disorders (2005)	8	99	1:17,382
Fatty acid oxidation disorders (2003)	10	285	1:6,952
Congenital hypothyroidism (1977)	126	2,585	1:1,625
Congenital adrenal hyperplasia (1993)	5	175	1:19,004
Sickle cell disease (1987)	60	2,092	1:2,008
Hemoglobin H disease (2012)	3	15	1:58,805
Cystic fibrosis (October 2007)	15	320	1:4,179
Primary immunodeficiencies (October 2011)	11	120	1:8,285
Lysosomal storage disorders (August 2017)	5	17	1:15,316
X-linked adrenoleukodystrophy (October 2019)	1	1	1:25,710
Total	271	7,078	-

MICHIGAN
Newborn
Screening

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES

Newborn Screening
Guide for Hospitals
January 2021

Completing the Newborn Screening Card

It is extremely important to fill out the NBS card completely and accurately. Press firmly using a black or blue pen and **clearly print** the information. The card will be scanned into the NBS database, so legibility is critical. The specimen submitter is legally responsible for the accuracy and completeness of the information on the NBS card. Include the following information in the spaces provided:

Infant Information

- ✓ **INFANT'S NAME:** Record last name followed by first name. If no first name is available at the time of specimen collection, the last name followed by "boy" or "girl" should be used. For single mothers, use the last name of mother or last name specified by mother. DO NOT LEAVE BLANK.
- ✓ **GENDER:** Completely shade in the appropriate oval to designate newborn's gender as male, female, or ambiguous.
- ✓ **BIRTH DATE:** Use a six-digit number (mm/dd/yy) for date of birth. For example, a birth on January 4, 2019 would be recorded as 011419.
- ✓ **BIRTH TIME:** Record time of birth in military time. For example, a birth at 4:30 p.m. would be recorded as 1630. For help with time conversions, see Appendix 12.
- ✓ **BIRTH WEIGHT (grams):** Record the birthweight in grams in the boxes provided. DO NOT use pounds and ounces. Note: Birthweight is required on the first sample ("blue") card *only*. For help with weight conversions, visit New Zealand's Newborn Services Clinical Guideline website.
- ✓ **CURRENT WEIGHT (grams)**: Record the current weight in grams in the boxes provided. Do not use pounds and ounces. Note: This information is required on the repeat sample ("pink") card *only*. For help with weight conversions, visit New Zealand's Newborn Services Clinical Guideline website.
- ✓ **WEEKS GESTATION:** Record weeks of gestation at time of birth. Note: This information is requested for the first sample ("blue") card *only.* It is not necessary to add this information to the repeat sample ("pink") card.
- ✓ **SINGLE BIRTH:** Completely shade in oval for single birth.
- ✓ **MULTIPLE BIRTH ORDER:** Completely shade in oval to record birth order by "A", "B", "C" for twins, triplets, etc.
- ✓ **ANTIBIOTICS:** Mark 'yes' next to antibiotics if the newborn received postnatal antibiotics prior to the first sample specimen collection or is currently receiving antibiotics at the time of a repeat sample collection. Do not check antibiotics if the newborn received antibiotics in the past but has not received them within 48 hours of collection. It is no longer necessary to include information about the mother's perinatal antibiotic use.
- ✓ **SPECIMEN DATE:** Use a six-digit number (mm/dd/yy) representing the date on which the specimen was collected.

- ✓ **COLLECTION TIME:** Record time of specimen collection in military time. For help with time conversions, see Appendix 12.

- ✓ **COLLECTED BY:** Record initials or employee hospital identification number of the person collecting the specimen.

- ✓ **NICU/SPECIAL CARE:** Indicate if the newborn was in the NICU or special care nursery at the time the specimen was collected. If neither, completely shade in the oval next to "no".

- ✓ **RBC TRANSFUSION:** Completely shade in oval "no" or "yes" to indicate whether the newborn was ever transfused with red blood cells **prior** to specimen collection, including in utero. If yes, give date (mm/dd/yy) and the start time (military) of the **most recent** transfusion. For example, if the transfusion started on October 13, 2019 at 11:20 p.m., enter 101319 2320.

- ✓ **MEDICAL RECORD NUMBER BABY:** Record the birth hospital's identification or medical record number. Note that laboratory data coders are unable to enter letters, hyphens and spaces that appear in a medical record number.

- ✓ **ANY TPN FEEDING:** Completely shade in oval "yes" if the newborn is receiving total parenteral nutrition (TPN) at the time the specimen is collected – OR – received TPN within 24 hours of specimen collection.

- ✓ **ETHNICITY:** Completely shade in oval for Hispanic or non-Hispanic. Ethnicity should be filled in first and, in addition, one of the six boxes for race should be filled in. Mark the mother's ethnicity if the father's ethnicity is unknown. Note: Ethnicity information is requested for the first sample ("blue") card *only*.

- ✓ **RACE:** Completely shade in the oval for one of the six racial categories after the designation of Hispanic or non-Hispanic has been selected. If the newborn has a parent in one racial category and the other parent is in a different racial category, fill in the Multi-Racial oval. It is very important to fill in either the Hispanic or non-Hispanic box and in addition fill in one of the six boxes for race. Mark the mother's race if the father's race is unknown.

Example 1: One parent identifies as Hispanic and both parents identify as Black. The card should be marked Hispanic and Black.

Example 2: One parent identifies as Hispanic and White; the other parent identifies as non-Hispanic and Black. The card should be marked Hispanic and Multi-Racial.

Example 3: Neither parent identifies as Hispanic. One parent identifies as White; the other parent identifies as Asian. The card should be marked non-Hispanic and Multi-Racial.

- ✓ **TYPE OF COLLECTION:** The preferred collection method is by heel stick with a single drop of blood applied directly to each circle on the filter paper. Note that the use of capillary tubes can result in layered, serum, clotted, or damaged specimens. If the heel was not used, indicate the alternate collection method. The type of flush refers to the flush used prior to specimen collection, such as heparin, saline or none.

- ✓ **OTHER FEEDING:** Check all that apply. For instance, if a mother is both breast and bottle feeding, mark both and indicate the type of formula. It is no longer necessary to include information about use of human milk fortifier.

Mother Information

- ✓ **MOTHER'S NAME:** Record last name followed by first name as it will appear on the newborn's birth certificate. If the newborn is *not* going to be released to the care of the mother at birth, next to 'If Not Birth Parent' mark adoptive parent, foster parent, or adoption agency. Please provide the contact information for the adoptive parent, foster parent, or adoption agency in place of the mother's information. Do not place sticky notes on the card or use red ink. Neither will be recorded when the card is scanned into the laboratory information management system. If contact information on new parents, foster parents, or the adoption agency is not on the card, we will not be able to contact the family if necessary. We would like to avoid calling the birth mother if she is no longer responsible for the care of the newborn.

- ✓ **MOTHER'S ADDRESS:** Record mother's current street address, apartment/unit/lot number, followed by city, state and zip code. Information about the mother is needed to locate newborns in need of clinical evaluation or retesting.

- ✓ **MOTHER'S PHONE:** Record mother's area code and primary telephone number.

- ✓ **MEDICAL RECORD NUMBER – MOTHER:** Record the hospital identification or medical record number. Note: This information is only required on the "blue" first sample card. Laboratory data coders are unable to enter letters, hyphens and spaces that appear in a medical record number.

- ✓ **BIRTH DATE:** Record the mother's date of birth (mm/dd/yy).

- ✓ **HEPATITIS B SURFACE ANTIGEN (HBsAg):** Provide date of test (mm/dd/yy) and completely shade in the appropriate oval to indicate a positive or negative result. If there is no HBsAg test result in the mother's record, the test should be done immediately. Positive HBsAg results should be faxed to the MDHHS Perinatal Hepatitis B Prevention Program at 517-335-9855. This important information helps assure that infants at risk receive the proper interventions. Note: HBsAg information is requested for first sample ("blue") cards *only*.

Provider Information

- ✓ **PROVIDER'S NAME:** Record last name, followed by first name, of the primary care provider (PCP) to be notified of an unsatisfactory or positive newborn screen. At the time of collection, verify with the mother that the PCP's name entered on the card is correct. If the mother does not offer a PCP's name, the physician in charge of the newborn nursery should be listed on the NBS card. The physician should arrange for all retesting through the hospital's outpatient laboratory. If the newborn is expected to be in the NICU for at least a week, list a staff neonatologist as the physician and write the NICU telephone and fax numbers on the NBS card. If discharge is expected within a week, write the name and clinic telephone and fax numbers of the provider who will be taking care of the newborn after discharge.

- ✓ **PROVIDER'S PHONE:** Indicate the primary care provider's area code followed by the telephone number. It is very important to provide a complete and correct number. This information is used to contact the primary care provider with positive screen results and follow-up information. If the hospital newborn nursery chooses to follow-up positive results directly, provide the name and telephone number of the staff person designated to contact the family. This option is preferred for newborns without a designated primary care provider.

- ✓ **PROVIDER'S FAX:** Indicate the primary care provider's area code followed by fax number. The fax number is needed to forward to the provider screening results that require further follow-up.

Submitter Information

- ✓ **SUBMITTER NAME:** Record the name of the submitter (this should be the birth hospital or midwife on all first sample newborn screens). If abbreviation of the hospital's name is necessary, use some letters from each word in the hospital's name. For example, the abbreviation for St. Joseph Mercy Hospital would be St. Jos. Mrcy. It is acceptable to apply a pre-printed hospital label that includes the hospital name, address, telephone number, and the appropriate hospital code.

- ✓ **HOSPITAL CODE:** MDHHS has assigned a 3-digit hospital code for each hospital that must be recorded in the boxes provided. The 3-digit code should be listed before the two preprinted zeros. For regular nurseries, a "0" should be added to the last box (after the two preprinted zeros). For the NICU, a "1" should be added to the last box. For the special care nursery, a "2" should be added to the last box.

- ✓ **SUBMITTER ADDRESS:** Record the submitter's street address followed by the city, state and zip code.

- ✓ **SUBMITTER PHONE:** Record submitter's area code and telephone number.

- ✓ **BIRTH HOSPITAL:** Record name of the birth hospital here only if different from the submitter.

Expiration Date:

- ✓ **EXPIRATION DATE:** The expiration date is located on the middle of the right-hand side on the newest cards and in the lower right-hand corner of older cards. Check the expiration date each time you collect a blood spot specimen. Cards used after the expiration date will be marked 'unsatisfactory/expired card' and a repeat specimen will be requested.

Notes Field:

- ✓ **NOTES FIELD:** The notes field added to the lower right-hand corner of newer cards can be used to notify the NBS Program of information such as newborn transfer, family history of a disorder, meconium ileus, the mother's name in the event the baby will not be released to her care, etc.

Notifying NBS Follow-up of Changes to Infant's Health or Guardian Status:

- ✓ It is very important that you notify NBS Follow-up of any changes to the infant's status that occurred after you sent the infant's blood spot specimen to the laboratory. Complete and return the NBS Follow-up Program Hospital Discharge Sheet found in Appendix 7.

Note: It is extremely important to fill out the screening card completely and accurately.

U.S. DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN

ADAM KANUSZEWSKI and ASHLEY KANUSZEWSKI as parent-guardians and next friend to their minor children, D.W.L., R.F.K., and C.K.K.; SHANNON LAPORTE, as parent-guardian and next friend to her minor children, M.T.L. and E.M.O.; and LYNNETTE WIEGAND, as parent-guardian and next friend to her minor children, L.R.W., C.J.W., H.J.W., and M.L.W.,

Plaintiffs,

v

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES; ROBERT GORDON, sued in his official and individual capacities; DR. SANDIP SHAH, sued in his official and individual capacities; DR. SARAH LYON-CALLO, sued in her official and individual capacities; MARY KLEYN, sued in her official and individual capacities; MICHIGAN NEONATAL BIOBANK, INC also known as MICHIGAN NEONATAL BIOREPOSITORY; DR. ANTONIO YANCEY, sued in his official and individual capacities,

Defendants.

No. 18-cv-10472

HON. THOMAS L. LUDINGTON

MAG. JUDGE PATRICIA T. MORRIS

STATE DEFENDANTS' OBJECTIONS AND RESPONSES TO PLAINTIFFS' DISCOVERY REQUESTS DATED 12/9/2020

Director Robert Gordon, Mary Kleyn, Dr. Sarah Lyon-Callo, Dr. Sandip Shah, and the Michigan Department of Health and Human Services (MDHHS) (collectively, "the State Defendants,") in their official capacities, by and through their attorneys, Dana Nessel, Attorney General of the State of Michigan, and Christopher L. Kerr and Aaron W. Levin, Assistant Attorneys General, state the following for its objections and responses to Plaintiffs' Discovery Requests dated December 9, 2020 (herein, "Discovery Requests").

GENERAL OBJECTIONS

1. The following general objections ("General Objections") apply to, and are asserted with respect to, all of the requests to admit numbered 1 through 21, as well as the individual request to produce and interrogatory, contained in the Discovery Requests, and are in addition to any specific objections stated below with respect to an individual Discovery Request ("Specific Objections"). In response to an individual Discovery Request, the State Defendants may restate a General Objection for emphasis, but that restatement in no way waives the applicability of every General Objection to that individual Discovery Request.

2. The State Defendants object generally to the Discovery Requests to the extent they seek information protected from disclosure by a statutory and/or common law privilege or protection, including but not limited to: (a) the attorney-client privilege; (b) the common interest privilege; (c) the joint defense privilege; (d) the deliberative-process privilege; and/or (e) the work-product doctrine. Should the State Defendants disclose any such privileged or protected information, the disclosure is inadvertent, shall not constitute a waiver of any privilege or protection, and shall be subject to Federal Rule of Civil Procedure 45(e)(2)(B).

3. The State Defendants object generally to the Discovery Requests to the extent they fail to take reasonable steps to avoid imposing undue burden or expense on the State Defendants, as required under Federal Rule of Civil Procedure 45(d)(1). The Discovery Requests provide no method for minimizing the compliance burden imposed upon, or reimbursing the compliance costs incurred by, the State Defendants.

4. The State Defendants object generally to the Discovery Request to the extent they are unreasonably cumulative or duplicative and/or can be obtained from some other source that is more convenient, less

burdensome, or less expensive, which compels their limitation under Federal Rule of Civil Procedure 26(b)(2)(C).

5. The State Defendants object generally to the Discovery Requests to the extent they seek information not relevant to any party's claim or defense or not proportional to the needs of the case, as required by Federal Rule of Civil Procedure 26(b)(1).

6. The State Defendants object generally to the Discovery Requests for lack of foundation to the extent they seek information about which the State Defendants lack personal knowledge.

7. The State Defendants object generally to the Discovery Requests to the extent they attempt to impose any obligations greater than those imposed or authorized by the Federal Rules of Civil Procedure, any applicable Local Rules, or any applicable court order.

SPECIFIC OBJECTIONS AND RESPONSES

REQUEST TO ADMIT NO. 1: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were consulted, prior to the respective heel prick test, as to whether the parents wanted his/her infant to participate in the entirety of the Newborn Screening Program.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness as "the entirety of the Newborn Screening Program" is not defined. Further, the State Defendants object to the extent this request

is irrelevant. Regardless of whether the parents were consulted by their medical care providers, newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed.

To the extent further response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 1 is admitted.

REQUEST TO ADMIT NO. 2: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the collective medical risks and/or benefits of the Newborn Screening Program prior to the respective heel prick test being completed.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, and 6. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

To the extent further response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 2 is admitted.

REQUEST TO ADMIT NO. 3: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the collective medical risks and/or benefits of the transfer to, storage of, and/or use by the Michigan Neonatal Biobank before the infants' blood spots were delivered to said entity.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 6, and for vagueness because "medical risks" is not defined and the retained blood spots are not used for any clinical purpose after newborn screening is

complete unless instructed by the family. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 3 is denied regarding Plaintiff-Children R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W and admitted regarding M.T.L.

REQUEST TO ADMIT NO. 4: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the collective legal risks and/or benefits of the Newborn Screening Program prior to the respective heel prick test being completed.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness because "legal risks" is not defined. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

To the extent further response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 4 is admitted.

REQUEST TO ADMIT NO. 5: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the collective legal risks and/or benefits of the transfer to, storage of, and/or use by the Michigan Neonatal Biobank before the infants' blood spots were delivered to said entity.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 6, and for vagueness because "legal risks" is not defined. Additionally, the State

Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 5 is denied regarding Plaintiff-Children R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W and admitted regarding M.T.L.

REQUEST TO ADMIT NO. 6: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the privacy risks and/or benefits of the Newborn Screening Program prior to the respective heel prick test being completed.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness because "privacy risks" is not defined. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

To the extent further response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 6 is admitted.

REQUEST TO ADMIT NO. 7: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the privacy risks and/or benefits of the transfer to, storage of, and/or use by the Michigan Neonatal Biobank before the infants' blood spots were delivered to said entity.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 6, and for vagueness because "privacy risks" is not defined. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 7 is denied regarding Plaintiff-Children R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W., for whom MDHHS has consent forms, and admitted regarding M.T.L.

REQUEST TO ADMIT NO. 8: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were explained the risks and/or benefits of the third-party access to blood spots left over after the completion of the respective heel prick test.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 6, and for vagueness because no period of time is specified.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 8 is denied.

REQUEST TO ADMIT NO. 9: Admit you lack evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W actually authorized the transfer of their infant's extracted blood spots to the Michigan Neonatal Biobank.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3 and 4.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 9 is admitted insofar as authorization is not obtained to physically transfer the blood spots to the Biobank but denied to the extent the blood spots remain under the control of MDHHS at all times.

REQUEST TO ADMIT NO. 10: Admit you did not obtain from the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W authorization to transfer the infant's extracted blood spots to the Michigan Neonatal Biobank.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3 and 4.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 10 is admitted that authorization is not obtained to physically transfer the blood spots to the Biobank but denied to the extent the blood spots remain under the control of MDHHS at all times. In further response, admitted insofar as a parent's authorization to transfer blood spots to the Michigan Neonatal Biobank is not explicitly required under the Public Health Code.

REQUEST TO ADMIT NO. 11: Admit you did not obtain from the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W authorization to store the infant's extracted blood spots at the Michigan Neonatal Biobank.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3 and 4.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 11 is admitted that authorization is not obtained to physically store the blood spots to the Biobank but denied to the extent the blood spots remain under the control of MDHHS at all times. In further response, admitted insofar as a parent's authorization to store blood spots to the Michigan Neonatal Biobank is not explicitly required under the Public Health Code.

REQUEST TO ADMIT NO. 12: Admit no one obtain prior authorization from the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W for the Michigan Neonatal Biobank to provide access/use of the infant's extracted blood spots to third parties (like researchers and/or businesses).

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 6, and further note that no Plaintiff-Child's blood spots have been accessed or used by third parties.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 12 is denied regarding Plaintiff-Children R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W, either because a parent provided authorization or because the

spots are not available to third parties by directive of a parent, and admitted regarding M.T.L.

REQUEST TO ADMIT NO. 13: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were informed and asked whether the samples obtained from each infant would be transferred and/or given to the Michigan Neonatal Biobank (for storage or use) prior to transferring the leftover blood spots from the MDHHS testing laboratory.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, and 6. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 13 is admitted that authorization is not obtained to physically transfer the blood spots to the Biobank but denied to the extent the blood spots remain under the control of MDHHS at all times. Request to Admit No. 13 is also admitted insofar as a parent's authorization to transfer blood spots to the Michigan Neonatal Biobank for storage is not explicitly required under the Public Health Code. In further response, Request to Admit No. 13 is denied regarding Plaintiff-Children R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W and admitted regarding M.T.L.

REQUEST TO ADMIT NO. 14: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were provided with the pamphlet explaining the requirements of MCL 333.5431 prior to the heel prick of each infant.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, and 6.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 14 is denied regarding R.F.K and C.K.K, as the parents of R.F.K and C.K.K. were provided the pamphlet on or about April 22, 2013. Request to Admit No. 14 is further denied regarding C.J.W., H.J.W., and M.L.W. as a parent of

those infants was provided the pamphlet on or around July 18, 2013. Request to Admit No. 14 is admitted regarding M.T.L, E.M.O, and L.R.W.

REQUEST TO ADMIT NO. 15: If the "health professional(s) in charge of the care of" R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W and/or "health professional in charge at the birth of" R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W prevented the heel prick test (until informed parental consent was obtained), said health profession would be guilty of a misdemeanor pursuant to MCL 333.5431(5).

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and to the extent it calls for speculation and asks for a legal conclusion. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed.

To the extent a response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 15 is admitted only insofar as Mich. Comp. Laws § 333.5431(5) states "A person who violates this section or a rule promulgated under this part is guilty of a misdemeanor."

REQUEST TO ADMIT NO. 16: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were provided actual explanation, orally or in written form, as to the scope the Newborn Screening Program (including the Michigan Neonatal Biobank) by the "health professional(s) in charge of the care of" R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W and/or "health professional in charge at the birth of " R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness because "scope" and "actual explanation" are not defined and

to the extent the request treats the Newborn Screening Program and Michigan Neonatal Biobank as the same. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

To the extent a response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 16 is denied in part regarding R.F.K and C.K.K, as R.F.K's and C.K.K.'s Parents were provided the pamphlet on or about April 22, 2013. Request to Admit No. 14 is further denied in part regarding C.J.W., H.J.W., and M.L.W. as their Parent was provided the pamphlet on or around July 18, 2013. Request to Admit No. 14 is admitted in part regarding M.T.L, E.M.O, and L.R.W. To the extent a further response is required, Request to Admit No. 16 is admitted insofar as the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents.

REQUEST TO ADMIT NO. 17: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were provided actual explanation, orally or in written form, as to the scope the Newborn Screening Program (including the Michigan Neonatal Biobank) by an agent or representative of the Michigan Department of Health and Human Services.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness because "scope" and "actual explanation" are not defined and to the extent the request treats the Newborn Screening Program and Michigan Neonatal Biobank as the same. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed. Additionally, the State Defendants

lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

To the extent a response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 17 is admitted in part, and denied to the extent extensive information has been provided by agents or representatives of the Michigan Department of Health and Human Services in the course of this litigation.

REQUEST TO ADMIT NO. 18: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W were provided actual explanation, orally or in written form, as to the scope the Newborn Screening Program (including the Michigan Neonatal Biobank) by an agent or representative of the Michigan Department of Health and Human Services.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness because "scope" and "actual explanation" are not defined and to the extent the request treats the Newborn Screening Program and Michigan Neonatal Biobank as the same. Further, the State Defendants object to the extent this request is irrelevant. Newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed. Additionally, the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents by their healthcare providers.

To the extent a response is required, subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 18 is admitted in part, and denied to the extent extensive information has been provided by agents or representatives of the Michigan Department of Health and Human Services in the course of this litigation.

REQUEST TO ADMIT NO. 19: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W had any knowledge of

the Newborn Screening Program at the time of the birth their respective infant.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, 5, 6, and for vagueness as "the entirety of the Newborn Screening Program" is not defined. Further, the State Defendants object to the extent this request is irrelevant. Regardless of whether the parents were consulted by their medical care providers, newborn screening is mandated by law, exempt from informed consent requirements, and all claims relating to the taking and testing of newborn blood spots for various diseases pursuant to Mich. Comp. Laws § 333.5431 have been dismissed.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 19 is denied regarding R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W, and admitted, both generally and regarding M.T.L., insofar as the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents.

REQUEST TO ADMIT NO. 20: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W had any knowledge of the Michigan Neonatal Biobank at the time of the birth their respective infant.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, and 6.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 20 is denied regarding Plaintiff-Children R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W, and admitted, both generally and regarding M.T.L., insofar as the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents.

REQUEST TO ADMIT NO. 21: Admit you lack any evidence and/or proof that the parents of infants R.F.K., C.K.K., M.T.L., E.M.O., L.R.W., C.J.W., H.J.W., and M.L.W had any knowledge of

the Michigan BioTrust for Health at the time of the birth their respective infant.

RESPONSE: The State Defendants specifically object to this Discovery Request for the reasons set forth in General Objections 3, 4, and 6.

Subject to and without waiving the foregoing General Objections and Specific Objections, Request to Admit No. 21 is denied regarding R.F.K, C.K.K, E.M.O, L.R.W., C.J.W., H.J.W., and M.L.W and admitted, both generally and regarding M.T.L., insofar as the State Defendants lack personal knowledge of what information was orally provided to Plaintiff-Parents.

REQUEST TO PRODUCE NO. 1: For each request-to-admit you deny because you have corresponding evidence/proof, please produce a copy of the evidence/proof.

RESPONSE: Subject to and without waiving the foregoing General Objections, please see the attached production which contains documents responsive to Request to Produce No. 1.

INTERROGATORY NO. 1: Identify all persons with whom you consulted and/or checked with to investigate actual or possible answers to these discovery requests. You do not need to disclose what was shared between client/counsel. However, for each person consulted, identify each discovery request the person contributed information which became your answer in response thereto.

RESPONSE: Subject to and without waiving the foregoing General Objections, in preparing these responses the State Defendants consulted with counsel, Shelby Atkinson, and Mary Kleyn. In general, Ms. Atkinson provided information related to the BioTrust (Requests to Admit Nos. 3, 5, 7, 8, 9, 10, 11, 12, 13, 17, 18, 20 and 21) and Ms. Kleyn provided information related to the newborn screening program (Requests to Admit Nos. 1, 2, 4, 6, 14, 15, 16, 17, 18, 19).

Respectfully submitted,

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Date: January 15, 2021

	STATE OF MICHIGAN DEPARTMENT OF COMMUNITY HEALTH POLICY AND PROCEDURE MANUAL *POLICY AND PROCEDURE*	CHAPTER Laboratori NUMBER 11.1 EFFECTIVE DATE September 8, 2008
SUBJECT Newborn Screening Specimens		Page 1 of 2

A. PURPOSE

The purpose of this policy is to establish for the Michigan Department of Community Health (DCH) a retention schedule for newborn screening dried blood spot specimens.

B. REVISION HISTORY

Issued September 8, 2008.
Revised January 5, 2009.
Revised June 4, 2009

C. DEFINITIONS

NBS: Newborn screening is a comprehensive program that tests for and provides long and short term follow up and medical management for children with disorders identified through the program. (PA 368 of 1978, 333.5431, 333.5430)

DBS: Dried blood spot is the blood specimen collected from the heel of a newborn at 24-48 hours post-birth on a filter paper collection devise. After drying, the blood and patient identifying information contained on the same paper collection devise are sent to the DCH Bureau of Laboratories for testing.

D. POLICY

The DCH will maintain, or cause to be stored, newborn screening dried blood spots indefinitely. Parents, legal guardians of, and/or persons from whom the specimen was collected after reaching the age of majority, may request that their specimen not be used for any research, by contacting DCH by telephone or mail. Parents, legal guardians of, and/or persons from whom the specimen was collected after reaching the age of majority, may request that their specimen be destroyed by providing the name, date of birth and their relationship to the individual from whom the specimen was collected and must provide copies of the individual's birth certificate and a government-issued identification (e.g., drivers license or passport) to confirm that they have authority to make such a request.

The DCH retains qualified ownership of DBS while in storage. The DCH may release part of the residual DBS upon written request of the individual for research studies or other uses. The DCH may release part, or all, of the de-identified specimen for NBS quality assurance and test development or public health or medical research with appropriate approval of the DCH scientific advisory panel and institutional review board. The DCH will reserve part of the specimen solely for the use of the individual or parent/guardian, unless requested otherwise by an authorized individual.

Retention schedules for DBS collected for other tests (e.g., HIV serology, lead) will be determined by Bureau of Laboratory policy.

E. PROCEDURE

Responsibility	*Action*
Bureau of Laboratories Newborn Screening Section Manager	Process and package dried blood spots for permanent storage maintaining specimen identification.
Bureau of Laboratories Newborn Screening Section	Oversee and confirm in writing the tagging of specimens as "not available for research" when request has been received from the

Manager	individual or parent or legal guardian of the individual.
Bureau of Laboratories Newborn Screening Section Manager	Oversee and confirm in writing the destruction of specimens when request for destruction has been received and confirmed authentic from the individual or parent or legal guardian of the individual.
Bureau of Laboratory Administrator	Assure an environment for the storage of the dried blood spot specimens that is secure and protects the integrity of the biological components of the specimen. Identify resources for an adequate storage environment for the specimens.

F. REFERENCES

Association of Public Laboratories Position/Policy statement on Residual Newborn Screening Specimens.
http://www.aphl.org/policy/Documents/residual_newborn_screening_specimens.pdf

Therrell, B.L, H.W. Hannon, et al. 1996. Guidelines for the retention, storage and use of residual dried blood spot samples after newborn screening analysis: Statement of the Council of Regional Networks for Genetic Services. Biochemical and Molecular Med. 57:116-124.

Directive to Destroy Residual Newborn Screening Blood Specimen, DCH-1448

Directive to Remove Residual Newborn Screening Blood Specimen from Possible Research Uses, DCH -1465

Michigan Public Health Code, Act 368 of 1978, 333.5431, 333.5430

G. CONTACT

For additional information concerning this policy, contact the DCH Bureau of Laboratories.

RECOMMENDED BY: _____ DATE: 6/17/09
Deputy Director

APPROVED BY: _____ DATE: 6-18-09
Director

Content Author: DCH Bureau of Laboratories

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Kids

The most
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Recovering From Delivery

Your baby's finally here, and you're thrilled — but you're also exhausted, uncomfortable, on an emotional roller coaster, and wondering whether you'll ever fit into your jeans again. Childbirth classes helped prepare you for giving birth, but you weren't prepared for all of this!

What to Expect Physically

After your baby arrives, you'll notice some changes — both physical and emotional.

Physically, you might experience:

- **Sore breasts.** Your breasts may be painfully engorged for several days when your milk comes in and your nipples may be sore.
- **Constipation.** The first postpartum bowel movement may be a few days after delivery, and sensitive hemorrhoids, healing episiotomies, and sore muscles can make it painful.
- **Episiotomy.** If your perineum (the area of skin between the vagina and the anus) was cut by your doctor or if it was torn during the birth, the stitches may make it painful to sit or walk for a little while during healing. It also can be painful when you cough or sneeze during the healing time.
- **Hemorrhoids.** Although common, hemorrhoids (swollen blood vessels in the rectum or anus) are frequently unexpected.
- **Hot and cold flashes.** Your body's adjustment to new hormone and blood flow levels can wreak havoc on your internal thermostat.
- **Urinary or fecal incontinence.** The stretching of your muscles during delivery can cause you to accidentally pass urine (pee) when you cough, laugh, or strain or may make it difficult to control your bowel movements, especially if you had a lengthy labor before a vaginal delivery.
- **"After pains."** After giving birth, your uterus will continue to have contractions for a few days. These are most noticeable when your baby nurses or when you are given medication to reduce bleeding.
- **Vaginal discharge (lochia).** Initially heavier than your period and often containing clots, vaginal discharge gradually fades to white or yellow and then stops within several weeks.
- **Weight.** Your postpartum weight will probably be about 12 or 13 pounds (the weight of the baby, placenta, and amniotic fluid) below your full-term weight, before additional water weight drops off within the first week as your body regains its balance.

What to Expect Emotionally

Emotionally, you may be feeling:

- **"Baby blues."** Many new moms have irritability, sadness, crying, or anxiety, beginning within the first several days after delivery. These baby blues are very common and may be related to physical changes (including hormonal changes, exhaustion, and unexpected birth experiences) and the emotional transition as you adjust to changing roles and your new baby. Baby blues usually go away within 1 to 2 weeks.
- **Postpartum depression.** More serious and longer lasting than the baby blues, this condition may cause mood swings, anxiety, guilt, and persistent sadness. PPD can be diagnosed up to a year after giving birth, and it's more common in women with a history of depression, multiple life stressors, and a family history of depression.

Also, when it comes to intimacy, you and your partner may be on completely different pages. Your partner may be ready to pick up where you left off before baby's arrival, whereas you may not feel comfortable enough — physically or emotionally — and might crave nothing more than a good night's sleep. Doctors often ask women to wait a few weeks before having sex to allow them to heal.

The Healing Process

It took your body months to prepare to give birth, and it takes time to recover. If you've had a cesarean section (C-section), it can take even longer because surgery requires a longer healing time. If unexpected, it may have also raised emotional issues.

Pain is greatest the first few days after the surgery and should gradually subside. Your doctor will advise you on precautions to take after surgery, and give you directions for bathing and how to begin gentle exercises to speed recovery and help avoid constipation.

Things to know:

- Drink 8-10 glasses of water daily.
- Expect vaginal discharge.
- Avoid stairs and lifting until your doctor says these activities are OK.
- Don't take a bath or go swimming until the doctor says it's OK.
- Don't drive until your doctor says it's OK. Also wait until you can make sudden movements and wear a safety belt properly without discomfort.
- If the incision becomes red or swollen, call your doctor.

Birth Control

You can become pregnant again before your first postpartum period. Even though this is less likely if you are exclusively breastfeeding (day and night, no solids, no bottles, at least 8 times a day, never going more than 4 hours during the day or 6 hours at night without feeding), have not had a period, and your baby is younger than 6 months old, it is still possible.

If you want to protect against pregnancy, discuss your options with your doctor. This may include barrier methods (like condoms or diaphragms), an IUD, pills, a patch, an implantable device, or shots.

Breastfeeding

You need plenty of sleep, lots of fluids, and good nutrition, especially if you're breastfeeding. An easy way to stay on top of drinking enough fluids is to have a glass of water whenever your baby nurses. At least until your milk supply is well established, try to avoid caffeine, which causes loss of fluid through urine and sometimes makes babies wakeful and fussy.

If you have any breastfeeding problems, talk to your doctor, midwife, or a lactation specialist. Your clinic or hospital lactation specialist can advise you on how to deal with any breastfeeding problems. Relieve clogged milk ducts with breast massage, frequent nursing, feeding after a warm shower, and warm moist compresses applied throughout the day.

If you develop a fever or chills or your breast becomes tender or red, you may have an infection (mastitis) and need antibiotics. Call your doctor if this happens. Continue nursing or pumping from both breasts, though, and drink plenty of fluids.

Engorged Breasts

Engorged breasts will feel better as your breastfeeding pattern becomes established or, if you're not breastfeeding, when your body stops producing milk — usually within a few days.

Episiotomy Care

Continue sitz baths (sitting in just a few inches of water and covering the buttocks, up to the hips, in the water) using cool water for the first few days, then warm water after that. Squeeze the cheeks of your bottom together when you sit to avoid pulling painfully on the stitches. Sitting on a pillow may be more comfortable than sitting on a hard surface.

Use a squirt bottle with warm water to wash the area with water when you use the toilet; gently pat dry. After a bowel movement, wipe from front to back to avoid infection. Reduce swelling with ice packs or chilled witch hazel pads. Local anesthetic sprays also can be helpful.

Talk to your doctor about taking an anti-inflammatory drug like ibuprofen to help with the pain and swelling.

Exercise

Exercise as soon as you've been cleared by your doctor to help restore your strength and pre-pregnancy body, increase your energy and sense of well-being, and reduce constipation. Begin slowly and increase gradually. Walking and swimming are excellent choices.

Hemorrhoids and Constipation

Alternating warm sitz baths and cold packs can help with hemorrhoids. It also can help to sit on an inflatable donut cushion.

Ask your doctor about a stool softener. Don't use laxatives, suppositories, or enemas without your doctor's OK. Increase your intake of fluids and fiber-rich fruits and vegetables. After your doctor has cleared it, exercise can be very helpful.

Sexual Relations

Your body needs time to heal. Doctors usually recommend waiting 4-6 weeks to have sex to reduce the risk of infection, increased bleeding, or re-opening healing tissue.

Begin slowly, with kissing, cuddling, and other intimate activities. You'll probably notice reduced vaginal lubrication (this is due to hormones and usually is temporary), so a water-based lubricant might be useful. Try to find positions that put less pressure on sore areas and are most comfortable for you. Tell your partner if you're sore or frightened about pain during sexual activity — talking it over can help both of you to feel less anxious and more secure about resuming your sex life.

Incontinence

Urinary or fecal incontinence often eases gradually as your body returns to its normal prepregnancy state. Encourage the process with Kegel exercises, which help strengthen the pelvic floor muscles. To find the correct muscles, pretend you're trying to stop peeing. Squeeze those muscles for a few seconds, then relax (your doctor can check to be sure you're doing them correctly).

Wear a sanitary pad for protection, and let the doctor know about any incontinence you have.

What Else You Can Do to Help Yourself

You'll get greater enjoyment in your new role as mom — and it will be much easier — if you care for both yourself and your new baby. For example:

- When your baby sleeps, take a nap. Get some extra rest for yourself!
- Set aside time each day to relax with a book or listen to music.
- Shower daily.
- Get plenty of exercise and fresh air — either with or without your baby, if you have someone who can babysit.
- Schedule regular time — even just 15 minutes a day after the baby goes to sleep — for you and your partner to be alone and talk.
- Make time each day to enjoy your baby, and encourage your partner to do so, too.
- Lower your housekeeping and gourmet meal standards — there's time for that later. If visitors stress you, restrict them temporarily.
- Talk with other new moms (perhaps from your birthing class) and create your own informal support group.

Getting Help From Others

Remember, Wonder Woman is fiction. Ask your partner, friends, and family for help. Jot down small, helpful things people can do as they occur to you. When people offer to help, check the list. For example:

- Ask friends or relatives to pick things up for you at the market, stop by and hold your baby while you take a walk or a bath, or just give you an extra hand. Or ask loved ones to drop off a meal.
- Hire a neighborhood teen — or a cleaning service — to clean the house occasionally, if possible.
- Investigate hiring a doula, a supportive companion professionally trained to provide postpartum care.

When to Call the Doctor

You should call your doctor about your postpartum health if you:

- have a fever of 100.4°F (38°C) or above
- soak more than one sanitary napkin an hour, pass large clots (larger than a quarter), or if the bleeding increases
- had a C-section or episiotomy and the incision becomes very red or swollen or drains pus
- have new pain, swelling, or tenderness in your legs
- have hot-to-the-touch, reddened, sore breasts or any cracking or bleeding from the nipple or areola (the dark-colored area of the breast)

- your vaginal discharge becomes foul-smelling
- have painful urination, a sudden urge to pee, or are unable to control urination
- have increasing pain in the vaginal area
- have new or worsening belly pain
- develop a cough or chest pain, nausea, or vomiting
- have bad headaches or vision changes
- become depressed or have hallucinations, suicidal thoughts, or any thoughts of harming your baby

While recovering from delivery can be a lot to handle, things will get easier. Before you know it, you will be able to fully focus on enjoying your new baby.

Reviewed by: Elana Pearl Ben-Joseph, MD
Date reviewed: June 2018

From: McKane, Patricia (DHHS)
To: Nighswander, Tom (DHHS)
Subject: RE: 1422_11.6.17**Confidential**
Date: Wednesday, November 08, 2017 1:35:00 PM
Sensitivity: Confidential

Hi Tom,
Additional detail for the second incident. Sarah Lyon-Callo, Sandip Shah, Carrie Langbo, Harry Hawkins, Eleanor Stanley, and possibly others in the lab were on a call to discuss the FOIA request received by MDHHS and the Michigan Neonatal Biobank. Ed Goldman from the University of Michigan and Antonio Yancey from Wayne State University were on the call representing the Michigan Neonatal Biobank.
The purpose of the call was to discuss the FOIAS and the respective agencies role and response. During the call, I believe that someone was wondering about the motivation for the FOIA. Harry Hawkins, from the lab stated that the attorney was the father of a baby. Sarah Lyon-Callo and others cut him off and explained that we can't share that information. Originally, I thought that he obtained the information for the NBS data system, but I was told that paternity is not recorded in that system. So, to answer one of your questions he may have made an assumption. Since I reported this incident I learned that we have a data use agreement with the Michigan Neonatal Biobank, which addresses inadvertent disclosure of confidential information.

Further clarification about the first incident. Staff told me that on Friday October 27th Harry called Janice Bach and told her that he looked up the woman listed on the FOIA request and discovered that she had a baby one month ago and that she had declined saving her infant's blood spots to the Michigan Neonatal Biobank. He relayed the same information to Mary Kleyn in a phone call Monday October 30th. I didn't become aware until I was meeting with Janice on October 31st. At the time, Janice said that Harry shared the information in a meeting, but then later said it was during a phone call.
Since I'm getting this information second hand I realize that things may get lost in translation.

Patricia McKane, DVM MPH - Director Lifecourse Epidemiology and Genomics Divsion
Michigan Department of Health and Human Services
Mailing address: PO Box 30195
Lansing, MI 48909
Cell 517-290-2713 Office ph: 517-335-9315 Fax 517-3359790 **|** McKanep@michigan.gov

From: Nighswander, Tom (DHHS)
Sent: Wednesday, November 08, 2017 9:21 AM
To: McKane, Patricia (DHHS) <McKaneP@michigan.gov>
Subject: RE: 1422_11.6.17

Hi Patti,

Can you tell me what the context of the conversation was when this disclosure occurred? I'm wondering how the conversation lead to the disclosure.

And can you tell me the types of details that were shared? The incident report indicates name, DOB and medical history – the types of medical details will be helpful.

And... do you have the name/information of the individual whose information was disclosed? We will need this if we have to provide notice.

Thanks,
- Tom

From: McKane, Patricia (DHHS)
Sent: Monday, November 06, 2017 2:52 PM
To: MDHHSPrivacySecurity <MDHHSPrivacySecurity@michigan.gov>
Cc: Ward, Cynthia (DHHS) <WardC7@michigan.gov>
Subject: 1422_11.6.17

Second incident occurred today, this is in addition to the report that I submitted last week.
Has anyone followed up with lab? The individual that is doing this doesn't work in my area. I assumed that you had followed up with them.
Patti

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

ADAM KANUSZEWSKI, et al,
Plaintiffs,

v.

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES, et al,
Defendants
_____/

Case No.: 18-cv-10472

Hon. Thomas L. Ludington,
District Court Judge

Hon. Patricia T. Morris,
Magistrate Judge

DECLARATION OF ADAM AND ASHLEY KANUSZEWSKI

1. We are the parent and/or legal guardian of R.F.K. and C.K.K. Ashley Kanuszewski is the parent and legal guardian of D.W.L. while Adam Kanuszewski is his step-father and parent.

2. Before our children were born and thereafter, we have no recollection of being asked by anyone whether we consented to the State of Michigan, its officials, agents, or partners (or these Defendants), including the Michigan Neonatal Biobank, seizing and testing the samples or spots of our children's blood to conduct medical tests.

3. Before our children were born and thereafter, no one from the birthing hospital or from the State (including its officials, agents, or partners or these Defendants) communicated with us regarding the risks (medical, legal, etc), the benefits, and any alternatives to the Newborn Screening

Program, including the aspect of the program the State and its officials call the Michigan BioTrust for Health regarding the post-testing retention, storage, or uses of the blood samples by third parties ("biobanking") like the Michigan Neonatal Biobank or their customers like third-party scientists and researchers.

4. Before our children were born and thereafter, we were never provided a copy of any informational brochure about Newborn Screening Program.

5. Before our children were born and thereafter, we were never provided any information describing the post-testing biobanking program known as the Michigan BioTrust for Health or Michigan Neonatal Biobank.

6. Through this lawsuit, we have come to understand that some of our children's blood samples or "spots" are being stored by Defendants via its program called the "Michigan BioTrust for Health" while other blood samples or "spots" are being stored in a warehouse in Detroit with a private non-profit entity known as the Michigan Neonatal Biobank.

7. Until we made contact with our counsel who investigated this matter for us, we did not know, realize, or understand that these Defendants had seized and indefinitely retained our children's blood samples or "blood spots" in a warehouse in Lansing with the Michigan BioTrust for Health or in

a warehouse in Detroit with a private non-profit entity known as the Michigan Neonatal Biobank.

8. Until we made contact with our counsel who investigated this matter for us, we did not know, realize, or understand that the Defendants (including its partners like the Biobank and Dr. Yancey) marketed and made our children's blood spots available for distribution, use, testing, and other uses, including by for-profit and academic researchers and scientists, who extract and use children's personal and deeply-private medical and genetic information/data for their own research projects—whether for-profit or otherwise.

9. We have no recollection of being consulted or clearly asked whether the State of Michigan, its officials, agents, or partners could (or be authorized to) seize and test our children's blood as a type of medical procedure being done by laboratories owned and operated by Defendants.

10. From what we have now learned as part of this case, Ashley Kanuszewski was never asked and never provided any consent whatsoever for post-testing biobanking for D.W.L. due to being born before May 2010.

11. Ashley Kanuszewski never empowered or authorized the Michigan Department of Health and Human Services or its Institutional Review Board to grant consent (or make the decision to do so in our stead)

as to medical and privacy issues surrounding the blood spots Defendants had non-consensually seized from D.W.L. as part of the Newborn Screening Program.

12. As for our children R.F.K. and C.K.K, Defendants in this case have produced what it purports to be a consent document, a copy of which is attached hereto.

13. Despite what Defendants have provided and it does appear to be Ashley Kanuszewski's signature, Ashley Kanuszewski does not remember signing such documents as presented.

14. The reason why there is no memory of signing the document is because seeking consent in the immediate hours following the arduous, body-damaging, stressful, tiring, and painful experience of child birth (which includes receiving and being under the influence powerful medications related to birthing) is the worst possible time to have a parent make a fully informed, reasoned decision. The better and more reasonable time for Defendants to have sought consent was in the months or weeks leading up to the birth of our children, when parents like us would have had the opportunity to consult with medical and legal experts one-on-one, conduct research, investigate Defendants' assertions, and secure fully and complete answers whether to participate in the Newborn Screening Program, the

Michigan BioTrust for Health, and the Michigan Neonatal Biobank. The current process appears to intentionally seek consent when full information is not and cannot be made available to mothers and fathers, and when the person being asked, normally the mother, is in no condition to make such a decision, i.e. in the postpartum recovery process in the hospital. Such are clearly shortcomings in the consent-obtaining process for Michigan's newborn screening program.

15. Notwithstanding, we do not want, desire, or would have approved the Defendants (or their blood-spot customers) invading our children's personal and medical privacy by retaining, using, or sharing their blood spots for any purpose, including for retention, storage, or use by a private, non-profit entity like the Michigan Neonatal Biobank or by third-party researchers (whether for-profit or academic).

16. No one communicated with us in sufficient enough detail the risks, the benefits and any alternatives regarding the retention, storage, or uses of the blood samples by third parties like the Michigan Neonatal Biobank or third-party researchers and scientists over whom we have no control.

17. We have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to take possession, control, or custody of

our children's blood (which contains deeply private medical and genetic information of our children) from the State Laboratory.

18. We have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to retain or use our children's blood which contains deeply private medical and genetic information of our children.

19. We have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to market, sell, transfer, give away, or otherwise generate monies from the use of our children's blood which contains deeply private medical and genetic information of our children.

20. From this lawsuit, we have learned that there is a process self-created by the Michigan Department of Health and Human Services to have our children's blood spots destroyed if requested after-the-fact.

21. Defendants never provided the form or sufficient information on how to do that prior to this lawsuit.

22. The gist of this process is improper because Defendants should not have kept, retained, stored, marketed, attempted to use, or use our children's blood spots (together with the personal and deeply-private medical and genetic information/data contained therein) in the first place without first fully and completely explaining the entire scope of their activities and expressly first obtained our informed consent.

23. Had we known the full and complete scope of the Newborn Screening Program, the Michigan BioTrust for Health, and Michigan Neonatal Biobank, we would have never provided any consent or authorization for any part of this program as it is both invasion and evisceration of our children's personal and medical privacy and personal autonomy, and improperly invades our rights as parents to make all decisions concerning the medical care of our children.

24. Any consent Defendants claim to have obtained from us regarding any aspects of our children's blood spots (together with the personal and deeply-private medical and genetic information/data contained therein) was done without our sufficient *informed* consent.

25. In addition, we have also come to learn that the State Defendants have retained and will indefinitely keep in government files and databases our children's personal and deeply-private medical and genetic information/data extracted during the medical tests conducted on our children by the newborn screening procedures.

26. We never gave consent or authorization for Defendants to retain, store, and indefinitely keep our children's personal and deeply-private medical and genetic information/data in the government's files and databases.

27. We have not and do not want, desire, or would have approved the Defendants (or their blood-spot customers) invading our children's personal and medical privacy by retaining, using, or sharing any of their medical data being kept in government databases.

28. By having custody of our children's blood beyond our consent, including beyond any informed consent, we believe our children are currently being harmed by interference with their personal autonomy and the invasion and evisceration of their personal and medical privacy via the unauthorized retention of their blood samples containing extractable or already extracted deeply private medical and genetic information.

29. Beyond the harm of unauthorized persons having extractable or already extracted deeply private medical and genetic information about our children without our consent, our children (and myself as their parent) are suffering from interference with their personal autonomy and invasions (and evisceration) of our children's personal and medical privacy because deeply private medical and genetic information and related blood samples are no longer in our control when distributed for uses for which we are not given notice of, and further did not consent to, consider, or authorize.

30. Because the State Defendants transferred our children's blood spots (which contains deeply private medical and genetic information of our

children) to the Michigan Neonatal Biobank, Inc (and Dr. Antonio Yancey) without notice or our consent, no one from the Michigan Neonatal Biobank, Inc will provide us notice or seek our informed consent before transferring or selling our children's blood spots (which contains deeply private medical and genetic information of our children) to other individuals and entities as done by and is the stated purpose of Michigan Neonatal Biobank, Inc and/or Dr. Antonio Yancey regarding blood samples.

31. Currently, nothing absolutely prevents Defendants from publicly disclosing our children's deeply private medical and genetic information extracted or extractable from our children's blood spots to others and then be improperly used by the general public.

32. My attorney has at least one example of state employees disclosing information about parents who inquired about the newborn screening program. See Exhibit W, Plaintiffs' Motion for Summary Judgment.

33. Such breaches, even if accidental, prevent us (as a parent) or our children (when they become adults) from have sufficient and certain control over the privacy of their private medical and genetic information from government and/or public searches and uses.

34. Because of the lack of these protections, the State Defendants have already transferred our children's blood samples containing their

deeply private medical and genetic information to a third-party entity—the Michigan Neonatal Biobank, Inc—which we did not authorize.

35. We wish to fully preserve our children's medical and genetic privacy from Defendants and/or all other persons/entities seeking to access to our children's non-consensually seized blood spots and/or the deeply private medical and genetic information contained therein.

36. We wish to fully preserve our children's medical and genetic privacy from Defendants and/or all other persons/entities seeking to access our children's deeply private medical and genetic information being retained in the government's files and databases.

37. Defendants' repeated assertion that we can simply destroy, by request, the already-tested blood spots of our children being held in Lansing and Detroit warehouses is insufficient because it does not allow us to regain complete control over (or otherwise protect) the deeply private medical and genetic information already extracted and currently possessed by Defendants in their files and databases.

38. In addition, we object to the way the State Defendants, through licensed doctors and nurses conscripted during and after the birth of our children, waited until the birth date or in the immediate aftermath to try to seek what they think is sufficient consent on behalf of Defendants; it is our

opinion that such consent in such difficult circumstances was sought by stealth or subterfuge.

39. Had we been fully and properly informed about the depth and scope of the Newborn Screening Program, including the transfer of our children's blood samples to a third-party for sale and use by others, the current retention of the deeply private medical and genetic information of our children in the government's files and databases (and possibly others), the marketing, soliciting, selling, and/or charging of fees for our children's blood, the interference with personal autonomy, and the intrusion into and evisceration of our children's medical and genetic privacy, we would have never given any form of consent whatsoever notwithstanding any possible prior incomplete consent we previously might have provided.

40. We have not given unequivocal, specific, and intelligently-given consent for our children's participation in the Newborn Screening Program (and the BioTrust for Health), specifically including any transfer of our children's blood samples to a third-party (like the Biobank) for marketing, solicitation, sale and/or use by others, the current retention of the deeply private medical and genetic information of our children in the government's files and databases (and possibly others), the sale or charging of fees for our children's blood, the interference with personal autonomy, and the intrusion

into and evisceration of our children's medical and genetic privacy and interference with their personal autonomy.

41. Nevertheless, we expressly state that at the time each of our children were born, we were never fully informed about the full depth and scope of the Newborn Screening Program (including the BioTrust for Health and Michigan Neonatal Biobank) as this lawsuit has brought to light.

42. With the extreme secrecy of the Newborn Screening Program, the over-expanded scope of the testing program other than as presented (including the non-noticed participation of the Michigan Neonatal Biobank and Dr. Yancey), and the limited and incomplete information provided to us during the birth of our children about the Newborn Screening Program, our lack of informed consent, the lack of any authorization for the possession, control, custody, sale, or transfer of children's blood to or by the Michigan Neonatal Biobank, Inc and/or Dr. Antonio Yancey, the Newborn Screening Program is an intolerable interference with personal autonomy and an intolerable intrusion into the privacy of our children and their medical privacy and should be deemed unconstitutional.

43. Pursuant to 28 U.S.C. § 1746, we each declare under penalty of perjury that the foregoing is true and correct.

Executed on 02 / 18 / 2021

Adam Kanuszewski

Executed on 02 / 19 / 2021

Ashley Kanuszewski

Child "C.K.K."

Michigan BioTrust for Health
research for the future

Baby Name

Admin. Use Only

Affix Label Here if Desired
Mark Parent Decision, Collect Signature, Return to MDCH

Blood spots are stored indefinitely (forever). Blood spots labeled with a code can be used for health research through the BioTrust. The brochure, *Your Baby's Blood Spots*, gives details to help you make a choice about allowing your baby's blood spots to be used in health research. Please read this brochure. If you still have questions, please call the Department of Community Health *toll free* at: 1-866-673-9939.

☒ Yes, my baby's blood spots may be used for health research.	☐ No, my baby's blood spots may not be used for health research.
This applies to all blood spots collected for newborn screening.	*There is no penalty for saying no.*

SN 2027251

38371

Ashley Kaniszewski
Parent Signature

2-10-16
Date

MI Dept of Community Health Laboratory Copy

Child "R.F.K."

Michigan BioTrust for Health
research for the future

Baby Name

Affix Label Here if Desired

Admin. Use Only

☒ Information Provided to Parent

☐ Parent Declined

You should have been given the booklet, *"After Newborn Screening"*. If not, please ask for it. This booklet describes the **Michigan BioTrust for Health** and how dried blood spots (DBS) could be used for medical research after newborn screening is complete. Please read this booklet and if you have any additional questions, you may call the Newborn Screening Program at *1-866-673-9939*.

- Participation in the Michigan BioTrust for Health is completely voluntary.
- If I say "yes" now I may change my mind at any time and ask that my child's DBS not be used for research by calling *1-866-673-9939*.
- When my child is 18 he or she can ask that their DBS not be used for research.
- There is no penalty from not allowing my child's DBS to be used for research.

I voluntarily agree to allow my child's DBS to possibly be used for medical research after newborn screening is complete. My permission applies to any blood spots obtained for newborn screening.

SN 1614380

38371

x Ashley Kanuszewski — Parent Signature

4-22-13 — Date

MI Dept of Community Health Laboratory Copy

HELLOSIGN

Audit Trail

TITLE	Kanuszewski Declaration
FILE NAME	_Kanuszewski Affidavit.pdf
DOCUMENT ID	ef63c92b64a78c44887b84d5609604ee365d0787
AUDIT TRAIL DATE FORMAT	MM / DD / YYYY
STATUS	Completed

Document History

SENT	**02 / 18 / 2021** 00:26:34 UTC	Sent for signature to Adam Kanuszewski (kanuszea@gmail.com) and Ashley Kanuszewski (ayers.ashley@gmail.com) from pellison@olcplc.com IP: 158.51.68.90
VIEWED	**02 / 18 / 2021** 13:56:01 UTC	Viewed by Ashley Kanuszewski (ayers.ashley@gmail.com) IP: 24.247.27.22
VIEWED	**02 / 18 / 2021** 15:21:13 UTC	Viewed by Adam Kanuszewski (kanuszea@gmail.com) IP: 24.180.168.174
SIGNED	**02 / 18 / 2021** 15:23:12 UTC	Signed by Adam Kanuszewski (kanuszea@gmail.com) IP: 24.180.168.174
SIGNED	**02 / 19 / 2021** 19:23:16 UTC	Signed by Ashley Kanuszewski (ayers.ashley@gmail.com) IP: 24.247.27.22
COMPLETED	**02 / 19 / 2021** 19:23:16 UTC	The document has been completed.

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

ADAM KANUSZEWSKI, et al,
Plaintiffs,

v.

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES, et al,
Defendants
_____/

Case No.: 18-cv-10472

Hon. Thomas L. Ludington,
District Court Judge

Hon. Patricia T. Morris,
Magistrate Judge

DECLARATION OF SHANNON LAPORTE

1. I am a parent and/or legal guardian of M.T.L. and E.M.O.

2. Before my children were born and thereafter, I have no recollection of being asked by anyone whether I consented to the State of Michigan, its officials, agents, or partners (or these Defendants), including the Michigan Neonatal Biobank, seizing and testing the samples or spots of my children's blood to conduct medical tests.

3. Before my children were born and thereafter, no one from the birthing hospital or from the State (including its officials, agents, or partners or these Defendants) communicated with me regarding the risks (medical, legal, etc), the benefits, and any alternatives to the Newborn Screening Program, including the aspect of the program the State and its officials call the Michigan BioTrust for Health regarding the post-testing retention,

storage, or uses of the blood samples by third parties ("biobanking") like the Michigan Neonatal Biobank or their customers like third-party scientists and researchers.

4. Before my children were born and thereafter, I was never provided a copy of any informational brochure about Newborn Screening Program.

5. Before my children were born and thereafter, I was never provided any information describing the post-testing biobanking program known as the Michigan BioTrust for Health or Michigan Neonatal Biobank.

6. Through this lawsuit, I have come to understand that some of my children's blood samples or "spots" are being stored by Defendants via its program called the "Michigan BioTrust for Health" while other blood samples or "spots" are being stored in a warehouse in Detroit with a private non-profit entity known as the Michigan Neonatal Biobank.

7. Until I made contact with my counsel who investigated this matter for me, I did not know, realize, or understand that these Defendants had seized and indefinitely retained my children's blood samples or "blood spots" in a warehouse in Lansing with the Michigan BioTrust for Health or in a warehouse in Detroit with a private non-profit entity known as the Michigan Neonatal Biobank.

8. Until I made contact with my counsel who investigated this matter for me, I did not know, realize, or understand that the Defendants (including its partners like the Biobank and Dr. Yancey) marketed and made my children's blood spots available for distribution, use, testing, and other uses, including by for-profit and academic researchers and scientists, who extract and use children's personal and deeply-private medical and genetic information/data for their own research projects—whether for-profit or otherwise.

9. I have no recollection of being consulted or clearly asked whether the State of Michigan, its officials, agents, or partners could (or be authorized to) seize and test my children's blood as a type of medical procedure being done by laboratories owned and operated by Defendants.

10. From what I have now learned as part of this case, I was never asked and I never provided any consent whatsoever for post-testing biobanking for my child M.T.L. due to his being born before May 2010.

11. I never empowered or authorized the Michigan Department of Health and Human Services or its Institutional Review Board to grant consent (or make the decision to do so in my stead) as to medical and privacy issues surrounding the blood spots Defendants had non-consensually seized from M.T.L. as part of the Newborn Screening Program.

12. As for my child E.M.O., Defendants in this case have produced what it purports to be a consent document, a copy of which is attached hereto.

13. Despite what Defendants have provided and it does appear to be my signature, I do not remember signing this document as presented.

14. The reason why I likely do not remember signing the document is because seeking consent in the immediate hours following the arduous, body-damaging, stressful, tiring, and painful experience of child birth (which includes receiving and being under the influence powerful medications related to birthing) is the worst possible time to have a parent make a fully informed, reasoned decision. The better and more reasonable time for Defendants to have sought consent was in the months or weeks leading up to the birth of my children, when parents like me would have had the opportunity to consult with medical and legal experts one-on-one, conduct research, investigate Defendants' assertions, and secure fully and complete answers whether to participate in the Newborn Screening Program, the Michigan BioTrust for Health, and the Michigan Neonatal Biobank. The current process appears to intentionally seek consent when full information is not and cannot be made available to mothers and fathers, and when the person being asked, normally the mother, is in no condition to make such a

decision, i.e. in the postpartum recovery process in the hospital. Such are clearly shortcomings in the consent-obtaining process for Michigan's newborn screening program.

15. Notwithstanding, I do not want, desire, or would have approved the Defendants (or their blood-spot customers) invading my children's personal and medical privacy by retaining, using, or sharingtheir blood spots for any purpose, including for retention, storage, or use by a private, non-profit entity like the Michigan Neonatal Biobank or by third-party researchers (whether for-profit or academic).

16. No one communicated with me in sufficient enough detail the risks, the benefits and any alternatives regarding the retention, storage, or uses of the blood samples by third parties like the Michigan Neonatal Biobank or third-party researchers and scientists over whom I have no control.

17. I have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to take possession, control, or custody of my children's blood (which contains deeply private medical and genetic information of my children) from the State Laboratory.

18. I have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to retain or use my children's blood which contains deeply private medical and genetic information of my children.

19. I have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to market, sell, transfer, give away, or otherwise generate monies from the use of my children's blood which contains deeply private medical and genetic information of my children.

20. From this lawsuit, I have learned that there is a process self-created by the Michigan Department of Health and Human Services to have my children's blood spots destroyed if requested after-the-fact.

21. Defendants never provided the form or sufficient information on how to do that.

22. The gist of this process is improper because Defendants should not have kept, retained, stored, marketed, attempted to use, or use my children's blood spots (together with the personal and deeply-private medical and genetic information/data contained therein) in the first place without first fully and completely explaining the entire scope of their activities and expressly first obtained my informed consent.

23. Had I known the full and complete scope of the Newborn Screening Program, the Michigan BioTrust for Health, and Michigan

Neonatal Biobank, I would have never provided any consent or authorization for any part of this program as it is both invasion and evisceration of the children's personal and medical privacy and personal autonomy, and improperly invades my rights as a parent to make all decisions concerning the medical care of my children.

24. Any consent Defendants claim to have obtained from me regarding any aspects of my children's blood spots (together with the personal and deeply-private medical and genetic information/data contained therein) was done without my sufficient *informed* consent.

25. In addition, I have also come to learn that the State Defendants have retained and will indefinitely keep in government files and databases my children's personal and deeply-private medical and genetic information/data extracted during the medical tests conducted on my children by the newborn screening procedures.

26. I never gave consent or authorization for Defendants to retain, store, and indefinitely keep my children's personal and deeply-private medical and genetic information/data in the government's files and databases.

27. I have not and do not want, desire, or would have approved the Defendants (or their blood-spot customers) invading my children's personal

and medical privacy by retaining, using, or sharing any of their medical data being kept in government databases.

28. By having custody of my children's blood beyond my consent, including beyond any informed consent, I believe my children are currently being harmed by interference with their personal autonomy and the invasion and evisceration of their personal and medical privacy via the unauthorized retention of their blood samples containing extractable or already extracted deeply private medical and genetic information.

29. Beyond the harm of unauthorized persons having extractable or already extracted deeply private medical and genetic information about my children without my consent, my children (and myself as their parent) are suffering from interference with their personal autonomy and invasions (and evisceration) of my children's personal and medical privacy because deeply private medical and genetic information and related blood samples are no longer in my control when distributed for uses for which I am not given notice of, and further did not consent to, consider, or authorize.

30. Because the State Defendants transferred my children's blood spots (which contains deeply private medical and genetic information of my children) to the Michigan Neonatal Biobank, Inc (and Dr. Antonio Yancey) without notice or my consent, no one from the Michigan Neonatal Biobank,

Inc will provide me notice or seek my informed consent before transferring or selling my children's blood spots (which contains deeply private medical and genetic information of my children) to other individuals and entities as done by and is the stated purpose of Michigan Neonatal Biobank, Inc and/or Dr. Antonio Yancey regarding blood samples.

31. Currently, nothing absolutely prevents Defendants from publicly disclosing my children's deeply private medical and genetic information extracted or extractable from my children's blood spots to others and then be improperly used by the general public.

32. My attorney has at least one example of state employees disclosing information about parents who inquired about the newborn screening program. See Exhibit W, Plaintiffs' Motion for Summary Judgment.

33. Such breaches, even if accidental, prevent me (as a parent) or my children (when they become adults) from have sufficient and certain control over the privacy of their private medical and genetic information from government and/or public searches and uses.

34. Because of the lack of these protections, the State Defendants have already transferred my children's blood samples containing their deeply private medical and genetic information to a third-party entity—the Michigan Neonatal Biobank, Inc—which I did not authorize.

35. I wish to fully preserve my children's medical and genetic privacy from Defendants and/or all other persons/entities seeking to access to my children's non-consensually seized blood spots and/or the deeply private medical and genetic information contained therein.

36. I wish to fully preserve my children's medical and genetic privacy from Defendants and/or all other persons/entities seeking to access my children's deeply private medical and genetic information being retained in the government's files and databases.

37. Defendants' repeated assertion that I can simply destroy, by request, the already-tested blood spots of my children being held in Lansing and Detroit warehouses is insufficient because it does not allow me to regain complete control over (or otherwise protect) the deeply private medical and genetic information already extracted and currently possessed by Defendants in their files and databases.

38. In addition, I object to the way the State Defendants, through licensed doctors and nurses conscripted during and after the birth of my children, waited until the birth date or in the immediate aftermath to try to seek what they think is sufficient consent on behalf of Defendants; it is my opinion that such consent in such difficult circumstances was sought by stealth or subterfuge.

39. Had I been fully and properly informed about the depth and scope of the Newborn Screening Program, including the transfer of my children's blood samples to a third-party for sale and use by others, the current retention of the deeply private medical and genetic information of my children in the government's files and databases (and possibly others), the marketing, soliciting, selling, and/or charging of fees for my children's blood, the interference with personal autonomy, and the intrusion into and evisceration of my children's medical and genetic privacy, I would have never given any form of consent whatsoever notwithstanding any possible prior incomplete consent I previously might have provided.

40. I have not given unequivocal, specific, and intelligently-given consent for my children's participation in the Newborn Screening Program (and the BioTrust for Health), specifically including any transfer of my children's blood samples to a third-party (like the Biobank) for marketing, solicitation, sale and/or use by others, the current retention of the deeply private medical and genetic information of my children in the government's files and databases (and possibly others), the sale or charging of fees for my children's blood, the interference with personal autonomy, and the intrusion into and evisceration of my children's medical and genetic privacy and interference with their personal autonomy.

41. Nevertheless, I expressly state that at the time each of my children were born, I was never fully informed about the full depth and scope of the Newborn Screening Program (including the BioTrust for Health and Michigan Neonatal Biobank) as this lawsuit has brought to light.

42. With the extreme secrecy of the Newborn Screening Program, the over-expanded scope of the testing program other than as presented (including the non-noticed participation of the Michigan Neonatal Biobank and Dr. Yancey), and the limited and incomplete information provided to me during the birth of my children about the Newborn Screening Program, my lack of informed consent, the lack of any authorization for the possession, control, custody, sale, or transfer of children's blood to or by the Michigan Neonatal Biobank, Inc and/or Dr. Antonio Yancey, the Newborn Screening Program is an intolerable interference with personal autonomy and an intolerable intrusion into the privacy of my children and their medical privacy and should be deemed unconstitutional.

43. Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on 02 / 17 / 2021

Shannon LaPorte

Child "E.M.O."

Before you sign this form please read, *Your Baby's Blood Spots.* It explains in more detail how your baby's blood spots may be used in health research through the Michigan BioTrust for Health. If you still have questions, please call the Michigan Department of Health and Human Services (MDHHS) toll free at 1-866-673-9939.

☐ **Yes, my baby's blood spots <u>may be</u> used for health research through the BioTrust.**
By checking this box you understand:

- Unused blood spots are stored using a code and not your child's name. The spots are stored forever at a secure site (Biobank) unless you, or your grown child, change your mind.
- Stored blood spots may be used by the state lab to help ensure that newborn screening detects those at risk. Stored blood spots may also be used for research approved by MDHHS. Blood spots can only be used for studies to better understand disease or improve the public's health.
- Many types of laboratory methods are used to study biological factors like DNA or environmental factors like metals and toxins.
- The risk for using your baby's blood spots in research is that it could be identified. This risk is very low. Many steps are taken to protect privacy. Details that could identify your child or family are removed before your child's blood spots are given to a researcher.
- Most likely you or your child will not benefit from blood spot research.
- Participation is voluntary. You can call MDHHS at any time if you change your mind. There is no penalty or loss of benefits for saying no or changing your mind.

☒ **No, my baby's blood spots <u>may not</u> be used for health research.**
By checking this box you understand:

- Blood spots will be stored forever but not used for research. These stored blood spots may still be used by the state lab to help ensure that newborn screening detects those at risk.
- You must contact MDHHS if you do not want blood spots stored for any reason after newborn screening.

Parent Signature 2/12/17 *Date*

Your choice applies to all blood spots collected for newborn screening. Please visit www.michigan.gov/biotrust for further information including research updates. For questions about your research rights or whom to contact in case of a research-related injury, please call the MDHHS IRB at 517-241-1928.

38371

MDHHS Copy

SN 2365751

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UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

ADAM KANUSZEWSKI, et al,
Plaintiffs,

v.

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES, et al,
Defendants
_____/

Case No.: 18-cv-10472

Hon. Thomas L. Ludington,
District Court Judge

Hon. Patricia T. Morris,
Magistrate Judge

DECLARATION OF LYNNETTE WIEGAND

1. I am a parent and/or legal guardian of L.R.W., C.J.W., H.J.W., and M.L.W.

2. Before my children were born and thereafter, I have no recollection of being asked by anyone whether I consented to the State of Michigan, its officials, agents, or partners (or these Defendants), including the Michigan Neonatal Biobank, seizing and testing the samples or spots of my children's blood to conduct medical tests.

3. Before my children were born and thereafter, no one from the birthing hospital or from the State (including its officials, agents, or partners or these Defendants) communicated with me regarding the risks (medical, legal, etc), the benefits, and any alternatives to the Newborn Screening Program, including the aspect of the program the State and its officials call

the Michigan BioTrust for Health regarding the post-testing retention, storage, or uses of the blood samples by third parties ("biobanking") like the Michigan Neonatal Biobank or their customers like third-party scientists and researchers.

4. Before my children were born and thereafter, I was never provided a copy of any informational brochure about Newborn Screening Program.

5. Before my children were born and thereafter, I was never provided any information describing the post-testing biobanking program known as the Michigan BioTrust for Health or Michigan Neonatal Biobank.

6. Through this lawsuit, I have come to understand that some of my children's blood samples or "spots" are being stored by Defendants via its program called the "Michigan BioTrust for Health" while other blood samples or "spots" are being stored in a warehouse in Detroit with a private non-profit entity known as the Michigan Neonatal Biobank.

7. Until I made contact with my counsel who investigated this matter for me, I did not know, realize, or understand that these Defendants had seized and indefinitely retained my children's blood samples or "blood spots" in a warehouse in Lansing with the Michigan BioTrust for Health or in a

warehouse in Detroit with a private non-profit entity known as the Michigan Neonatal Biobank.

8. Until I made contact with my counsel who investigated this matter for me, I did not know, realize, or understand that the Defendants (including its partners like the Biobank and Dr. Yancey) marketed and made my children's blood spots available for distribution, use, testing, and other uses, including by for-profit and academic researchers and scientists, who extract and use children's personal and deeply-private medical and genetic information/data for their own research projects—whether for-profit or otherwise.

9. I have no recollection of being consulted or clearly asked whether the State of Michigan, its officials, agents, or partners could (or be authorized to) seize and test my children's blood as a type of medical procedure being done by laboratories owned and operated by Defendants.

10. Defendants in this case have produced what it purports to be consent documents, copies of which aer attached hereto.

11. Despite what Defendants have provided and it does appear to be my signature, I do not remember signing this document as presented. In fact, during one of those time, I do not remember being in the hospital as I was under heavy birth-related medications.

12. The reason why I likely do not remember signing the document is because seeking consent in the immediate hours following the arduous, body-damaging, stressful, tiring, and painful experience of child birth (which includes receiving and being under the influence powerful medications related to birthing) is the worst possible time to have a parent make a fully informed, reasoned decision. The better and more reasonable time for Defendants to have sought consent was in the months or weeks leading up to the birth of my children, when parents like me would have had the opportunity to consult with medical and legal experts one-on-one, conduct research, investigate Defendants' assertions, and secure fully and complete answers whether to participate in the Newborn Screening Program, the Michigan BioTrust for Health, and the Michigan Neonatal Biobank. The current process appears to intentionally seek consent when full information is not and cannot be made available to mothers and fathers, and when the person being asked, normally the mother, is in no condition to make such a decision, i.e. in the postpartum recovery process in the hospital. Such are clearly shortcomings in the consent-obtaining process for Michigan's newborn screening program.

13. Notwithstanding, I do not want, desire, or would have approved the Defendants (or their blood-spot customers) invading my children's

personal and medical privacy by retaining, using, or sharing their blood spots for any purpose, including for retention, storage, or use by a private, non-profit entity like the Michigan Neonatal Biobank or by third-party researchers (whether for-profit or academic).

14. No one communicated with me in sufficient enough detail the risks, the benefits and any alternatives regarding the retention, storage, or uses of the blood samples by third parties like the Michigan Neonatal Biobank or third-party researchers and scientists over whom I have no control.

15. I have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to take possession, control, or custody of my children's blood (which contains deeply private medical and genetic information of my children) from the State Laboratory.

16. I have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to retain or use my children's blood which contains deeply private medical and genetic information of my children.

17. I have never authorized Michigan Neonatal Biobank, Inc (or its Director, Dr. Antonio Yancey) to market, sell, transfer, give away, or otherwise generate monies from the use of my children's blood which contains deeply private medical and genetic information of my children.

18. From this lawsuit, I have learned that there is a process self-created by the Michigan Department of Health and Human Services to have my children's blood spots destroyed if requested after-the-fact.

19. Defendants never provided the form or sufficient information on how to do that.

20. The gist of this process is improper because Defendants should not have kept, retained, stored, marketed, attempted to use, or use my children's blood spots (together with the personal and deeply-private medical and genetic information/data contained therein) in the first place without first fully and completely explaining the entire scope of their activities and expressly first obtained my informed consent.

21. Had I known the full and complete scope of the Newborn Screening Program, the Michigan BioTrust for Health, and Michigan Neonatal Biobank, I would have never provided any consent or authorization for any part of this program as it is both invasion and evisceration of the children's personal and medical privacy and personal autonomy, and improperly invades my rights as a parent to make all decisions concerning the medical care of my children.

22. Any consent Defendants claim to have obtained from me regarding any aspects of my children's blood spots (together with the

personal and deeply-private medical and genetic information/data contained therein) was done without my sufficient *informed* consent.

23. In addition, I have also come to learn that the State Defendants have retained and will indefinitely keep in government files and databases my children's personal and deeply-private medical and genetic information/data extracted during the medical tests conducted on my children by the newborn screening procedures.

24. I never gave consent or authorization for Defendants to retain, store, and indefinitely keep my children's personal and deeply-private medical and genetic information/data in the government's files and databases.

25. I have not and do not want, desire, or would have approved the Defendants (or their blood-spot customers) invading my children's personal and medical privacy by retaining, using, or sharing any of their medical data being kept in government databases.

26. By having custody of my children's blood beyond my consent, including beyond any informed consent, I believe my children are currently being harmed by interference with their personal autonomy and the invasion and evisceration of their personal and medical privacy via the unauthorized

retention of their blood samples containing extractable or already extracted deeply private medical and genetic information.

27. Beyond the harm of unauthorized persons having extractable or already extracted deeply private medical and genetic information about my children without my consent, my children (and myself as their parent) are suffering from interference with their personal autonomy and invasions (and evisceration) of my children's personal and medical privacy because deeply private medical and genetic information and related blood samples are no longer in my control when distributed for uses for which I am not given notice of, and further did not consent to, consider, or authorize.

28. Because the State Defendants transferred my children's blood spots (which contains deeply private medical and genetic information of my children) to the Michigan Neonatal Biobank, Inc (and Dr. Antonio Yancey) without notice or my consent, no one from the Michigan Neonatal Biobank, Inc will provide me notice or seek my informed consent before transferring or selling my children's blood spots (which contains deeply private medical and genetic information of my children) to other individuals and entities as done by and is the stated purpose of Michigan Neonatal Biobank, Inc and/or Dr. Antonio Yancey regarding blood samples.

29. Currently, nothing absolutely prevents Defendants from publicly disclosing my children's deeply private medical and genetic information extracted or extractable from my children's blood spots to others and then be improperly used by the general public.

30. My attorney has at least one example of state employees disclosing information about parents who inquired about the newborn screening program. See Exhibit W, Plaintiffs' Motion for Summary Judgment.

31. Such breaches, even if accidental, prevent me (as a parent) or my children (when they become adults) from have sufficient and certain control over the privacy of their private medical and genetic information from government and/or public searches and uses.

32. Because of the lack of these protections, the State Defendants have already transferred my children's blood samples containing their deeply private medical and genetic information to a third-party entity—the Michigan Neonatal Biobank, Inc—which I did not authorize.

33. I wish to fully preserve my children's medical and genetic privacy from Defendants and/or all other persons/entities seeking to access to my children's non-consensually seized blood spots and/or the deeply private medical and genetic information contained therein.

34. I wish to fully preserve my children's medical and genetic privacy from Defendants and/or all other persons/entities seeking to access my children's deeply private medical and genetic information being retained in the government's files and databases.

35. Defendants' repeated assertion that I can simply destroy, by request, the already-tested blood spots of my children being held in Lansing and Detroit warehouses is insufficient because it does not allow me to regain complete control over (or otherwise protect) the deeply private medical and genetic information already extracted and currently possessed by Defendants in their files and databases.

36. In addition, I object to the way the State Defendants, through licensed doctors and nurses conscripted during and after the birth of my children, waited until the birth date or in the immediate aftermath to try to seek what they think is sufficient consent on behalf of Defendants; it is my opinion that such consent in such difficult circumstances was sought by stealth or subterfuge.

37. Had I been fully and properly informed about the depth and scope of the Newborn Screening Program, including the transfer of my children's blood samples to a third-party for sale and use by others, the current retention of the deeply private medical and genetic information of my

children in the government's files and databases (and possibly others), the marketing, soliciting, selling, and/or charging of fees for my children's blood, the interference with personal autonomy, and the intrusion into and evisceration of my children's medical and genetic privacy, I would have never given any form of consent whatsoever notwithstanding any possible prior incomplete consent I previously might have provided.

38. I have not given unequivocal, specific, and intelligently-given consent for my children's participation in the Newborn Screening Program (and the BioTrust for Health), specifically including any transfer of my children's blood samples to a third-party (like the Biobank) for marketing, solicitation, sale and/or use by others, the current retention of the deeply private medical and genetic information of my children in the government's files and databases (and possibly others), the sale or charging of fees for my children's blood, the interference with personal autonomy, and the intrusion into and evisceration of my children's medical and genetic privacy and interference with their personal autonomy.

39. Nevertheless, I expressly state that at the time each of my children were born, I was never fully informed about the full depth and scope of the Newborn Screening Program (including the BioTrust for Health and Michigan Neonatal Biobank) as this lawsuit has brought to light.

40. With the extreme secrecy of the Newborn Screening Program, the over-expanded scope of the testing program other than as presented (including the non-noticed participation of the Michigan Neonatal Biobank and Dr. Yancey), and the limited and incomplete information provided to me during the birth of my children about the Newborn Screening Program, my lack of informed consent, the lack of any authorization for the possession, control, custody, sale, or transfer of children's blood to or by the Michigan Neonatal Biobank, Inc and/or Dr. Antonio Yancey, the Newborn Screening Program is an intolerable interference with personal autonomy and an intolerable intrusion into the privacy of my children and their medical privacy and should be deemed unconstitutional.

41. Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on 02 / 17 / 2021

Lynnette Wiegand

Child "C.J.W."

Michigan BioTrust for Health
research for the future

Baby Name

Wiegand,Boy A Lynnette 102-60-26
DOB: 7/17/2013 7/17/2013 H304-02
0 dy - male Chai Yakarn Soontharotok*
78657951

Admin. Use Only

☒ Information Provided to Parent

☐ Parent Declined

You should have been given the booklet, *"After Newborn Screening"*. If not, please ask for it. This booklet describes the **Michigan BioTrust for Health** and how dried blood spots (DBS) could be used for medical research after newborn screening is complete. Please read this booklet and if you have any additional questions, you may call the Newborn Screening Program at *1-866-673-9939*.

- Participation in the Michigan BioTrust for Health is completely voluntary.
- If I say "yes" now I may change my mind at any time and ask that my child's DBS not be used for research by calling *1-866-673-9939*.
- When my child is 18 he or she can ask that their DBS not be used for research.
- There is no penalty from not allowing my child's DBS to be used for research.

I voluntarily agree to allow my child's DBS to possibly be used for medical research after newborn screening is complete. My permission applies to any blood spots obtained for newborn screening.

SN 1657527

38371

x Cynthia M Wiegand
Parent Signature

7-18-13
Date

MI Dept of Community Health Laboratory Copy

Child "H.J.W."

Michigan BioTrust for Health
research for the future

Baby N: Wiegand,Boy A Lynnette 108-08-10
DOB: 12/24/2014 12/24/2014 H318-02
0 dy - male Chai Yakarn Soontharotok*
Mark 83286263 um to MDCH

Admin. Use Only

Blood spots are stored indefinitely (forever). Blood spots labeled with a code can be used for health research through the BioTrust. The brochure, *Your Baby's Blood Spots*, gives details to help you make a choice about allowing your baby's blood spots to be used in health research. Please read this brochure. If you still have questions, please call the Department of Community Health *toll free* at: 1-866-673-9939.

☒ Yes, my baby's blood spots may be used for health research.	☐ No, my baby's blood spots may not be used for health research.
This applies to all blood spots collected for newborn screening.	*There is no penalty for saying no.*

SN 1836403

38371

Parent Signature: Lynnette Wiegand Date: 12-25-14

MI Dept of Community Health Laboratory Copy

Child "L.R.W."

Michigan BioTrust for Health
research for the future

Baby Name

[redacted]

Admin. Use Only

☐ Information Provided to Parent

☐ Parent Declined

You should have been given the booklet, *"After Newborn Screening"*. If not, please ask for it. This booklet describes the **Michigan BioTrust for Health** and how dried blood spots (DBS) could be used for medical research after newborn screening is complete. Please read this booklet and if you have any additional questions, you may call the Newborn Screening Program at *1-866-673-9939*.

- Participation in the Michigan BioTrust for Health is completely voluntary.
- If I say "yes" now I may change my mind at any time and ask that my child's DBS not be used for research by calling *1-866-673-9939*.
- When my child is 18 he or she can ask that their DBS not be used for research.
- There is no penalty from not allowing my child's DBS to be used for research.

I voluntarily agree to allow my child's DBS to possibly be used for medical research after newborn screening is complete. My permission applies to any blood spots obtained for newborn screening.

SN 1447191

38371

[redacted] m Wiz

Parent Signature

11-22-11

Date

MI Dept of Community Health Laboratory Copy

Child "M.L.W."

Before you sign this form please read, *Your Baby's Blood Spots*. It explains in more detail how your baby's blood spots may be used in health research through the Michigan BioTrust for Health. If you still have questions, please call the Michigan Department of Health and Human Services (MDHHS) toll free at 1-866-673-9939.

☐ **Yes, my baby's blood spots may be used for health research through the BioTrust.**
By checking this box you understand:

- Unused blood spots are stored using a code and not your child's name. The spots are stored forever at a secure site (Biobank) unless you, or your grown child, change your mind.
- Stored blood spots may be used by the state lab to help ensure that newborn screening detects those at risk. Stored blood spots may also be used for research approved by MDHHS. Blood spots can only be used for studies to better understand disease or improve the public's health.
- Many types of laboratory methods are used to study biological factors like DNA or environmental factors like metals and toxins.
- The risk for using your baby's blood spots in research is that it could be identified. This risk is very low. Many steps are taken to protect privacy. Details that could identify your child or family are removed before your child's blood spots are given to a researcher.
- Most likely you or your child will not benefit from blood spot research.
- Participation is voluntary. You can call MDHHS at any time if you change your mind. There is no penalty or loss of benefits for saying no or changing your mind.

☒ **No, my baby's blood spots may not be used for health research.**
By checking this box you understand:

- Blood spots will be stored forever but not used for research. These stored blood spots may still be used by the state lab to help ensure that newborn screening detects those at risk.
- You must contact MDHHS if you do not want blood spots stored for any reason after newborn screening.

Parent Signature _____ Date 1-30-17

Your choice applies to all blood spots collected for newborn screening. Please visit www.michigan.gov/biotrust for further information including research updates. For questions about your research rights or whom to contact in case of a research-related injury, please call the MDHHS IRB at 517-241-1928.

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SN 2324314

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TITLE	Wiegand Declaration
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Mothers' Decisions About Donating Newborns' Blood Spots for Research

A Qualitative Study

Elizabeth R. Eisenhauer, PhD, RN; Alan R. Tait, PhD; Lisa Kane Low, PhD, CNM, FACNM, FAAN; Cynthia M. Arslanian-Engoren, PhD, RN, FAAN

ABSTRACT

Residual dried blood spots from millions of newborns are being stored and used for research. The state of Michigan proactively developed a broad consent process for research use of newborns' blood spots. However, the extent to which mothers make informed choices about this research is unclear. A descriptive, qualitative study was conducted examining this issue. Twenty-nine observations of the consent process and 20 semistructured interviews were conducted with mothers on the postpartum unit of a large, academic hospital in Michigan. Content analysis of the transcripts was conducted. While most mothers agreed to donate the blood spots ($n = 14/20$; 70%), findings indicated that most decisions were uninformed ($n = 16/20$; 80%), as mothers lacked knowledge of biobanking research. Misunderstandings about anonymity, the consenter's credentials, and entity conducting the research seemed to influence decision making. Suggestions for improving the consent process include (1) changing the venue of blood spot education and consent from the postpartum period to the perinatal period, (2) strengthening the depth of information and delivery of information provided about the topic, including ethical and values clarification, and (3) increasing consenter education and training. Implementation may help increase the proportion of informed decisions.

Key Words: biological specimen banks, ethics, informed consent, newborn blood spot screening, nurses

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Disclosure: The authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this article.

Each author has indicated that he or she has met the journal's requirements for Authorship.

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Residual dried blood spots (rDBS) are biospecimens that remain after legally required newborn screening (NBS) is completed on the nearly 4 million infants born annually in the United States.[1,2] The rDBS are frequently stored and used for research, often without parental consent.[2] The collection of human biological specimens for future, unspecified research (ie, biobanking) has become a widespread practice.[2,3] By retaining, storing, and distributing rDBS, NBS programs, managed by state departments of health, are a major source of pediatric biospecimens for research.[4] While this research has led to important medical advancements,[5] it has also introduced new ethical issues including risks to genetic privacy and other personal values.[4,6-8]

Taking note of ethical concerns, in 2010, the Michigan Department of Health and Human Services (MDHHS) was the first to adopt a broad consent process for rDBS research as part of the NBS that occurs about 24 hours after birth.[9] However, because broad consent provides few details about future research, it

may not provide adequate information for informed decision-making[10] and thereby could contribute to decisional regret and moral distress.[11] Thus, it is also essential to determine whether donors (or surrogate decision makers such as parents) possess adequate knowledge and understanding of biobanking to make an informed choice.[12] As NBS and rDBS research occurs globally, this concern has international implications.[13]

BACKGROUND

Genetic privacy

It is important for individuals to understand the risk for a potential breach of genetic privacy before donating biospecimens to a biobank.[14] Deoxyribonucleic acid (DNA) in biospecimens reveals individuals' unique attributes and genetic predispositions to a host of diseases, including many that potentially carry social stigma (eg, schizophrenia, alcoholism).[15] Unwanted exposure of private genetic information may cause personal embarrassment, distress, or discrimination (eg, employment, insurance, or social) despite partial protective legislation.[15,16] Because DNA is unique to each human, replacing names, birth dates, and other identifiers with a code may not fully protect genetic privacy.[15] In addition, without specific (or in some cases any) consent, rDBS have been used to study issues such as maternal cocaine and tobacco use,[17,18] which may also be perceived as an invasion of privacy.

Moral risk

Because intended research uses of rDBS are often unspecified at the time of donation, alignment of the research with personal values may be unclear or unknown. This lack of clarity may precipitate moral risk, defined as the possibility that biospecimens may be used in research activities misaligned with the parents' (or donors') personal, religious, or cultural values.[7,8,15] A recent literature review noted several religious concerns related to biobanking including blood storage, cloning, and genetic analysis.[19] Lack of transparency, at the time of consent, about potential uses for biospecimens may pose conflicts with personal values and lead to moral distress.[11]

Theoretical framework

The multidimensional measure of informed choice[12] (hereafter MMIC) was the theoretical framework guiding this study (see Figure 1, derived from Marteau et al.[12]). The main concepts are knowledge, attitudes, and the participation decisions. Knowledge is defined as participants' understanding of key information about

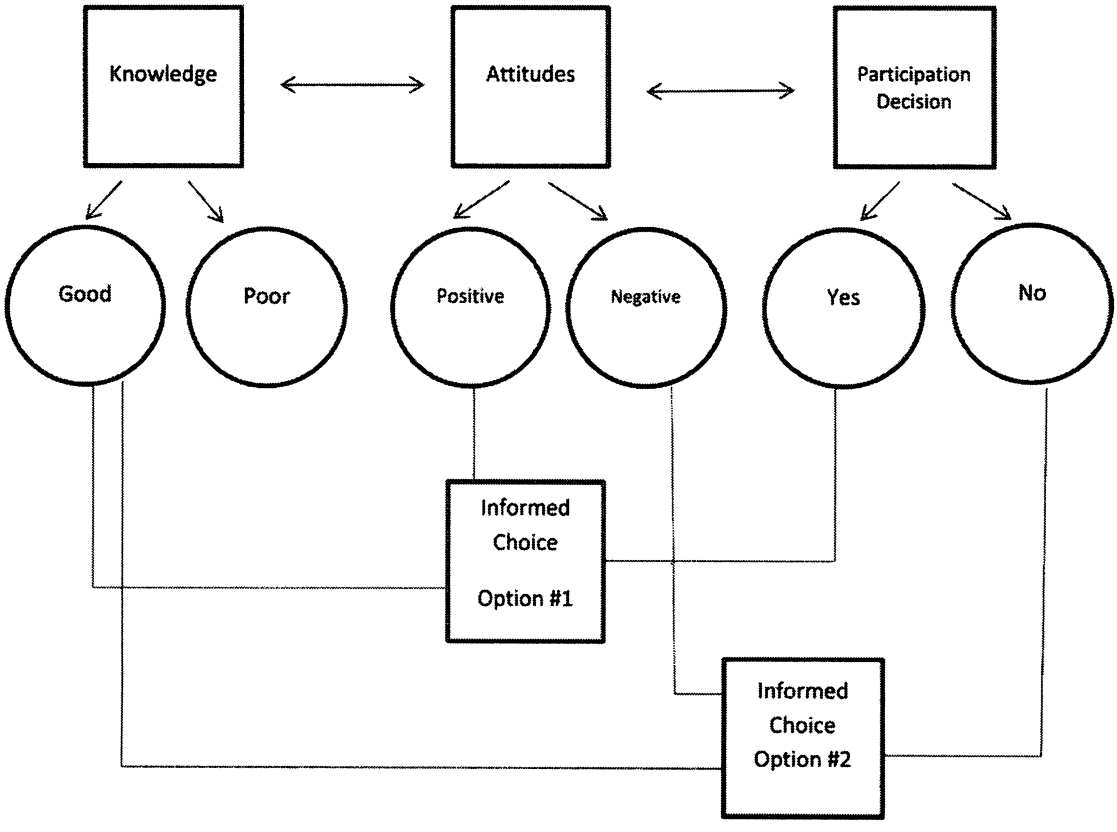

Figure 1. Informed choices per the multidimensional measure of informed choice.

the topic, deemed essential by professional consensus for making an informed choice. Attitudes are individuals' value-based judgments about facts and information.[12] In this model, an informed choice is based on adequate knowledge and consistent with decision makers' personal values, as reflected by their attitudes.[12] While the MMIC has often been used in studies about prenatal testing,[12,20,21] to our knowledge, this is the first study to use it to guide the examination of mothers' decisions about donating newborns' rDBS for research.

METHODS

Design

This article presents the qualitative component of a larger triangulated study[22] conducted to investigate factors influencing mothers' decisions to donate their newborn's rDBS to the Michigan BioTrust for Health (ie, "the BioTrust"). This program of the MDHHS is charged with oversight of the research use of rDBS, including the consent process.[9] The specific aim of the qualitative portion of the study was to describe the context and content of the consent process, mothers' knowledge of the BioTrust and biobanking, and the influence of personal and religious values on their decisions to donate their newborn's rDBS for research purposes. Furthermore, this study sought to determine the proportion of decisions deemed informed choices, as measured by the MMIC.[12] A descriptive, qualitative design[23] was used to characterize factors that influenced these decisions, including the context of the postpartum unit, mothers' knowledge of biobanking, their personal values, experience with the consent process, and demographic characteristics.

Setting and sample

The BioTrust consent process occurred in private rooms on the mother/baby unit of a large, academic medical center; the unit has 50 private maternity rooms and delivers nearly 4000 newborns each year. A convenience sample was recruited by the principal investigator (PI) as mothers were approached by hospital personnel about NBS and consent for rDBS research. The PI shadowed the staff member responsible for obtaining BioTrust consent (ie, "the consenter"). When the consenter approached each mother to explain NBS and the BioTrust, she also explained the PI's presence. Verbal permission was obtained from each mother for observation of the BioTrust consent process. After the mother rendered a decision about the BioTrust, the mother was asked to participate in a brief semistructured interview regarding her decision. To be eligible to participate in the semistructured interview, mothers had to be (1) 18 years or older, (2) able to speak English, (3) seen within a 24-hour window of rendering the decision of interest, and (4) willing to be audiotaped. Once eligibility was determined, the study was explained in detail and written informed consent was obtained. Interviews were conducted in the mother's hospital room at that time or later the same day. Family members (eg, newborn's father) who were present were allowed to stay with the participant's permission and were made aware the interview would be audiotaped.

Ethical considerations

Approval to conduct the study was obtained from the appropriate university institutional review board. Mothers were free to stop the interview at any point or decline to answer particular interview questions. No names were included on audiotapes or transcripts to ensure confidentiality of the participants. No incentives were offered for participating in the interviews.

Data collection

Observations

Passive participant observation was used to collect data on (1) the physical setting in which the consent discussion occurred, (2) informational materials provided, (3) individuals present in the room during the consent and interviews, (4) activities and interactions, and (5) nonverbal behaviors to emphasize the importance of contextual factors of the postpartum period during the BioTrust consent process.

Semistructured interviews

An interview guide was developed (see Table 1) using information in the BioTrust brochure,[24] essential biobanking informed consent topics,[14] and concepts in the MMIC.[12] Content validity was established by team members with expertise in informed consent (A.R.T.) and maternity care (ie, certified nurse midwife [L.K.L.]). The interview guide was pilot tested with 5 mothers. Additional questions were asked at the completion of the 5 interviews to elicit feedback about the interview process and to assess whether anything asked was unclear. As no suggestions for change were provided, these 5 interviews were included in the final sample.

Following the consent process, mothers were interviewed to examine their knowledge of the rDBS and biobanking research, experience with the consent process, and personal values. Knowledge was assessed by asking each participant to describe her understanding of the blood spots, NBS, the BioTrust, and biobanking. Next, each mother was asked to describe the informed consent process that had just occurred and to reflect

JPNN

Table 1. Interview questions, probes, and categories

Interview questions	Probes	Category
First, please describe to me what you know about the blood spots from the newborn screening test?	What do you understand about the blood spots from the newborn screening test?	Newborn screening knowledge
Please tell me what you know about the Michigan BioTrust.		BioTrust knowledge
Next, please describe how you were asked for permission to donate the leftover blood spots to the BioTrust as you experienced it.	Who asked for your permission? What did he or she tell you? What happened?	Informed consent
What was your decision about the donating your baby's blood spots to the biobank?	Did you agree or not agree to donate your baby's blood spot to the biobank?	Donation decision[a]
What kinds of thoughts, questions, or concerns were in your mind as you made your decision?		Values/attitudes perceived risks
Do you think your questions were answered? How was this done?	By whom or by what information?	Informed consent
Do you think you were you able to get the information that you needed to make the decision?		Informed consent
Is there any additional information that would have been helpful to you in making this decision?		Informed consent
If you had more time, would you be willing to find more information?		Informed consent
What did you find helpful or unhelpful to you to make the decision to donate your baby's blood spot to the Michigan BioTrust?		Informed consent
Please tell me about how you chose (yes/no)?	What was important to you in making the decision?	Values/attitudes
What personal experiences, values, opinions, or religious beliefs of yours do you think may have influenced your decision?	How did _____ affect your decision? Can you give me an example?	Values/attitudes
What have you heard about biobanking?	Can you please describe biobanking in your own words?	Biobanking knowledge
What is the purpose of the Michigan BioTrust?		Knowledge informed consent
Next, please describe your expectations about medical research involving your child's genetic information/blood spots.		Attitudes/values
Do you have any concerns about medical research involving your child's genetic information/blood spots? If yes, please explain.		Perceived risks
Are there things you would want or would not want the blood spots used for?	Like what? Can you please give me an example?	Attitudes/values
On a scale of 1-5 (rating described), how would you rate your confidence in your decision?		Confidence
If you were to change your mind about donating, what would you have to do?		Informed consent
Please complete the following sentence: For me, personally, donating (or not donating) my newborn's blood spots for research is_(fill in the blank)____.[b]		Attitudes
Anything you would like to add about your experience and decision regarding the BioTrust?		Summation

[a] 19 of 20 decisions were observed as they were made.
[b] Question adapted from Marteau et al.[12]

on questions or concerns she may have had during the decision-making process. Then, each mother was asked to repeat her decision and describe why she agreed or declined to donate her newborn's blood spots for research. Finally, each mother was asked to describe any personal experiences or personal or religious values she thought may have influenced her decision.

At the end of each interview, each mother was given an opportunity to provide any additional descriptions of her experience. Demographic data including age, education, race, religion, insurance status, and parity were also collected. After confirmation with the mother that she had no additional information to share, the interview was considered complete. The observations and interviews were conducted over 4 days during October to November 2016.

Data analysis

Data were analyzed using qualitative content analysis; steps included (1) preparation, (2) organizing and coding the data, and (3) reporting the results.[25] Preparation included verbatim transcription of the audiotaped interviews (E.R.E.). This involved scrutinizing the data, accomplished by listening to each interview multiple times as part of the transcription process, and then by reading, rereading, and abstracting the interview transcripts (E.R.E. and C.M.A-E.). Next, data were organized using codes developed on the basis of categories in the MMIC framework and interview questions (eg, knowledge, attitudes, and decisions), key words, and phrases. Narrative data were extracted from the transcripts, organized in tables, reviewed, and iteratively compared. Data matrices were then created to compare and contrast responses and demographics of mothers who decided to donate or not donate their newborn's rDBS. The unit of analysis was the collective experiences of the 20 mothers who participated in the qualitative interviews.

To classify decisions as informed or uninformed, responses to knowledge questions were classified as either good (+) or poor (−) by 2 coders (E.R.E. and C.M.A-E.). Responses consistent with factual materials (eg, per the BioTrust brochure[24]) were classified as good knowledge, whereas inconsistent responses or statements such as "I do not know" were classified as poor knowledge. Similarly, attitudes were classified into positive and negative categories. Favorable, optimistic thoughts or feelings toward blood spot research were characterized as positive attitudes, whereas negative attitudes were marked by suspicious thoughts or feelings toward such research. Using the MMIC definition of an informed choice, there were only 2 possible combinations of knowledge, attitude, and donation decisions that would constitute an informed decision.[12] Option 1 was when a mother had (*a*) good knowledge about the BioTrust and biobanking, (*b*) a positive attitude toward rDBS research, and (*c*) agreed to donate her newborn's rDBS. The other option was when a mother had (*a*) good knowledge about the BioTrust and biobanking, (*b*) a negative attitude toward rDBS research, and (*c*) declined to donate her newborn's rDBS (see the Figure). Choices based on poor knowledge and/or attitudes incongruent with decision making were classified as uninformed choices per the MMIC framework.[12]

Trustworthiness of the data was reinforced by the use of audiotape and subsequent verbatim transcription of the interviews. Participants' views were confirmed through informal member checking and probes used during the interviews to clarify statements.[26] The sample size was deemed adequate after the 14th interview as determined by data saturation, the point when new information stops occurring and established responses continue to repeat.[26,27] Interrater reliability was established using the approach of Miles and Huberman[28] (the number of agreements divided by the total number of agreements and disagreements). Categorization of participants' responses (ie, good or poor knowledge, positive or negative attitudes, level of perceived risk) was iteratively discussed, classified, and revised as needed between 2 coders (E.R.E. and C.M.A-E.). Two evaluations of biobanking knowledge were changed from good to poor. Discordance was reconciled by further discussion and 100% consensus was reached.

RESULTS

Observations

The BioTrust consent process was observed 29 times and was estimated to be, on average, 5 minutes in length. Mothers who had given birth the previous day were identified from a daily census and approached regarding NBS education and potential rDBS donation. The same consenter, an unlicensed member of the ancillary staff, was observed for all consent interactions. The consenter arranged her visits with mothers according to time of delivery and approached mothers before the heel stick procedure for NBS occurred. While the consenter strived to give each mother as much time to rest after birth as possible time constraints existed, as NBS must be conducted after the newborn is 24 hours old but before leaving the hospital.

The consenter respectfully introduced herself to the mother by name and job title and explained she was there to talk about NBS. Next, the consenter asked each mother whether she was familiar with the newborn heel stick and described the process. At this institution, mothers were given a folder of information at

admission, including brochures on NBS[29] and the BioTrust,[24] and these folders were observed to be present in the mother's room during the consent process. The consenter verbally referenced the brochures stating, "There's a pamphlet in your folder . . . ." However, a detailed review of those materials was not observed, nor were informational materials used that explained potential controversial types of research (ie, moral risks). The consenter explained that 6 blood spots would be collected to screen for more than 50 metabolic diseases, often briefly describing examples (eg, phenylketonuria and cystic fibrosis). Next, the consenter described the difference between screening and research by stating: "The state also wants me to ask if they can use the leftover blood for anonymous medical research. The screening is required, but you can say yes or no to the research." The manner used to present the information and the language used were the same at each encounter. Before checking a yes or no box to indicate a participation choice, each mother looked at the BioTrust consent form on the back of the NBS blood spot card that summarizes key information.[30] However, the extent to which mothers actually read or understood the information is unknown. Mothers (and fathers) tended not to ask questions during the BioTrust consent process. Eye contact and puzzled facial expressions were observed between mothers and fathers before responding to the consent question. If silence was prolonged, the consenter prompted the mother by stating, "The blood spots either go to the biobank for research or sit with the state. It's up to you." Mothers (or fathers) verbally expressed a choice and then one signed the blood spot card accordingly. During one observation, parents contradicted each other's decision to donate: the mother stated she wanted to agree, and the father stated he wanted to decline donation. Subsequently, the mother declined. Family members were frequently observed in the room with the mother (eg, fathers were present in 15/20 [75%] interviews). Mothers identified others present at the time of the BioTrust consent and/or the interviews as an aunt, a sister-in-law, and grandparents.

Interviews

Twenty mothers (20/29; 69%) participated in the semistructured interviews, and 9 mothers declined (9/29; 31%). Interviews lasted 6 to 20 minutes (median = 8 minutes). The median age of participants was 32 years (range, 23-42 years); most were multiparous (n = 15), with this birth most often being their second child (n = 10). Three-fourths (n = 15) had at least some college or a college degree. Sixty-three percent of the mothers identified a religious affiliation and indicated the practice of their faith was important (n = 12/19; 63%). Of those mothers who identified a religion, the importance of the practice of their faith was rated highly (average 8.75 on a 10-point scale).[31] Characteristics of the participants are presented in Table 2.

Knowledge

Fourteen mothers (70%) were able to correctly describe knowledge of the NBS by stating: ". . . screening for these different diseases and they will tell us if our child has them and what we need to do to treat them to prevent certain symptoms" and ". . . check[ing] for different diseases or illnesses that babies could have." Conversely, when asked to describe the Michigan BioTrust, most mothers (16/20; 80%) stated, "I don't know anything about it" or "nothing" about it. Similar responses were noted when asked to describe biobanking. Most mothers (n = 16/20; 80%) indicated they did not have any knowledge of it, stating, "Biobanking? I don't know" and "Sorry, I don't know."

Five of the mothers who declined to donate the rDBS for research described a "lack of information around the process" and clearly stated, "I just really didn't know anything . . . about the research part of it so that's why my answer was no." Mothers described "the inability to get clear information" and their unwillingness to "put my child out there" because "I just don't know a lot of information." One mother perceived that donation options were not "presented equally" and described the BioTrust brochure as "definitely geared toward you saying yes."

In addition, 4 types of misunderstandings emerged from the narrative data, involving 11 of the mothers. One mother who declined donation misunderstood the procedure and said, "I just don't want him to be more uncomfortable," believing donation would require the newborn to have a second heel stick. Two other mothers agreed to donate because they perceived that "it's [the university hospital] asking me" and felt "[the university hospital] does a lot of good research . . . I am happy to participate." Four other mothers who agreed to donate stated since ". . . it's totally anonymous," and one said, "If it wasn't anonymous, I probably wouldn't do it . . . ." Five mothers indicated a "nurse" entered the room to ask for consent.

Attitudes

All of the mothers who agreed to donate rDBS (n = 14) had attitudes about the research classified as positive. The 6 mothers who declined to donate rDBS had attitudes classified as negative. No choice was inconsistent with the stated attitudes about the research.

Mothers who agreed to donate their newborn's blood spots (n = 14; 70%) overwhelmingly described wanting to do "good" and to "help" others. One mother said

Table 2. Characteristics of interviewed mothers[a]

		Donation decision	
		Yes ($n = 14$), %	No ($n = 6$), %
Age, y			
Median	32	34	24
Range	23-42	25-42	23-29
	***n* (%)**	***n* (%)**	***n* (%)**
Race			
Asian	1 (5)	0 (0)	1 (17)
Black or African American	2 (10)	0 (0)	2 (33)
White or Caucasian	12 (60)	11 (79)	1 (17)
Other (Arabic, mixed-race, other)	4 (20)	3 (21)	1 (17)
Missing[b]	1 (5)	0 (0)	1 (17)
Religion			
Christian	6 (30)	3 (21)	3 (50)
Muslim	5 (25)	3 (21)	2 (33)
None	7 (35)	7 (50)	0 (0)
Unitarian	1 (5)	1 (7)	0 (0)
Missing[b]	1 (5)	0 (0)	1 (17)
Highest level of education completed			
High school	4 (20)	1 (7)	3 (50)
Some college	6 (30)	5 (36)	1 (17)
Bachelor's degree	4 (20)	4 (29)	0 (0)
Master's degree	4 (20)	3 (21)	1 (17)
Professional degree (PhD, MD)	1 (5)	1 (7)	0 (0)
Missing[b]	1 (5)	0 (0)	1 (17)
Insurance coverage			
Public (Medicaid)	8 (40)	5 (36)	3 (50)
Private (employer/ self-insured)	10 (50)	9 (64)	1 (17)
Both	1 (5)	0 (0)	1 (17)
Missing[b]	1 (5)	0 (0)	1 (17)
No. of live births (including this baby)			
1	4 (20)	3 (21)	1 (17)
2	10 (50)	7 (50)	3 (50)
≥3	5 (25)	4 (29)	1 (17)
Missing[b]	1 (5)	0 (0)	1 (17)
Confidence in decision—average (1, uncertain; 5, very confident)			
Overall	4.4	4.5	4.2

[a] % Columns may not total 100% due to rounding.
[b] Missing data = 1 mother declined to answer demographic questions.

donating blood spots was about "helping, helping others, finding cure, helping finding cure, hopefully." Mothers described blood spot donation as a way "... to be socially responsible..." and "...advance medical care...." Mothers frequently ($n = 12$; 60%) expressed the perception of research as a benevolent act. One mother said, "... research is good. Let's do that!" and 2 other mothers stated they were "always pro-research."

Perceived risk

Three mothers who agreed to donate rDBS perceived no risks with the research. One participant stated, "They're not ... to harm my child, so, why not [participate]!" Nine others who agreed to donate perceived "little" or "small" risks, and one of these mothers expressed that the research was "low enough risk that I'm not too worried about it." The perception of low risk was often linked to the fact the blood spots were "leftover" and there would not be "an extra prick" for the newborn.

However, mothers who declined to donate perceived more risk and stated, "... it's private information. I don't want it to go out in public," and expressed concerns the blood spots would be used for "commercial reasons

... for profit." Additional concerns included "any negative research" and "uncertainty about how it's going to be used."

Six mothers (30%) mentioned religious, spiritual, or moral issues as they described their donation decisions. Two mothers who agreed to donate associated "trying to help each other" with their religious beliefs. They stated, "[My congregation] really believe in the inner connectedness of all livings beings" and "I hope to God they find cures for illnesses." Two other mothers agreed to donate despite expressing moral concerns. They said: "Just don't clone them" or use the blood spots for "anything like immoral, like ... abortion." One mother who declined to donate stated, "... I believe in certain things like being Christian for one, and in Christ and all that," and she feared the blood spots may be used for "witchcraft." Another mother denied that "visions" (ie, religious or spiritual entities) led her to say no but stated she declined on the basis of her lack of knowledge.

Mothers' descriptions of consent process

The majority of mothers ($n = 12/20$; 60%) were able to describe the difference between NBS and the request to use rDBS for research. One mother stated:

> She came ... in and ... described ... the state requires six blood spots and they do some testing for children ... and then ... she asked ... if we would be willing to ... use the leftover blood spots for research.

However, 8 mothers were unable to describe the difference clearly. One mother stated, "She just really just asked me if I ... want to it get a researched [*sic*] and I said yes, but I don't want those remaining blood kept."

Four mothers characterized the consent process as "straightforward" or "no big deal" and as an "easy decision." Two of these mothers reported "details" were not provided, nor were they always perceived as necessary. One mother stated, "... I think she didn't specify more details just because I didn't ask for them...."

Two mothers stated the speed at which the decision was made was "... like a one second decision!" and "... I made it on the fly!" A third mother stated, "I didn't think twice of it."

Two mothers specifically reported the brief explanation provided by the consenter to be "helpful" in making the decision and that the consenter "kind of went over it a little bit with us." Two other mothers stated they appreciated "having a choice" about donation (one said yes and one said no to donation), and 3 mothers explicitly denied feeling any pressure imposed by the consenter to influence their decisions. One said it was "very low pressure ... like it was okay either way." Another one stated she felt "no pressure at all," and the third mother said "it felt normal." However, another mother described that she did not find the process helpful stating: "... how can we give informed consent ... [a] couple of hours after a birth, when they've [*sic*] had all kind of narcotics and drugs, and trauma? And there is somebody in the room every half hour...."

When asked, "If you were to change your mind about donating what would you have to do?" Four mothers were able to described the process to withdraw from the BioTrust stating they would "[use] the Internet," "read the pamphlet," or "contact the state." Eight other mothers described it as "telling the lady" or "telling you guys," whereas others stated they did not know ($n = 5$) or did not understand the question ($n = 3$).

Demographics and decisions

A total of 14 mothers agreed to donate their newborn's blood spots to the BioTrust, and 6 declined. Mothers who self-identified their race as white tended to agree to donate, whereas mothers who self-identified their race as nonwhite were split in their decisions (see Table 2). In addition, mothers who declined to donate tended to be younger in age (in their 20s) than mothers who agreed to donate rDBS, who were mostly in their 30s or older than 40 years. Twelve mothers ($n = 12/19$; 63% of those who answered demographic questions) reported a religious affiliation (ie, Christian, Muslim, or Unitarian); 5 of those 12 (42%) mothers declined to donate rDBS, whereas all 7 mothers who indicated no religious affiliation agreed to donate their newborn's rDBS. Education, insurance status, and number of births did not seem to be exclusively associated with any particular donation decisions (see Table 2).

On the basis of the MMIC[12] classifications, 4 mothers (20%) made an informed choice: a choice congruent with both (*a*) possessing good knowledge and (*b*) consistent with personal attitudes toward blood spot research. Sixteen mothers (80%) lacked adequate knowledge to make an informed choice. Informed choices included 3 mothers who agreed to donate and 1 mother who declined. Only 3 of the 4 mothers who made an informed choice were willing to answer demographic questions. All 3 of these mothers were in their 30s, had at least some college education, and identified a religious affiliation. Two had private insurance and one had public insurance (ie, Medicaid). Two mothers were multiparous and one a first-time mother; fathers were present in 2 out of 4 instances of informed choice. All mothers indicated they were fairly confident with their decisions (see Table 2).

DISCUSSION

Observation of the BioTrust consent process indicated that information provided to mothers lacked depth, which may have contributed to lack of adequate knowledge and frequent misunderstandings. This finding is consistent with a recent focus group study that included 69 participants from 3 states and reported that individuals frequently found information on the MDHHS blood spot card consent form confusing.[32] Observations also confirmed previous reports[33,34] that the postpartum environment is not conducive to education about NBS and rDBS research, as mothers described being sleep-deprived, fatigued, under the effect of medication or in pain, and were observed to be preoccupied with their new baby. While the consenter's approach was professional and friendly, it was also routine, brief, and observed to elicit only a yes or no response. Routinization of consent for other postpartum decisions (eg, newborn care, pain medication, breastfeeding, and male circumcision) has been noted to overlook patients' values and the emotional consequences of the decisions and thereby impede meaningful informed consent.[35,36] Shared decision-making[37] in which patients' values and preferences are openly discussed and clarified might be a better approach to aid informed choices. Extended discussion with a person knowledgeable about details of the research is still the most efficacious intervention to aid understanding of consent information.[38,39]

Semistructured interviews revealed that the majority of the mothers ($n = 16$; 80%) made the decision without adequate knowledge of the BioTrust or biobanking and thus these decisions failed to reach the threshold of an informed choice.[12] Findings were consistent with the current literature, which indicates that many participants lack understanding of key elements of informed consent for biobanking[40] and that low knowledge scores contribute to other uninformed decisions including those involving prenatal testing[12,20,21] and declining to vaccinate children.[41]

The 6 mothers who declined to donate perceived higher risks to personal values (eg, privacy and research uses). However, even 2 mothers who agreed to donate expressed moral caveats on research involving abortion and cloning, indicating perceptions of moral risk. Indeed, rDBS have been used to study birth defects and develop new techniques for prenatal genetic diagnosis.[42,43] Research from Canada and the United Kingdom demonstrated that advances in prenatal genetic testing have contributed to an increase in abortions due to the presence of fetal anomalies.[44,45] Moreover, one of these mothers held the misperception that the request for rDBS was emanating from the hospital, a trusted institution in the community, although the request was actually from the MDHHS. Misperceptions about anonymity, the consenter's credentials, and the entity conducting the research were common. Thus, it is crucial to clarify specific points including that blood spots are coded, but not anonymous, the consenter's credentials (eg, registered nurses vs unlicensed personnel), which have been shown to influence biobanking decision making,[40,46] and that the request for rDBS is coming from the state department of health, not a trusted hospital or consenter. Parents need accurate information on which to base their donation decisions, and understanding should be verified. Observations also indicated that fathers wanted to be more involved in rDBS education and decision making.

Limitations

The study sample was a small, convenience sample of mothers derived from a single data collection site, where only one consenter was observed, which may limit the generalizability of results. The MMIC[12] attributes an informed choice to only 3 categories: knowledge, attitudes, and participation. An informed choice may be more complex and involve deliberation,[21] which is not captured in the MMIC. Finally, despite efforts by the PI to be as unobtrusive during the consent process, the potential for a Hawthorne effect cannot be ruled out. The consenter knew she was being observed, which may have influenced her behavior.[26] Nevertheless, this study provided valuable data on the BioTrust consent process and mothers' decision-making process.

Clinical Implications

Based on findings from this study, 3 recommendations are put forth: (1) education about NBS and rDBS research should begin at prenatal visits, outside of the postpartum environment; (2) information provided to parents about research on rDBS must be accurate, comprehensive, and include ethical implications of biobanking; and (3) consenters should be required to complete training on communication skills, ethical issues involved in rDBS research, and shared decision-making techniques, in addition to formal human subjects' training.[47]

CONCLUSION

This study examined the consent process and decisions of mothers asked to donate their newborn's rDBS for research purposes to the Michigan BioTrust. While most mothers agreed to donate the blood spots, many decisions were based on inadequate knowledge and misunderstandings. Therefore, policy and procedure changes are needed to restructure the consent process to promote informed choices. While individuals' level of

biobanking knowledge may be difficult to improve, the context, content, and delivery of the BioTrust consent process may be more amenable to change.

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EDUCATIONAL BACKGROUND

Institution	Date	Degree
University of Michigan Ann Arbor, MI	2018	PhD (Nursing)
State University of New York at Buffalo Buffalo, NY	2006	MLS
State University of New York at Buffalo Buffalo, NY	2005	Graduate Certificate (Health Informatics)
State University of New York at Buffalo Buffalo, NY	1995	BSN
National Technical Institute for the Deaf /Rochester Institute of Technology Rochester, NY	1993	AAS

MAJOR AREA OF CONCENTRATION IN PRACTICE/RESEARCH

My current research focuses on the ethical, legal, and social implications of biobanking and genetic testing, specifically issues related to informed consent. I investigate the influence of information provision, health literacy, and personal values on patients' decision-making processes, with the aim of improving the proportion of informed choices.

DOCTORAL DISSERTATION/PROJECT

Eisenhauer, E.R. (2018). *Informed choices in biobanking: An examination of congruence between knowledge, personal & religious values, and decisions [doctoral dissertation].* Ann Arbor, Michigan: University of Michigan.

RESEARCH GRANTS

Dates	Funding Organization	Award
2019-20	University Research Committee Faculty Research Fellowship, Oakland University, Rochester MI	$10,000
2017	University of Michigan, Rackham Graduate Student Research Grant, Ann Arbor, MI	$2,779
2010	CareSource, Dayton, OH for Miami Valley Hospital	$5,000

SCHOLARSHIP, FELLOWSHIP, AND AWARDS

Dates	Title	Award
2017-2018	Alice Hatt Lapides Graduate Fellowship Endowment Fund University of Michigan School of Nursing	full tuition support
2016-2017	University of Michigan School of Nursing	full tuition support
2014-2016	Jonas Nurse Leaders Scholars Program	$20,000
2015	Rackham Conference Travel Grant	$800
2013	Rackham Conference Travel Grant	$700
2012-2013	Rackham Regent's Fellowship, University of Michigan	$19,442
2006	Medical Library Association Scholarship in Health Sciences Librarianship, Upstate New York and Ontario Chapter (UNYOC)	$500
1994	First recipient of the Coletta A. Klug award, psychiatric nursing, State University of New York at Buffalo	$220

EMPLOYMENT RECORD (Professional Teaching Experience)

Institution Employed	Title of Position	Dates
Oakland University, Rochester, MI	Assistant Professor School of Nursing	2019-Present
Oakland University, Rochester, MI	Visiting Instructor School of Nursing	2018-2019
Madonna University, Livonia, MI	Adjunct Faculty College of Nursing and Health	2016-2018

EMPLOYMENT RECORD (Professional Experience other than Teaching)

Institution Employed	Title of Position	Dates
University of Michigan School of Nursing Ann Arbor, MI	Graduate Student Research Assistant	2013-2014
St. John Hospital and Medical Center Detroit, MI	Research Assistant	2012
Detroit Medical Center Detroit, MI	Clinical Transformation Specialist	2011
Miami Valley Hospital Dayton, OH	Research Nurse/ Low Birth Weight Study Coordinator	2007-2010
Kaleida Health Libraries/ Women & Children's Hospital of Buffalo Buffalo, NY	Clinical Informationist	2006-2007
Uniform Data System for Medical Rehabilitation Amherst, NY	Information Resource Specialist	2005-2007
Health Sciences Library State University of New York at Buffalo Buffalo, NY	Graduate Student Reference Assistant	2005
Women & Children's Hospital of Buffalo, Buffalo, NY	Registered Nurse	2004- 2005
Seton House (Detox/Rehab) Providence Hospital, Washington, DC	Registered Nurse	2003-2004
Mount St. Mary's Hospital, Lewiston, NY	Registered Nurse	2002-2003
Stutzman Addiction Treatment Center, Buffalo, NY	Registered Nurse II	1997-2002
Horizon Human Services, Buffalo, NY	Senior Addiction Counselor/ Registered Nurse	1995-1997
Buffalo, NY	Free-lance American Sign Language Interpreter	1993-2002

PUBLICATIONS (Refereed)

1. **Eisenhauer, E. R.,** Tait, A. R., Kane Low, L., Arslanian-Engoren, C. M. (2019). Mothers' decisions about donating newborns' blood spots for research: A qualitative study. *Journal of Perinatal and Neonatal Nursing, 33*(4), 361-371.

2. **Eisenhauer, E. R.,** Tait, A. R., Rieh, S. Y., & Arslanian-Engoren, C. M. (2019). Participants' understanding of informed consent for biobanking: A systematic review. *Clinical Nursing Research*, *28*(1), 30-51.

3. **Eisenhauer, E. R**., & Arslanian-Engoren, C. (2016). Religious values and biobanking decisions: An integrative review. *Research and Theory for Nursing Practice, 30*(2), 104-123.

4. **Eisenhauer, E.R**. (2015). An interview with Dr. Barbara A. Carper. *Advances in Nursing Science, 38*(2), 73-82.

5. **Eisenhauer, E.R**., Mosher, E.C, Lamson, K.S., Wolf, H.A., Schwartz, D.G. (2012). Health education for Somali Bantu refugees via home visits. *Health Information and Libraries Journal 29*(2), 152-161.

6. **Eisenhauer, E.,** Uddin, D.E, Albers, P., Paton, S., Stoughton, R.L. (2011). Establishment of a low birth weight registry and initial outcomes. *Maternal and Child Health Journal 15*(7), 921-30.

PUBLICATIONS (Non-refereed)

1. **Eisenhauer, E. R.** (2015). Informed consent and the use of biospecimens in research. *AJN: The American Journal of Nursing*, *115*(7), 11.

2. **Eisenhauer, E.R.** (2014). Letter to the editor. *Advances in Nursing Science, 37*(3), 190-191.

3. **Eisenhauer, E.** (2006). Health science library students promoting multicultural health literacy. *National Network 31*(1), 12-13.

SCHOLARLY PRESENTATIONS (Refereed)

Podium Presentations

1. **Eisenhauer, E. R. (presenter),** Tait, A. R., Kane Low, L., Arslanian-Engoren, C. M. (2019, March). *Mothers' decisions about donating newborns' blood spots for research: A qualitative study.* Paper presented at Midwest Nursing Research Society, Kansas City, MO.

2. **Eisenhauer, E. R. (presenter)**, & Arslanian-Engoren, C. (2015, October). *A middle-range theory of informed consent: A proposed model and empirical indicators*. Paper

presented at the 7th Annual International Association of Clinical Research Nurses (IACRN) Conference, Baltimore, MD.

3. **Eisenhauer, E. R. (presenter).** (2013, October). *Information behavior of clinical research participants.* Paper presented at the 5th Annual International Association of Clinical Research Nurses (IACRN) Conference, San Diego, CA.

4. **Eisenhauer, E. (presenter),** Uddin, D.E., Albers, P., Paton, S., Stoughton, R.L. (2009, June). *Establishment of a low birth weight registry and outcomes at one year.* Paper presented at the Ohio Public Health Epidemiology Symposium, Columbus, OH.

5. **Eisenhauer, E. (presenter),** Uddin, D., Albers, P., Paton, S. Stoughton, R.L. (2008, December). *Establishment of a low birth weight registry and initial outcomes.* Paper presented at the 14th Annual Maternal Child Health Epidemiology (MCH EPI) Conference, Atlanta, GA.

Posters and Conference Proceedings

1. Manion, F. J., **Eisenhauer, E. R.**, Karnovsky, A., He, Y., Lin, Y., Harris, M. R. (2014, November). *Analysis of content coverage for informed consent concepts*. Poster presented at the American Medical Informatics Association (AMIA) 2014 Annual Symposium, Washington, D.C.

2. Lin Y., Harris M. R., Manion F. J., **Eisenhauer E.**, Zhao B., Shi W., Karnovsky, A., He, Y. (2014, October). *Development of a BFO-based informed consent ontology (ICO).* Paper presented at and available in proceedings of the 5th International Conference on Biomedical Ontologies (ICBO), Houston, TX. (pp. 84-86). Available from http://ceur-ws.org/Vol-1327/icbo2014_paper_54.pdf

3. **Eisenhauer, E. R.** & Harris M. R. (2014, May). *Concepts, terms, and metadata for building semantic interoperability of research consents and permissions*. Poster presented at the Medical Library Association (MLA) '14, Building Our Information Future. Chicago, IL.

4. **Eisenhauer, E. R.** (2014, April). *Information behavior of clinical research participants.* Poster presented at the Dean's Research Day. School of Nursing, University of Michigan, Ann Arbor, MI.

5. McKenna, D., Uddin, D., Glover, M., **Eisenhauer, E.** (2010, February). *Maternal psychological stress (MPS) as a novel causative and modifiable risk factor in preterm birth (PTB).* Society of Maternal Fetal Medicine Poster Abstract 446. Poster presented at Society for Maternal-Fetal Medicine (SMFM) Annual Meeting, Chicago, IL.

6. **Eisenhauer E.**, Uddin D. E., Albers P., Paton S., Stoughton, R. L. (2009, November). *The factor of maternal stress in the delivery of a low birth weight infant.* Poster presented at "Improving the Grade: Promoting Healthy Birth Outcomes through the Prevention of

Prematurity, Birth Defects, and Infant Mortality." The March of Dimes, Ohio Chapter, Columbus, OH.

7. Mosher E., Schwartz D. G., **Eisenhauer E.**, Wolf, H.A., Ahluwalia K.P., Slawek D., Lamson, K.S., Diina T. (2008, May). *Connecting an underserved community with consumer health information: The clinical informationist's role in a health education program.* Poster #100. Poster presented at Medical Library Association Annual Meeting, Chicago, IL.

8. **Eisenhauer E.**, Callas A., Engel P., Zwirlein, S. Kennedy M., Schwartz, D. (2006, May). *Health science library students promoting multicultural health literacy.* Poster # 103. Poster presented at Medical Library Association Annual Meeting, Phoenix, AZ.

SCHOLARLY PRESENTATIONS (Invited)

1. Eisenhauer, E. R. (2019, March 18). *Informed choices in biobanking: An examination of congruence between knowledge, personal & religious values, and decisions*. Oakland University Beaumont Graduate Program of Nurse Anesthesia. Beaumont Hospital Royal Oak, MI. [Invited by Dr. Mary A. Golinski, PhD, CRNA].

MANUSCRIPT REVIEWER

Clinical Nursing Research, 2014-2018
Public Health Nursing, 2017
Health Information and Libraries Journal, 2011-2015
Maternal and Child Health Journal, 2009-2012

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American Nurses Association (ANA)
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Did You Give the Government Your Baby's DNA? Rethinking Consent in Newborn Screening

Sonia M. Suter*

ABSTRACT

Newborn screening (NBS) has long offered the possibility of identifying rare conditions, which can be lethal or debilitating if not detected and treated quickly in the newborn period. These screening programs, usually mandatory, have been well established in every state since the 1960s. In the last decade, the number of conditions screened for has risen exponentially to include more than fifty inborn errors of metabolism, blood disorders, genetic, or other conditions. Not surprisingly, newborn screening programs have been widely accepted for their potential to save the lives of countless children.

Despite their valuable public health benefits, however, old approaches to, and more recent expansions of, NBS raise important privacy and policy concerns. NBS samples are collected in most states without affirmative, or sometimes any, consent from parents. NBS programs now screen for an ever-broadening range of diseases—sometimes without careful assessment of the risks and benefits—including conditions for which there is no treatment. NBS samples are retained for long periods or indefinitely. And finally, few, if any, limits prevent potentially invasive uses of these samples by the government or third parties. Indeed, evidence suggests that a great deal of research is being conducted on these stored blood spots, the

* Professor of Law, The George Washington University Law School. I am grateful to Naomi Cahn, Hank Greely, Pilar Ossorio, Mark Rothstein, Gil Siegal, and the participants of the Legal Scholars Workshop of the Genetics, Ethics and the Law Conference at the University of Virginia for their very thoughtful comments and suggestions. Many thanks also to my library liaison, Nicholas Stark, and my research assistants, Jessica Arco, Josh Oyster, Rebecca Szucs, and Kristen Ward, for their efficiency, thoroughness, and resourcefulness.

collection and storage of which many parents are simply unaware. Only a few lawsuits and legislatures have addressed the legality of these practices.

With recent expansions in the scope of NBS and increased interest in these samples for research, it is time to take a fresh look at this long-standing public-health system and to reexamine some of the underlying philosophies and practices associated with it. While NBS offers important public health benefits, it also threatens some of the civil liberties of the parents and children involved. This piece argues for the need to strike a careful balance between the public goods and private interests, and describes a methodology that allows these competing values to be recognized in policymaking. It concludes by suggesting ways to balance the important values of maximizing the well-being of newborns and promoting research, while also protecting autonomy and privacy as much as possible.

INTRODUCTION

If you ask parents whether their child should undergo genetic testing or participate in research, most would probably say, consistent with legal norms in most areas of medicine, "only with my consent!" Yet the majority of parents do not realize that in every state, a small blood sample is collected from newborns to test for inborn errors of metabolism (many of which are inherited).[1] Nor do they realize that, in many states,

1. *See* Taralyn Tan, *Newborns' DNA: Don't Deny Scientists This Useful Resource*, GENETIC ENGINEERING & BIOTECH. NEWS (Apr. 13, 2010), http://www.genengnews.com/gen-articles/newborns-dna-don-t-denyscientists-this-useful-resource/4377 ("[I]n most cases, parents are not aware that the blood sample from their child is being kept at all.").

the dried blood spots (DBS) are retained for long periods or indefinitely, with few, if any, limits on third-party access to and uses of these samples.[2] Indeed, evidence suggests that a great deal of research is being conducted on these stored blood spots by the state and other entities.[3] All of this, from collection to retention of samples, often comes without parents' affirmative, let alone informed, consent.[4]

The impetus for mandatory newborn screening (NBS) is the fact that rarely, but quite significantly, a child will be born with abnormal levels of enzymes, metabolites, or other chemicals, which can be lethal or debilitating if not detected and treated in time.[5] NBS offers the possibility of identifying some of these conditions before clinical symptoms manifest and "before developmental disabilities or death occurs."[6] These, usually mandatory, screening programs have been well established in every state since the 1960s, potentially saving the lives of countless children.[7] The scope of NBS programs has expanded dramatically in recent years, with most states screening for between twenty-seven[8] and over fifty inborn errors of

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2. *See* Lori Andrews, *Public Choices and Private Choices: Legal Regulation of Genetic Testing*, *in* JUSTICE AND THE HUMAN GENOME PROJECT 46, 55 (Timothy F. Murphy & Marc A. Lappé eds., 1994) (noting that genetic information can change lives, "precipitated by the release of genetic information to third parties—such as when insurers or employers make adverse decisions against people based on genetic information"); Tan, *supra* note 1 (discussing DNA warehousing and the indefinite retention of samples).

3. *See, e.g.*, Tan, *supra* note 1 ("[S]torage . . . allows geneticists and neonatology researchers access to an incredible genetic database. These blood spot samples can be utilized to develop new genetic tests, to learn more about existing genetic disorders, and to study factors such as the mother's health and in utero environment in relation to rare disorders.").

4. *Id.*

5. *See Newborn Screening, Pediatric Genetics*, CENTERS FOR DISEASE CONTROL & PREVENTION, http://www.cdc.gov/ncbddd/pediatricgenetics/newborn_screening.html (last updated May 13, 2013) (discussing the importance of newborn screening and the benefits derived from the process).

6. *See* Michael S. Watson et al., *Newborn Screening: Toward a Uniform Screening Panel and System*, 8 GENETICS MED. 1S, 1S (Supp. May 2006) ("States and territories mandate newborn screening of all infants born within their jurisdiction for certain disorders that may not otherwise be detected before developmental disability or death occurs.").

7. *Id.* (discussing the importance of the state-based newborn screening programs that began over forty years ago).

8. STEFAN TIMMERMANS & MARA BUCHBINDER, SAVING BABIES? THE CONSEQUENCES OF NEWBORN GENETIC SCREENING 59 (2013) ("By 2010, all states screened for 27 . . . conditions."); Wylie Burke et al., *Genetic Screening*,

metabolism.[9] Some of these conditions have been added to the list without careful assessment of the risks and benefits,[10] and some are identified and reported with no known effective treatment.[11]

Even so, NBS has been a well-accepted part of our public health system for nearly half a century.[12] Recently, a few lawsuits have challenged the consent requirements with respect to NBS and related research. In 2003, a couple claimed that Nebraska's efforts to compel the screening of their newborn violated their religious freedom and parental rights.[13] The Nebraska Supreme Court found no such violation.[14]

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33 EPIDEMIOLOGIC REVIEWS 148, 149 (2011) ("In the United States, most states screen for at least 29 conditions . . . ."); *see also* ASSESSING GENETIC RISKS: IMPLICATIONS FOR HEALTH AND SOCIAL POLICY 66 (Lori B. Andrews et al. eds., 1994) [hereinafter AGR] ("Newborns are usually screened today for several inborn errors of metabolism . . . .").

9. *See* Louise Moody & Kubra Choudhry, *Parental Views on Informed Consent for Expanded Newborn Screening*, 16 HEALTH EXPECTATIONS 239, 239 (2011) (mentioning that all states now screen for fifty-three core conditions to detect inherited metabolic diseases). This range of conditions includes what are described as twenty-nine core conditions and a secondary group of twenty-five targets that can be identified by screening for the core set. TIMMERMANS & BUCHBINDER, *supra* note 8, at 50, 63.

10. *See* Beth A. Tarini et al., *Waiving Informed Consent in Newborn Screening Research: Balancing Social Value and Respect*, 148C AM. J. MED. GENETICS 23, 23–24 (2008) (mentioning that "new NBS tests have rarely been subjected to population-based study" and demonstrating the difficulties of assessing risks and benefits).

11. *See* Andrews, *supra* note 2, at 58 ("Given the current state of development of medical genetics, . . . effective treatment for genetic disorders is rare . . . ."); Ellen Wright Clayton, *Currents in Contemporary Ethics: State Run Newborn Screening in the Genomic Era, or How to Avoid Drowning When Drinking from a Fire Hose*, 38 J.L. MED. & ETHICS 697, 698 (2010) (noting that for many of the reported results of newborn screening, "the efficacy and utility of therapeutic and preventative interventions are not clear").

12. Watson, *supra* note 6, at 1S.

13. *See* Douglas Cnty. v. Anaya, 694 N.W.2d 601, 604 (Neb. 2005) (discussing the Anaya's argument that the requirement violated their "First Amendment right to free exercise of religion and their fundamental rights as parents").

14. *Id*. at 608 (concluding that the requirement did not "unlawfully burden the Anayas' right to freely exercise their religion" or "unlawfully burden their parental rights," mentioning the lack of evidence that the state had an anti-religious purpose in enforcing the law and the valid policy interests in addressing the health and safety of children born in Nebraska).

The more recent "Baby DNA Lawsuits"[15] have challenged the involuntary collection and dissemination of NBS samples to researchers for purposes other than NBS.[16] In Minnesota, the state Supreme Court ruled that the state's dissemination and use of newborns' DBS for research without obtaining written informed consent violated its Genetic Privacy Act.[17] Two similar lawsuits were brought in Texas. The state settled with the five plaintiff parents in the first suit after agreeing to destroy all samples collected without parental consent since 2002.[18] A class action filed in late 2010 in Texas was dismissed as moot because there was no evidence that the parties' newborn samples were actually used or distributed for research.[19]

I argue in this Article that these lawsuits and other developments in NBS should give pause to the presumption that parental consent is not necessary with respect to NBS. We already obtain much more information from NBS than we did in the past and we are on the cusp of being able to obtain substantially more information in the near future. Moreover, the nature of the information we will be able to glean will be of varied value, certainty, and complexity, raising issues not only about what diseases we should screen for, but whether parents should be required to consent to some or all parts of the NBS process. In addition, the fact that newborn samples are increasingly used for research, and that anonymization of biospecimens is increasingly difficult, supports the need to

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15. K.J. Mullins, *Bill to Ban Unauthorized Use of Infant DNA Clears Senate Committee*, DIGITAL J. (Feb. 11, 2010), http://www.digitaljournal.com/article/287446.

16. *See id.* (pointing out that NBS samples are used for unauthorized research).

17. Bearder v. Minnesota, 806 N.W.2d 766, 776 (Minn. 2011) (holding that there is no authority in the statute to disseminate blood samples or genetic information, without consent, "beyond that expressly authorized for the reporting of newborn test results"). *See generally* MINN. STAT. §13.386 (2010) (Minnesota's Genetic Privacy Act).

18. *See* Higgins v. Tex. Dep't of Health Servs., 801 F. Supp. 2d 541, 545–46 (W.D. Tex. 2011) (discussing the settlement of the earlier *Beleno* lawsuit, and the agreement to "destroy all blood specimens taken as part of the newborn screening program" prior to May 2009, for which no written consent existed); Allison M. Whelan, Note, *That's My Baby: Why the State's Interest in Promoting Public Health Does Not Justify Residual Newborn Blood Spot Research Without Parental Consent*, 98 MINN. L. REV. 419, 430–31 (2013).

19. *Higgins*, 801 F. Supp. 2d at 554 ("Plaintiffs never refute Defendants' evidence that Plaintiffs' children's blood samples were not distributed and have in fact been destroyed. Accordingly . . . their claims are now moot.").

rethink the role of consent in NBS, at least with respect to storage and research uses of DBS. As I will argue, the case for consent with respect to research also supports, in part, the notion of consent for NBS itself.

Yet, just as changing circumstances provide reasons to rethink parental consent with respect to NBS, the increasing scope of information we can glean from NBS makes the possibility of obtaining fully informed consent that much more problematic logistically, practically, and economically. In addition, the DBS are potentially valuable resources for research that can benefit the common good, generally, and the pediatric population, in particular. Thus, the question of consent in NBS raises issues about how to strike the right balance between the public good and private interests.

This Article offers a proposal for finding the right balance of consent for NBS itself, and for the storage and use of DBS. Part I offers a history of NBS and its evolution. Part II explores the rationales for the limited consent provisions for NBS as well as the growing practice of retaining these samples and using them for purposes that go beyond the original goals of NBS. Part III highlights the ways in which the public good comes into conflict with the private interests and describes a methodology that allows for these competing values to be recognized in policymaking. It concludes by suggesting that requiring affirmative consent for NBS and for research on DBS best balances the values of protecting the newborn's well-being and promoting research, while also protecting autonomy and privacy as much as possible.

I. THE EVOLUTION OF NEWBORN SCREENING

NBS begins with a heel prick and the collection of a few drops of blood on filter paper, or Guthrie cards.[20] It is a preventive health measure that involves the analysis of the newborn's blood for various medical conditions, many of which are inherited, including certain inborn errors of metabolism and

20. *See* AGR, *supra* note 8, at 39 ("This test could be performed on a spot of blood obtained from a heel prick before the infant left the hospital nursery."). The Guthrie cards are named after Dr. Robert Guthrie, who developed the first NBS assay for phenylketonuria. Clayton, *supra* note 11, at 697; *Spotlight on NBS Researchers, Robert Guthrie, MD, PhD*, NEWBORN SCREENING TRANSLATIONAL RES. NETWORK, https://www.nbstrn.org/about/spotlight/Guthrie (last visited Mar. 6, 2014).

blood disorders.[21] The value of conducting screening during the newborn period is both practical and clinically significant. Most infants are born in hospitals, which makes the systematic collection of samples easier at this stage of life than nearly any other.[22] In addition, for many of the diseases screened, treatment must be started in the newborn period to prevent the development of clinical symptoms.[23]

As its name suggests, NBS is a *screening* program in which an abnormal result does not necessarily identify the presence of disease. It merely indicates an increased risk that the child has the condition, necessitating confirmation through diagnostic testing.[24]

With its inception nearly fifty years ago, NBS is the longest program of genetic screening in the history of genetics.[25] The first state program screened for phenylketonuria (PKU), a disease in which the child lacks a vital enzyme that breaks down the amino acid, phenylalanine.[26] Without this enzyme, phenylalanine can accumulate in the brain, causing mental retardation, unless the affected child eats a phenylalanine-free diet.[27] The first program, developed in Massachusetts, was

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21. *E.g.*, *Newborn Screening*, *supra* note 5.

22. *See* MARIAN F. MACDORMAN ET AL., NAT'L CTR. FOR HEALTH STATISTICS, CTRS. FOR DISEASE CONTROL & PREVENTION, HOME BIRTHS IN THE UNITED STATES, 1990–2009, at 1 (2012) (showing that only 0.72% of births took place in the home in 2009).

23. *E.g.*, *Newborn Screening Tests*, KIDSHEALTH, http://kidshealth.org/parent/system/medical/newborn_screening_tests.html# (last visited Mar. 1, 2014) ("[E]arly diagnosis and proper treatment can make the difference between lifelong impairment and healthy development."); *see also* Clayton, *supra* note 11, at 697 (discussing the policy behind newborn screening and the rationale of "adding disorders to the newborn screening panel only if early detection and treatment could avert serious harm").

24. AGR, *supra* note 8, at 65 ("These screening tools are not definitive diagnostic tests, however, and positive results must be confirmed through specific testing for the disease in question.").

25. *See* Nancy S. Green et al., *Newborn Screening: Complexities in Universal Genetic Testing*, 96 AM. J. PUB. HEALTH 1955, 1955 ("Newborn Screening (NBS) is the first and largest example of systematic, populationwide genetic testing . . . .").

26. AGR, *supra* note 8, at 66.

27. *See id.* (stating that "high phenylalanine levels" can lead to mental retardation, and that a phenylalanine dietary restriction is "highly effective in preventing mental retardation"). The deficient enzyme is called phenylalanine hydroxylase. *Id.*

voluntary.[28] This is in sharp contrast, as I will address in Part II, to what is essentially mandatory screening in many states. Most states do not require affirmative parental consent under the theory either that the police powers justify this public health measure or under the doctrine of *parens patriae*.[29]

While PKU was the primary disease screened for in the early days of NBS, the panel of NBS diseases has expanded considerably in the last few years. The initial expansion, however, was quite slow, with only a few diseases added per decade.[30] As late as 2003, the number of diseases screened for in most states was still quite low—eight or fewer diseases.[31] Technological advances, however, changed that. While initial NBS required a separate assay for each disorder, the development of tandem mass spectrometry (MS/MS) in the 1990s allowed for the identification of over forty conditions through a single test,[32] contributing greatly to the expansion of

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28. *See* Newborn Screening Task Force, Am. Acad. of Pediatrics, *Serving the Family from Birth to the Medical Home: Newborn Screening: A Blueprint for the Future—A Call for a National Agenda on State Newborn Screening Programs*, 106 PEDIATRICS 389, 389 (2000) [hereinafter NBSTF] ("By 1962, Massachusetts launched a voluntary newborn PKU screening program that demonstrated the feasibility of mass genetic screening."). Initially, "the American Medical Association (AMA) and its state organizations opposed mandatory screening as an infringement of physicians' rights to regulate their professional practice." TIMMERMANS & BUCHBINDER, *supra* note 8, at 38.

29. *See infra* Part II.A.

30. *See* Burke et al., *supra* note 8, at 149 (providing background information on the expansion of NBS).

31. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-03-449, NEWBORN SCREENING: CHARACTERISTICS OF STATE PROGRAMS 2 (2003) [hereinafter GAO], *available at* http://www.gao.gov/new.items/d03449.pdf ("While the number of genetic and metabolic disorders included in state newborn screening programs range from 4 to 36, most states screen for 8 or fewer disorders.").

32. *See* Cecilia I. Kaye et al., *Introduction to the Newborn Screening Fact Sheets*, 118 PEDIATRICS 1304, 1307, 1310 (2006) (discussing how MS/MS has led to additional disorders added to screening panels and the essential role played by pediatricians throughout the process). *See generally* Bridget Wilcken et al., *Screening Newborns for Inborn Errors of Metabolism by Tandem Mass Spectrometry*, 348 NEW ENG. J. MED. 2304, 2309 (2003) ("It is now possible to screen rapidly, simultaneously, and inexpensively for a number of very rare disorders with the use of tandem mass spectrometry."). Tandem mass spectrometry screens for inborn errors of metabolism by measuring the levels of various metabolites in the blood. *Id.* at 2305. Abnormalities in the levels of these metabolites suggest the presence of metabolic disorders. Mary Ann Baily & Thomas H. Murray, *Ethics, Evidence, and Cost in Newborn Screening*, HASTINGS CENTER REP., May–June 2008, at 23, 25. MS/MS can also screen for

NBS.[33] After several years of much variability in screening practices, a consensus began to emerge about the need for more uniformity in NBS, especially with respect to screening panels.[34] The American College of Medical Genetics (ACMG) issued recommendations for the standardization of the selection of NBS diseases in 2005, which were endorsed by several professional groups.[35] Now every state tests or will test for a minimum of twenty-nine conditions.[36] Some panels include over fifty disorders.[37]

As technologies allow us to test for more diseases more efficiently, the question of what diseases should be included in each state's NBS panel remains difficult and, as we shall see later, has some bearing on the question of whether parental consent should be required. Among the relevant criteria are, of course, scientific considerations, such as the prevalence of the condition in the population, the validity of the NBS test, and the efficacy of available treatments.[38] But other non-scientific considerations also play a vital role. Political concerns—such as

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PKU and other amino acid disorders, but it does not allow for the testing of all NBS disorders. Kaye et al., *supra* at 1310.

33. TIMMERMANS & BUCHBINDER, *supra* note 8, at 17. Interestingly, in the United Kingdom, "there was insufficient evidence and cost-effectiveness to support tandem mass spectrometry technologies for newborn screening," whereas in the United States, these factors did not inhibit the use of this technology because "cost-effectiveness is often neglected within health policy discussions, due to cultural anxieties about healthcare rationing." *Id.* at 58.

34. *Id.* at 34 ("The United States is one of only two industrialized countries without a national newborn screening policy.").

35. *Id.* at 50, 59. Although the report was one of the most controversial reports on NBS issued by an advisory body, it was also one of the most influential, in large part because it was strongly endorsed by such groups as the March of Dimes Foundation; The American Academy of Pediatrics; the Association of Women's Health, Obstetric and Neonatal Nurses; and the Secretary's Advisory Committee on Heritable Disorders in Newborns and Children. *Id.* at 59.

36. *Id.* at 50; Watson et al., *supra* note 6, at 1S ("[T]he expert panel identified 29 conditions for which screening should be mandated."). I should note that I was part of the panel.

37. Moody & Choudhry, *supra* note 9, at 239 ("All states in the USA now screen for 53 core conditions . . . .").

38. The "classical" criteria used by states in determining which conditions to include in their NBS panels were derived from a seminal paper for the World Health Organization by Wilson and Jungner. *See* Heather Harrell, *Currents in Contemporary Ethics: The Role of Parents in Expanded Newborn Screening*, 37 J.L. MED. & ETHICS 846, 846–47 (2009) (discussing Wilson and Jungner's ten criteria to apply when considering population screening).

the existence of advocacy groups[39] and cost-benefit analysis[40]—are also hugely influential. And, of course, ethical considerations should and often do come into play.[41] For example, because the benefits to the newborn, to the family, and to society do not necessarily overlap, decision makers must decide whose benefits should determine the selection of the screening panel.

If the goal of NBS is to benefit the newborn, the panel of diseases should be limited to those for which we have effective treatments or early intervention and whose natural history we understand well. If we also consider the benefits to the family, however, the panel of diseases might be broader because it would include diseases with no treatment that might help parents make better informed reproductive decisions about

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39. In the context of NBS, parents have been strong advocates for expanding the array of tests. Advocacy and lobbying have been strong forces in the development and evolution of NBS. As Ellen Wright Clayton observes, NBS laws were influenced more by individual practitioners and political groups than anything else. Clayton, *supra* note 11, at 697–98 (discussing how most programs in the United States were driven by a report endorsed by the government committees and parent advocacy groups); *see* TIMMERMANS & BUCHBINDER, *supra* note 8, at 39, 44–48, 59–61 (describing the powerful role of advocacy in promoting NBS and its expansion).

40. *See* Harrell, *supra* note 38, at 846–47 (explaining that the criteria when considering population testing boils down to screening "illnesses that are sufficiently understood" and can be tested in a cost-effective manner). One of the reasons PKU screening was so widely applauded was its high cost savings of $93,000 per detected case. *Report of the NIH Consensus Development Conference on Phenylketonuria (PKU): Screening & Management: Chapter II*, NAT'L INST. CHILD HEALTH & HUM. DEV., https://www.nichd.nih.gov/publications/pubs/pku/Pages/sub30.aspx (last updated Dec. 21, 2011). The costs of screening per detected case, however, can sometimes be quite large. *See* OFFICE OF TECH. ASSESSMENT, U.S. CONG., HEALTHY CHILDREN: INVESTING IN THE FUTURE 106–11 (1988) (demonstrating the variability in cost amongst different screening and testing strategies). Some groups, such as the March of Dimes, have taken the view that newborns should be screened regardless of how rare the disorder is, in essence rejecting considerations of cost-benefit analysis. *See Newborn Screening*, MARCH OF DIMES, http://www.marchofdimes.com/baby/newborn-screening.aspx (last visited Mar. 26, 2014) (expressing their desire for mandatory testing of extremely rare diseases, most of which, but not all, can be treated or dealt with). This perspective is more political or ethical than scientific, since it may not result in the greatest health benefit to the community, though it is quite a sympathetic position from the perspective of the individual families who benefit from such an approach. *See* Press Release, N.Y. Dep't of Health, State Health Department Receives March of Dimes Award for National Leadership in Newborn Screening (Dec. 14, 2007) (lauding New York's comprehensive NBS program).

41. *See infra* text accompanying notes 42–44.

whether to undergo prenatal testing with future pregnancies.[42] In addition, such information can avoid diagnostic odysseys, when parents search long and hard for the diagnosis of a rare condition.[43] Finally, if we focus on the benefits to society, the panel of diseases would be even larger, including conditions about which we have limited knowledge and no effective treatments so that we can identify potential research subjects to learn more about the natural history of the disease.[44]

For some time, the consensus has been that the benefits to the newborn should be decisive in selecting conditions for NBS since the *raison d'être* of the program is to protect infants from debilitating diseases.[45] Despite this consensus, these criteria have not always been followed in practice.[46] Because state health departments have substantial discretion to decide which

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42. Many parents would seek prenatal testing with future pregnancies, even if they did not plan to terminate affected pregnancies. Peter T. Rowley, *Parental Receptivity to Neonatal Sickle Trait Identification*, 83 PEDIATRICS 891, 892 (1989) (noting that most women at risk for having a child with sickle cell anemia wanted prenatal testing even though only one quarter would terminate the pregnancy if the fetus were affected). *But see* Ranjeet Grover et al., *Newborn Screening for Hemoglobinopathies: The Benefit Beyond the Target*, 76 AM. J. PUB. HEALTH 1236, 1236–37 (1986) (reporting that fourteen out of twenty-three women at risk for having a child with sickle cell anemia had an amniocentesis and three of the four affected pregnancies were terminated). Some have observed that this rationale for NBS makes it less about protecting the newborn and more about eugenic goals of eradicating undesirable conditions in the population. *See, e.g.*, TWILA BRASE, CITIZENS COUNCIL ON HEALTH CARE, NEWBORN GENETIC SCREENING THE NEW EUGENICS? THE CASE FOR INFORMED CONSENT REQUIREMENTS FOR GENETIC TESTING, BABY DNA STORAGE AND GENETIC RESEARCH 1 (2009), *available at* http://www.cchfreedom.org/pr/NBS_EUGENICS_REPORT_Apr2009_FINAL.pdf.

43. Baily & Murray, *supra* note 32, at 28–29.

44. TIMMERMANS & BUCHBINDER, *supra* note 8, at 51 (describing how consideration of not just individual benefits, but also benefits to the family and society is an example of "'benefit creep'").

45. *See* J.M.G. WILSON & G. JUNGNER, WORLD HEALTH ORG., PRINCIPLES AND PRACTICE OF SCREENING FOR DISEASE 14 (1968) (stating that the aim of early detection is to protect the individual). For a broader discussion and criticism of the shift in focus of some NBS programs from benefit to the infant to benefit to the family and society, see generally PRESIDENT'S COUNCIL ON BIOETHICS, THE CHANGING MORAL FOCUS OF NEWBORN SCREENING: AN ETHICAL ANALYSIS BY THE PRESIDENT'S COUNCIL ON BIOETHICS (2008), *available at* http://bioethics.georgetown.edu/pcbe/reports/newborn_screening/index.html (discussing the shift from focusing primarily on what benefits the infant to a "*broader conception of benefit*").

46. *See generally* COMM. FOR THE STUDY OF INBORN ERRORS OF METABOLISM, NAT'L ACAD. OF SCIS., GENETIC SCREENING: PROGRAMS, PRINCIPLES AND RESEARCH 228 (1975) (listing unacceptable aims of NBS).

tests to include for NBS, there is little oversight.[47] Even the ACMG recommendations, which expressly declare that the benefit to the newborn should drive the selection of disease,[48] include a panel of diseases, not all of which directly or indirectly benefit the newborn.[49]

Several factors have contributed to, and will likely further contribute to, the expansion of NBS, not all of which directly benefits the newborn. Technological advances, such as MS/MS, have contributed to this expansion.[50] Other technologies, like DNA microarrays, will make it possible to screen for a slew of genetic conditions.[51] With the possibility of ever-cheaper whole genome sequencing, it is not hard to imagine a time, in the not too distant future, when NBS will be expanded to include whole genome sequencing.[52] Indeed, the National Institutes of Health (NIH) recently funded pilot programs to "explore the promise—and ethical challenges—of sequencing every newborn's

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47. *See* AGR, *supra* note 8, at 67 (stating that typically state health departments have broad discretion to introduce tests, often with little oversight, which can lead to testing for genetic conditions with little clinical significance).

48. Watson et al., *supra* note 6, at 2S. The approach to selecting diseases awarded points for clear benefits to family and society, as well as points for individual benefits, which were weighted more heavily. TIMMERMANS & BUCHBINDER, *supra* note 8, at 51–52.

49. Specifically the group proposed mandated screening for a panel of twenty-nine conditions and suggested that an additional twenty-five be reported to families. Watson et al., *supra* note 6, at 1S. Because there is no treatment for some of these diseases, they did not meet the standard criteria for NBS. Baily & Murray, *supra* note 32, at 26; Watson et al., *supra* note 6, at 1S; *see also* Jeffrey R. Botkin et al., *Newborn Screening Technology: Proceed with Caution*, 117 PEDIATRICS 1793, 1796 (2006) (discussing the issues with offering results for a large number of conditions for which limited or no evidence of benefits exist).

50. This would not be the first time that medical diagnostics have been driven as much or more by technology than by need. *See* Sonia Mateu Suter, *The Routinization of Prenatal Testing*, 28 AM. J.L. & MED. 233, 233 (2002) ("A product of the technology era, genetics has, in a short time, offered vast amounts of information.").

51. DNA microarrays allow researchers to analyze thousands of active genes at a time, which could allow them to search for huge numbers of genetic disease mutations at one time. *DNA Microarray Technology*, NAT'L HUM. GROWTH RES. INST. (Nov. 15, 2011), http://www.genome.gov/10000533.

52. *See* FRANCIS S. COLLINS, THE LANGUAGE OF LIFE: DNA AND THE REVOLUTION IN PERSONALIZED MEDICINE 208 (2010) ("[It is] almost certain . . . that complete genome sequencing will become part of newborn screening in the next few years.").

genome."[53] This is consistent with the development of personalized medicine and the belief that it is responsible and empowering to get as much medical information as possible.[54]

So far, most of the expansions of NBS have been beneficial, although the data about "long-term clinical outcomes" are limited.[55] The lives of many children, who might have died years ago because their state did not screen for medium chain acyl-coenzyme A dehydrogenase deficiency (MCADD), for example, have been saved by the introduction of MCADD testing in all states.[56] Even so, the expansion of NBS is not without costs. The more conditions we screen for, the greater the risk of the inevitable artifacts of any screening program: false negatives, false positives, and clinical and diagnostic uncertainty. False negatives may create false reassurance and slow the process of diagnosis; because pediatricians know that NBS is done for all children, they may assume that the child does not have one of the NBS diseases based on the negative NBS result.[57]

False positives present the opposite problem.[58] When a child is reported as being positive for one of the NBS conditions,

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53. Jocelyn Kaiser, *NIH Studies Explore Promise of Sequencing Babies' Genomes*, SCI. MAG. (Sept. 4, 2013, 2:45 PM), http://news.sciencemag.org/biology/2013/09/nih-studies-explore-promise-sequencing-babies%E2%80%99-genomes.

54. *See* Suter, *supra* note 50, at 233–34 (noting the strong desire to use technology to get as much information as possible, but also cautioning that knowledge can be toxic at times).

55. TIMMERMANS & BUCHBINDER, *supra* note 8, at 184.

56. *See* Baily & Murray, *supra* note 32, at 23–24 (discussing Mississippi's response to MCADD and the benefits to its newborn population). However, not all deaths due to MCADD have been eliminated with NBS. *See* TIMMERMANS & BUCHBINDER, *supra* note 8, at 185.

57. False negatives can occur because of failures in the administration of NBS: failure to perform the test properly, to record the results, or simply to test. But false negatives can also occur even if everything is done correctly because NBS is a *screening* test—it is not diagnostic. AGR, *supra* note 8, at 40. False negatives may have become less of a problem in the last five to ten years, but state health departments recognize the possibility of false negatives. ARIZ. DEP'T OF HEALTH SERVS., ARIZONA NEWBORN SCREENING PROGRAM: GUIDELINES 42–43 (2010), *available at* http://www.azdhs.gov/lab/aznewborn/documents/providers/AZ-Newborn-Screening-Provider-Guidelines.pdf (revised Jan. 2011).

58. False positives may result from errors in the testing process (testing/analysis or reporting), but in general, false positives are an unavoidable consequence of screening for extremely rare disorders. But like false negatives, they are also inevitable artifacts of any screening program. The

the family can experience a great deal of anxiety and confusion. Some studies have shown that false positives can have an adverse effect on the relationship between parent and child, including parents' continued worries about the child's health even after learning that she did not have the condition after all.[59] In addition, false positives may have a negative health impact on the child by requiring follow-up testing and treatment until it is determined that the child is unaffected; further testing and treatment both pose potential medical risks.[60] Children who have false positive results are often mislabeled as ill even though they do not display any clinical symptoms.[61]

The recent and rapid expansion of NBS panels may also result in the diagnosis of conditions for which there is no treatment, which may create unnecessary stress and anxiety for the family and affect the parent-child relationship. For example, parents may pursue costly treatment odysseys, hoping to find a cure even though no proven treatment exists.[62] While such information may help parents with future reproductive decision making, this rationale moves NBS away from its stated purpose of benefitting the newborn. Moreover, it undercuts the

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incidence of false positives can be quite high. "Some states have a [positive predictive value] of only 3%, meaning that 97% of infants who initially test positive do not actually have the disease." Whelan, *supra* note 18, at 438.

59. *See* K. Fyrö & G. Bodegård, *Four-Year Follow-up of Psychological Reactions to False Positive Screening Tests for Congenital Hypothyroidism*, 76 ACTA PAEDIATRICA SCANDINAVICA 107, 107, 111 (1987) (finding that a significant portion of families experienced persistent anxiety months and years after false positives); James R. Sorenson et al., *Parental Response to Repeat Testing of Infants with 'False-Positive' Results in a Newborn Screening Program,* 73 PEDIATRICS 183, 185–86 (1984). One study also found that about half of the children demonstrated difficulty adjusting psychologically to the false positives as the mother-child relationship was negatively impacted. Karin Fyrö & Göran Bodegård, *Difficulties in Psychological Adjustment to a New Neonatal Screening Programme*, 77 ACTA PAEDIATRICA SCANDINAVICA 226, 229–31 (1988) (noting, however, that other factors may have played a role in the dysfunction, which were unveiled by the NBS results).

60. Harrell, *supra* note 38, at 847–48 (describing the general concern and her family's experience with a false positive when her son was screened as a newborn).

61. *Id*. at 847 (discussing the effects of a ten to one ratio of false positives to true positives, coupled with a lack of visible symptoms, on parents' decision making, and the fact that false positives create the belief that the child is ill and that it is neglectful not to proceed with additional testing).

62. *See* Baily & Murray, *supra* note 32, at 28–29.

justification for the mandatory nature of NBS, as we shall see in Part III.B.

Even more complicated issues arise when laboratories make incidental findings of "abnormalities" or clinically ambiguous findings.[63] This problem has increased with tandem mass spectrometry, which looks for a group of core conditions by identifying unusually high levels of metabolites related to these conditions.[64] An artifact of this technology is the incidental identification of elevated levels of certain metabolites, which the laboratory was not even trying to identify,[65] or the identification of screening values that lie outside the normal range but that do not always clearly correlate with defined disease categories.[66] These findings can lead to a new kind of diagnostic odyssey, where children become, to use the terminology of Timmermans and Buchbinder, "patients-in-waiting," who hover "for extended periods of time under medical attention between sickness and health, or more precisely, between pathology and an undistinguished state of 'normality.'"[67]

Several problems arise when these incidental or diagnostically uncertain findings are made and reported to

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63. TIMMERMANS & BUCHBINDER, *supra* note 8, at 12 ("Newborn screening is a technology expected to provide actionable knowledge, yet it generates uncertainty in the clinic . . . .").

64. Baily & Murray, *supra* note 32, at 25 ("Tandem mass spectrometry measures the levels of various metabolites in the blood, and abnormalities in the levels suggest the presence of metabolic disorders.").

65. TIMMERMANS & BUCHBINDER, *supra* note 8, at 104 (describing the identification of ACADM variants of unknown significance). Indeed, one of the debated aspects of MS/MS is how many of the metabolic variants to report to families. The ACMG proposed that in addition to a core panel of twenty-nine conditions identified through MS/MS, twenty-five others should be disclosed to families. *See supra* note 49. Some countries report only a limited number of conditions identifiable through MS/MS. Clayton, s*upra* note 11, at 697 ("Many countries have chosen to report only a limited number of disorders detectable by MS/MS . . . ."). The argument for this approach is that, if the family knows about these conditions, they might avoid diagnostic odysseys. In addition, such information might be useful for reproductive decision making, and following such children might help us deepen our understanding of these conditions. These arguments, however, depart from the traditional NBS philosophy by placing societal benefits above the needs of the child. Baily & Murray, *supra* note 32, at 28. On the other hand, not everyone wants such information and there can be harm in receiving ambiguous information or information about conditions for which there is no treatment. *See* Clayton, *supra* note 11, at 698 ("Some parents simply will not want all these results.").

66. TIMMERMANS & BUCHBINDER, *supra* note 8, at 65.

67. *Id.*

parents. The child might be stigmatized as a "sick child" before symptoms develop, if they ever will. This label has been shown to have a harmful effect on the parent-child relationship and on the family as a whole.[68] Indeed, in some cases, the child might never become clinically affected by the abnormal levels of the metabolite or the mutation.[69] There may be a considerable time lag before physicians can determine whether high metabolites or certain mutations are clinically significant, hence the phrase "patients-in-waiting."

Timmermans and Buchbinder's ethnographic study of a genetics clinic describes the complexities and anxieties that such diagnostic uncertainties present and the ways in which entire families are affected during this period.[70] If families learn of these findings, they might embark on treatment odysseys, investing significant money and time in search of treatments that may not exist or that are unproven. Sometimes the heightened vigilance that parents exhibit during this period is difficult to "tone down" once it becomes clear that the child is not clinically affected.[71] NBS programs may also spend added dollars to report and follow up on conditions for which treatments may not exist. It has also presented challenges for clinicians who have to contend with the fact that expanded screening has "identified more patients than anticipated," most of whom are asymptomatic, and which requires a collective

68. *See supra* note 59.

69. In fact, with little knowledge of the disease's natural history, it is difficult to know the rate of false positives or negatives or even, at times, to determine whether there is a false positive or negative.

70. TIMMERMANS & BUCHBINDER, *supra* note 8, at 65–96 (describing the full experience of "patients-in-waiting" and their families).

71. *Id.* at 88 ("When, after time passed, the baby remained fine, clinicians sometimes had trouble getting the parents to tone down their level of vigilance."); *id.* at 91 ("[W]hile geneticists could be ready to let the condition fade away, family members could nevertheless perpetuate the medicalization of their child."); *id.* at 226 ("The most striking emotion we observed in the clinic was anxiety, but parents also expressed shame, anger, and sadness."). Even so, "nearly all of the families in [Timmermans and Buchbinder's] study regarded the screening program favorably." As one parent said, "[w]e would rather go through 10 weeks of the hell we went through than a lifetime of having a special needs child without having the opportunity to know from day one or day five." *Id.* at 219.

learning process and the development of new knowledge to determine who is truly affected.[72]

If NBS ultimately includes whole genome sequencing, similar issues will arise on an even greater scale. We are unlikely to fully understand for some time the clinical implications of many mutations, let alone the complex interactions of different mutations within a particular genome and environment. In many instances, it will be difficult to determine whether a genetic variant is likely to have a significant clinical impact, or what the degree or timing of such impact would be.[73] As a result, whole genome sequencing would likely provide a great deal of data of limited value, which could increase parental anxiety and confusion.

Although the *raison d'etre* for NBS was to promote the wellbeing of newborns, some of the expansions of NBS can only be justified by other considerations, such as allowing parents to make better informed reproductive decisions and benefiting society by allowing us to better understand the conditions. The more these other rationales are used to justify expansions of NBS, the more we should question whether screening infants without the consent of parents can be justified. I turn now to an explanation for the enduring lack of consent in NBS before discussing the issues of consent that arise with respect to the storage and dissemination of newborn samples for research and other uses.

II. THE LACK OF CONSENT IN NBS

Consent has long been absent in NBS, making it in essence a mandatory screening program. Recently, the public and scholarly communities have focused largely on the lack of consent with respect to the storage and future uses of DBS. But although the lack of consent with respect to the collection of blood samples and screening itself has not been challenged as strongly, there are reasons to question the presumption against requiring consent for NBS itself. I begin by describing the general rationales for lack of consent in NBS and then turn to the practices with respect to storage and future uses before

72. *Id.* at 94–95; *see id.* at 119 ("[E]xpanded newborn screening has prompted a tremendous knowledge explosion about rare metabolic conditions.").

73. Clayton, *supra* note 11, at 698.

offering my recommendations, in Part III, regarding consent in these two areas.

A. CONSENT (OR LACK THEREOF) FOR NEWBORN SCREENING ITSELF

NBS is quite unusual in being one of the few areas where the state can require medical testing of an individual or child without affirmative consent.[74] Even so, the mandatory nature of NBS has long been well accepted with only minimal criticism.[75] Although most states do not require affirmative parental consent for newborn screening, there is some variability with respect to what amounts to presumed consent. The majority of states allow parents to opt out, although the reasons they allow differ. Some will only allow parents to refuse for religious reasons.[76] Many will allow parents to opt out for any reason.[77] At one extreme, NBS is mandatory without exception.[78] One state actually imposes criminal penalties for refusing to undergo NBS.[79] Even in states where there is an opt-out provision, there is serious doubt as to whether parents truly have an opportunity to refuse in these jurisdictions,[80] making

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74. Parents are generally allowed to refuse medical treatment or testing on behalf of their child, unless their decision puts a child at grave risk. *See* Andrews, *supra* note 2, at 59 ("Only when their decisions put their children at grave risk are parental decisions overridden by the state.").

75. *See, e.g.*, Clayton, *supra* note 11, at 697 (discussing the rapid development of the screening programs and stating that they "were almost always mandatory, in response to advocacy by geneticists and parents").

76. *See* TENN. CODE ANN. § 68-5-403 (2013) (allowing parents to opt out of testing or medical treatment if they file a written statement that states such tests or treatment conflict with their "religious tenets and practices"); WIS. STAT. ANN. § 253.13(3) (West 2010) (stating that the statute shall not apply "if the parents or legal guardian of the child object thereto on the grounds that the test conflicts with their religious tenets and practices").

77. *See, e.g.*, FLA. STAT. ANN. § 383.14(4) (West 2007) ("The provisions of this section shall not apply when the parent or guardian of the child objects thereto."); N.M. STAT. ANN. § 24-1-6(A) (West 2011) (stating that parents, after being informed of the reasons for the tests, may waive the requirements for the tests in writing).

78. MICH. COMP. LAWS ANN. § 333.5431 (West 2001); MONT. CODE ANN. §§ 50-19-201 to -211 (2013); NEB. REV. STAT. §§ 71-519 to -524 (2009); S.D. CODIFIED LAWS §§ 34-24-17 to -25 (2011); W. VA. CODE §§ 16-22-1 to -6 (2010).

79. S.C. CODE ANN. § 44-37-30(G) (1991).

80. Ruth Faden et al., *A Survey to Evaluate Parental Consent as Public Policy for Neonatal Screening*, 72 AM. J. PUB. HEALTH 1347, 1347 (1982) (describing the screening as "compulsory for all practical purposes").

the provision "opt-out" more in name than practice. Only two states require affirmative parental consent.[81]

Not only is a requirement of consent for NBS rare, but parents are often woefully uninformed about NBS. Often states provide limited information about the nature of NBS testing[82] or that there is an option to opt out (when there is such an option).[83] Sometimes parents are not even informed that the child will be tested.[84] If a child tests positive through NBS, parents often do not learn that the newborn *screening* results are not diagnostic and that there may be false positives or negatives.[85] And many are not adequately educated about the nature of the condition or offered genetic counseling, even when the child tests positive.[86]

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81. D.C. CODE §§ 7-831 to -840 (LexisNexis 2012); WYO. STAT. ANN. §§ 35-4-801 to -802 (2013). In the last few years, Maryland switched from its opt-in, informed consent approach, to an opt-out approach. *See* MD. CODE REGS. 10.52.12.07 (2013); Rachel L. Schweers, *Newborn Screening Programs: How Do We Best Protect Privacy Rights While Ensuring Optimal Newborn Health?*, 61 DEPAUL L. REV. 869, 891 n.130 (2012). The rationale for this change was to bring testing in line with the national Newborn Screening Taskforce, to be like the vast majority of states, and to lighten the paperwork burden on hospitals and providers because parental refusal is so rare. MD. DEP'T OF HEALTH & MENTAL HYGIENE, 2008 LEGISLATIVE REPORT: SHOULD A COORDINATED STATEWIDE SYSTEM FOR SCREENING NEWBORN INFANTS BE APPLIED TO ALL NEWBORN INFANTS IN MARYLAND? 2–3 (2008).

82. *See* Schweers, *supra* note 81, at 869 (discussing the lack of knowledge about screening policies amongst health care providers, and the need to initiate a discussion in order to address concerns).

83. *See, e.g.*, MD. CODE REGS. 10.52.12.07 (2013) (providing an example of an opt-out regulation); Rachel Grob, *Parenting in the Genomic Age: The 'Cursed Blessing' of Newborn Screening*, 25 NEW GENETICS & SOC'Y 159, 159, 163 (2006).

84. AGR, *supra* note 8, at 67 (stating that at this point, most parents receive brochures or some general information at the time of screening, although in many cases this is very thin, token information); *see* Terry C. Davis et al., *Recommendations for Effective Newborn Screening Communication: Results of Focus Groups with Parents, Providers, and Experts*, 117 PEDIATRICS S326 (Supp. May 2006) (providing that one-third of patients in a study in California never received NBS materials from their prenatal providers even though California requires them to provide patients with such information); Lisa A. Faulkner et al., *The Newborn Screening Educational Gap: What Prenatal Care Providers Do Compared with What Is Expected*, 194 AM. J. OBSTETRICS & GYNECOLOGY 131 (2006).

85. AGR, *supra* note 8, at 65, 67.

86. *See* Clayton, *supra* note 11, at 697 ("While some people may value this information, other parents who specifically chose not to have carrier screening for themselves may be less pleased when they involuntarily learn their carrier status from their child's newborn screen.").

NBS laws and practices go very much against legal and ethical norms in the United States, which recognize an individual's right to choose whether to undergo medical treatment or testing and to refuse treatment even when it can result in death.[87] Not only is consent required for most medical interventions and treatments,[88] generally consent must be *informed*.[89]

There is considerable irony in the fact that parental decision making and education are so limited with NBS since it is essentially a form of *genetic* screening. Mandatory genetic testing is extremely unusual,[90] in large part because a strong consensus has existed for some time that genetic screening programs should not be compulsory and should involve informed consent.[91] After all, genetics and especially genetic counseling are among the disciplines in medicine most deeply committed to individual autonomy in medical decision making and informed decision making for genetic testing.[92]

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87. The Supreme Court, in *Cruzan v. Mo. Dep't of Health*, 497 U.S. 261, 269–70 (1990), discussed the long common law tradition of protecting bodily integrity through battery actions and the informed consent doctrine, which is now "firmly entrenched in American tort law." Based on this common law tradition, the court inferred that a competent person has a constitutionally protected right to refuse lifesaving hydration and nutrition. *See* Winston v. Lee, 470 U.S. 753, 753, 766 (1985) (holding the surgical removal of a bullet from a defendant's body was an unreasonable search violating the Fourth Amendment); Rochin v. California, 342 U.S. 165, 172–73 (1952) (holding that evidence obtained through the forceful use of a stomach pump violated the Due Process Clause).

88. Treating a patient or imposing some medical intervention without a patient's consent could easily be the basis for a battery claim. BARRY R. FURROW ET AL., HEALTH LAW: CASES MATERIALS AND PROBLEMS 357–58 (5th ed. 2004).

89. *Id.* at 357.

90. Andrews, *supra* note 2, at 58 (providing that some unfortunate exceptions to this rule have included the mandatory testing for carriers of the gene for sickle cell anemia); *see* AGR, *supra* note 8, at 40–42.

91. Faden et al., *supra* note 80, at 1347–48 (describing various policy committees that have expressly rejected "public health justification[s] for mandatory [genetic] screening" and noting that "[t]he Genetic Disease Title of Public Law 94-278, which provides assistance in the establishment of genetic testing and counseling programs, requires that the 'participation by an individual in any program or portion thereof under this part shall be wholly voluntary'").

92. *See* TIMMERMANS & BUCHBINDER, *supra* note 8, at 19 (noting how inconceivable it seems in "an era infused with bioethical concern about patient autonomy and genetic discrimination" to screen "the overwhelming majority of

NBS is not, however, the only example in which the state has made medical decisions on behalf of individuals. The state has intervened either to protect the well-being of the public or the individual himself. In *Jacobson v. Massachusetts*, for example, the Supreme Court upheld the state's right to mandate its citizens to be vaccinated against smallpox.[93] The Court reasoned that vaccinating an individual against his will did not violate the individual's liberty interests.[94] This was so because a "community has a right to protect itself against an epidemic of disease which threatens the safety of its members,"[95] as long as the means of doing so are "reasonably required for the safety of the public."[96] The court located the state's right to compel vaccination within its police powers because it protects the public health[97] by preventing the spread of highly contagious smallpox.[98] The state has also exercised its police powers to impose medical treatment against a person's will when someone has been deemed mentally ill and a threat to others.[99] In both instances, the government intervenes to prevent one individual from threatening physical danger or harm to another.[100] In spite of possessing these potentially broad powers, the states have tended to be fairly limited in using them.[101]

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infants . . . for *genetic* conditions without informed consent"); Suter, *supra* note 50, at 242–43.

93. Jacobson v. Massachusetts, 197 U.S. 11, 38–39 (1905).

94. *Id.* at 27.

95. *Id.*

96. *Id.* at 28.

97. *Id.* at 24–25 ("The authority of the State to enact this statute is to be referred to what is commonly called the police power—a power which the State did not surrender when becoming a member of the Union under the Constitution. [T]his court . . . has distinctly recognized the authority of a State to enact quarantine laws and 'health laws of every description;' . . . . According to settled principles, the police power of a State must be held to embrace, at least, such reasonable regulations established directly by legislative enactment as will protect the public health and the public safety.").

98. *Id.* at 35 (finding "strong support" for the view that vaccination is an effective "means of protecting a community against smallpox").

99. Washington v. Harper, 494 U.S. 210, 236 (1990).

100. Ellen Wright Clayton, *Screening and Treatment of Newborns*, 29 HOUS. L. REV. 85, 126 (noting that the police power "has historically been invoked only to protect others from physical harm").

101. Andrews, *supra* note 2, at 54 (noting, for example, that the government has not tended to track people down with infectious diseases, quarantined them, or forced them to undergo treatment, but observing that in some limited

The mandatory nature of NBS has been justified by these police powers because NBS is touted as a public health effort.[102] In fact, however, NBS does not neatly fit into this model. NBS screening is conducted primarily to prevent harm to the *individual* who is being screened, rather than to prevent harms to others.[103] To be sure, identifying a child's metabolic disorder in time to provide treatment can minimize suffering for the family overall, reduce societal health care costs, and expand families' reproductive options. These rationales, however, are not typically what we think of as public health efforts of the sort that justifies the police powers. Of course, if we conceive of the public health more broadly as the public good, then this justification is more powerful.

Even so, the better rationale for the mandatory nature of NBS is the doctrine of *parens patriae*, which allows the state to limit a person's liberty to protect the individual.[104] The basic principle of this doctrine is to preserve human life.[105] Although there is a common law and constitutional presumption that parents have the right to make medical decisions on behalf of their children,[106] the state can intervene if parental decisions constitute abuse or neglect.[107] Classic cases in which the state

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cases people have been required to be tested to HIV infection if convicted of certain crimes).

102. Faden et al., *supra* note 80, at 1347.

103. Whelan, *supra* note 18, at 435 (describing the police powers as infringing "on individual rights primarily to protect the public from other individuals' actions or behaviors").

104. STEVEN OLSON & ADAM C. BERGER, INST. OF MED., CHALLENGES AND OPPORTUNITIES IN USING RESIDUAL NEWBORN SCREENING SAMPLES FOR TRANSLATIONAL RESEARCH: WORKSHOP SUMMARY 7 (2010) ("Newborn screening programs are authorized through the legal doctrine known as *parens patriae*, which gives the state the right to assume certain roles of parents based on benefits to the child and to society as a whole."); Clayton, *supra* note 100, at 126.

105. Newmark v. Williams, 588 A.2d 1108, 1115 (Del. 1991).

106. *Id.* at 1115–16 ("[T]he common law recognizes that the only party capable of authorizing medical treatment for a minor in 'normal' circumstances is usually his parent or guardian."); *e.g.*, Santosky v. Kramer, 455 U.S. 745, 753 (1982); Parham v. J.R., 442 U.S. 584, 602 (1979).

107. *Newmark*, 588 A.2d at 1116 ("[T]he State can intervene in the parent-child relationship where the health and safety of the child and the public at large are in jeopardy."); BARRY R. FURROW ET AL., BIOETHICS: HEALTH CARE LAW AND ETHICS (6th ed. 2008); Lainie F. Ross, *Predictive Genetic Testing of Children and the Role of the Best Interest Standard*, 41 J.L. MED. & ETHICS 899, 901 (2013) (noting that in the United States, as compared with the United Kingdom, the best interest standard tends to give "'considerable deference to

has successfully intervened include parental decisions to withhold lifesaving transfusions or chemotherapy.[108]

The *parens patriae* justification for NBS is the urgent need for early diagnosis of conditions for which early treatment can reduce morbidity and mortality. It is further supported by the fact that the risks of testing and treatment are generally minimal. Thus, the argument goes, the state must intervene because parental refusal to test for various inborn errors of metabolism and other serious conditions could be potentially life threatening or seriously debilitating by preventing an affected child from being diagnosed during the newborn period. The underlying presumption is that without a mandate, parents will refuse to participate in NBS, leaving children undiagnosed and therefore untreated for treatable conditions.[109] Because NBS fits better within a medical model—where the focus is the risk/benefit calculus with respect to the individual—than a public health model, the *parens patriae* justification is more appropriate than the police powers rationale.

Even so, as some scholars pointed out in the earlier years of NBS, and as is even truer now as NBS expands, the *parens patriae* rationale is somewhat questionable for many reasons. First, as I discuss in Part III, empirical data challenge the presumption that a mandate is necessary to ensure that newborns are screened. Second, definitive treatments are not available for all of the conditions identified;[110] a problem that

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childrearing decisions made by parents or guardians, with state intervention generally confined to instances of abuse or neglect'") (citing Lainie F. Ross et al., *Technical Report: Ethical and Policy Issues in Genetic Testing and Screening of Children*, 15 GENETICS MED. 234, 236 (2013)); June Carbone, Legal Applications of the "Best Interest of the Child" Standard: Judicial Rationalization or a Measure of Institutional Competence 10 (unpublished manuscript) (on file with author) (noting that, although "the treatment of children starts with deference toward parental preferences" parental rights "are not absolute").

108. Andrews, *supra* note 2, at 59; Seema Shah, *Does Research with Children Violate the Best Interests Standard? An Empirical and Conceptual Analysis*, 8 NW. J.L. & SOC. POL'Y 121, 125, 156 (2013) (finding that courts ordered blood transfusions over parental objections in all but two cases).

109. *See* PRESIDENT'S COMM'N FOR THE STUDY OF ETHICAL PROBLEMS IN MED. & BIOMEDICAL RESEARCH, A REPORT ON THE ETHICAL, SOCIAL, AND LEGAL IMPLICATIONS OF GENETIC SCREENING, COUNSELING, AND EDUCATION PROGRAMS (1983), *available at* http://kie.georgetown.edu/nrcbl/documents/pcemr/geneticscreening.pdf.

110. *See* TIMMERMANS & BUCHBINDER, *supra* note 8, at 183 (describing how the genetics clinic saw many "symptomatic patients who did not seem to

will likely grow as the panel of diseases expands. Third, in some cases interventions can save lives, but the children still "face significant developmental delays, frequent hospitalizations, and serious risks of mortality."[111] Sometimes, newborn screening may not occur in time to protect those at greatest risk.[112] Given the ongoing morbidity and mortality for many children screened positive, some scholars predict that "the health payoff of screening is likely to be lower than the number of true positive might otherwise imply."[113]

Even when treatments are available, the state often does not actually provide treatment to the affected children; the programs merely provide families with the information to seek out treatment.[114] The success of newborn screening in preventing disease depends largely on day-to-day efforts to manage the conditions and "the ability [of families] to tap into available medical services and social resources," which is as much a function of socioeconomic factors as anything else.[115] As

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improve" and how "for the most severe disorders associated with the worst outcomes . . . newborn screening [is] unlikely to make a difference in outcomes"); Clayton, *supra* note 11, at 698 ("Other disorders are identified for which there is no effective therapy.").

111. TIMMERMANS & BUCHBINDER, *supra* note 8, at 179; *id.* at 184 ("[S]ome children did poorly despite the advance knowledge provided by newborn screening."); *id.* at 189 (describing conditions for which early interventions "could prevent only some negative consequences").

112. *Id.* at 162 ("[B]etween July 2005 and April 2009, 62 screen positive infants died in California before follow-up care could be started in a metabolic center."); *id.* at 180 ("In some cases, newborn screening results arrived too late, after a child had already sustained a devastating metabolic crisis and permanent brain damage.").

113. *Id.* at 216.

114. *See* Burke et al., *supra* note 8, at 152 ("Although most states provide informational brochures, many parents are unaware that their infant has been tested unless they are notified of a positive result."); *see also* R. Rodney Howell, *We Need Expanded Newborn Screening*, 117 PEDIATRICS 1800, 1802 (2006) ("The facilities vary widely for such follow-up around the country, and it is incumbent on the state programs to work in their regions to provide follow-up support in terms of funding and organization."). In such cases, we may simply be labeling more children as ill without actually providing much clinical benefit to many of these children, especially if parents are not adequately educated or cannot afford the treatment. Moreover, it exacerbates concerns about whether the resources devoted to NBS could be better used to address the urgent health care needs of many children that have still not been met.

115. TIMMERMANS & BUCHBINDER, *supra* note 8, at 195; *see id.* at 170, 194–210 (describing the effects of insurance, access to transportation, language, education and bureaucratic barriers on parents' abilities to manage their children's metabolic conditions).

a result, the state's efforts work only partially toward the goal of eliminating the deleterious effects of the diseases, leading some to question whether the true motivation for mandatory NBS is actually the well-being of the child.[116]

Finally, even if the state is motivated primarily by the well-being of each child, it is not clear that the risks are great enough to justify state intervention. While many of the NBS conditions could lead to grave, even life-threatening, harm if undetected, these conditions are extremely rare. This means that the probability that any one child who is not tested through NBS will suffer a grave or life-threatening illness by failing to undergo NBS is statistically quite low, although clearly the magnitude of harm could be quite great.[117] In contrast, both the probability and magnitude of harm (death or serious debilitation) in failing to provide blood transfusions or chemotherapy, for example, will often be considerable.[118] As Professor Lori Andrews has noted, the risks of refusing NBS screening "is far less than the risks inherent in many other decisions that parents are routinely allowed to make," such as allowing their children to play on high school sports teams.[119] Moreover, the probability of false positives is quite high; the rate of false to true positives can be as high as, or higher than, ten to one.[120] As noted above, false positives are often not inconsequential. They can potentially lead to psychological,

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116. *See* Burke et al., *supra* note 8, at 151 ("However, growing test capacity has led to calls to expand not only the number of disorders screened for but also the goals of newborn screening."). "In the past, . . . infrastructural problems and healthcare costs had tempered enthusiasm for expanding newborn screening, but the separation of the scientific issues from those affecting healthcare delivery had the effect of decontextualizing the viability of screening." TIMMERMANS & BUCHBINDER, *supra* note 8, at 55.

117. NBSTF, *supra* note 28, at 414.

118. Andrews, *supra* note 2, at 60. Of course, the calculus can often be complicated by other factors. In *Newmark v. Williams*, 588 A.2d 1108 (Del. 1991), for example, the Delaware Supreme Court ruled that it was not neglectful for parents to refuse chemotherapy treatment for their three-year-old child, who suffered from "an aggressive and advanced form of pediatric cancer," because the proposed treatment was "highly invasive, painful, involved terrible temporary and potentially permanent side effects, posed an unacceptably low chance of success, and a high risk that the treatment itself would cause his death." *Id*. at 1109–10, 1118.

119. Andrews, *supra* note 2, at 60.

120. *See* Harrell, *supra* note 38, at 847 ("Given such real life consequences of a false positive and that the rate of false positives to true positives is as high as 10 to 1 (or higher) for many of the newborn screens . . . .").

relational, and even physical harms from follow-up testing and/or treatment.[121] While the magnitude of such harms is lower than failing to detect the condition, the probability of such harms is likely much greater than the probability of identifying the conditions screened for.

Despite these concerns and a general presumption against compulsory genetic screening in virtually every other context, mandatory NBS remains the norm, even when opportunities arise to change the nature of this institution.[122] As I argue in Part III, it may be time to rethink the role of consent in NBS, particularly with the potential of NBS to expand even further and as NBS samples are used more widely in research, as the next section shows. In addition, consent requirements may go far in promoting the NBS education that parents, providers, and scholars believe is woefully inadequate.[123]

B. STORAGE AND SECONDARY USES OF NBS SAMPLES

Once the newborn blood spots are analyzed for the various NBS conditions, residual blood remains in the form of DBS.[124] Increasingly, states retain these samples for future uses, although the retention time varies significantly from state to state. Some states have provisions to retain samples for only one to four weeks, some for months, some for years, some for decades, and others indefinitely.[125] Often these samples are stored with identifying information.[126]

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121. *See id*. at 847–48.

122. MICH. COMM'N ON GENETIC PRIVACY & PROGRESS, FINAL REPORT AND RECOMMENDATIONS 4, 33 (1999). This Author was a member of the Michigan Commission on Genetic Privacy and Progress. Despite many months of deliberation, a majority of the committee voted to retain mandatory NBS, with an opt-out provision, although efforts were made to ensure that parents were to receive information about NBS.

123. Sandra J. Carnahan, *Biobanking Newborn Bloodspots for Genetic Research Without Consent*, 14 J. HEALTH CARE L. & POL'Y 299, 303, 322–25 (2011) ("Although educational pamphlets about the screening program are typically distributed to the parent, guardian, or managing conservator . . . state statutes, almost universally, do not require NBS programs to obtain the informed consent of the newborn's parent prior to extracting the blood sample.").

124. *Id*. at 301.

125. *See* Michelle H. Lewis et al., *State Laws Regarding the Retention and Use of Residual Newborn Screening Samples*, 127 PEDIATRICS 703, 704 (2011) ("A total of 40% of state public health laboratories have reported retaining DBS for at least 1 year."); Richard S. Olney et al., *Storage and Use of Residual Dried*

Although the samples are analyzed right away for NBS, there are several reasons states might want to retain the samples for months or even years. Many of these reasons are related to the underlying purpose of NBS. For example, the retention of these samples—along with contact information—is necessary for follow-up and to ensure that there will be appropriate intervention for an affected child.[127] In addition, labs may need to perform repeat tests to make a confirmatory diagnosis or to reassure families if there is a false positive.[128] Less directly related to NBS testing per se, but still connected to the public health aspects of NBS, is the retention of blood spots for quality assurance testing and to monitor the prevalence of various conditions in the state.[129] NBS samples may also be helpful for post-mortem diagnosis; for example, when trying to establish whether a genetic condition was related to a child's death.[130]

Increasingly, states are interested in long-term retention of these blood spots for purposes not directly related to NBS. Some states and/or other countries retain neonate blood spots for non-medical or non-research uses, such as identification in kidnappings or deaths.[131] NBS samples have also been used for paternity testing[132] and could potentially be used for the identification of criminals.[133]

Blood Spots from State Newborn Screening Programs, 148 J. PEDIATRICS 618, 619 fig. (2006).

126. Carnahan, *supra* note 123, at 320 (observing that a 2002 study found that thirty-four out of thirty-six NBS program studies stored the DBS with identifying information).

127. *Id.* at 304.

128. NBSTF, *supra* note 28, at 414.

129. *Id.* at 404, 413, 415–16 (suggesting that knowing about the prevalence of various conditions is important not only for better understanding of the condition, but also for determining the optimal allocation of resources).

130. Linda Kharaboyan et al., *Storing Newborn Blood Spots: Modern Controversies*, 32 J.L. MED. & ETHICS 741, 742 (2004).

131. MICH. COMM'N ON GENETIC PRIVACY & PROGRESS, *supra* note 122, at 28.

132. In New Zealand, the High Court ordered the Auckland Health Services to provide the blood sample of a man's child for paternity testing that he sought after the baby died. *H v G* [M/1686/98] 1999, *upheld in H v G* (1999) 18 FRNZ 572 (HC).

133. Some have called for universal DNA databanking for criminal forensic purposes. *See, e.g.*, D.H. Kaye & Michael E. Smith, *DNA Databases for Law Enforcement: The Coverage Question and the Case for a Population-Wide Database*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF

In addition, these blood spots, like most pathology samples, are a treasure trove for researchers because they are a valuable national repository of genetic material. As genetic technology develops,[134] the blood spots are an especially rich source of research material: they are stable over time, they constitute an unbiased collection of samples since they represent the entire population,[135] and they can potentially be linked to basic demographic information.[136] As one author notes, "[n]ewborn screening initially began as a population health endeavor but is rapidly becoming a resource for population research."[137] Newborn blood samples have been used in research and shared with investigators since the 1980s,[138] sometimes with identifying information.[139]

Only recently have professional groups begun to consider seriously how to handle the problems of storage and secondary uses of the samples.[140] Very few states have specific regulations

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JUSTICE 247, 269–71 (David Lazer ed., 2004) (arguing that universal DNA databases would eliminate the disproportionate minority representation in forensic databases). NBS blood spots would offer an easy way to achieve this goal.

134. "Optimal storage conditions" for these samples are less crucial for genetic analysis than for other kinds of biochemical analysis. NBSTF, *supra* note 28, at 415.

135. Nanette Elster, *Future Uses of Residual Newborn Blood Spots: Legal and Ethical Considerations*, 45 JURIMETRICS 179, 180 (2005); Kharaboyan et al., *supra* note 130, at 745.

136. NBSTF, *supra* note 28, at 415 (noting, however, that because these bloodspots "will not be linked to clinical data on the children" their "potential utility . . . will need to be carefully evaluated").

137. Elster, *supra* note 135, at 189.

138. *See Innocent Blood: Use of Newborn Heel Sticks Spurs Legal Challenges*, IRB ADVISOR (AHC Media, Atlanta, Ga.), Dec. 1, 2009 [hereinafter *Innocent Blood*] (noting that many states used them to determine things like the prevalence of HIV infections, prenatal exposure to heavy metals, frequencies of certain genes); Michelle Lore, *Is the Minnesota Department of Health Violating Privacy Laws*, MINN. LAW., Nov. 30, 2009 (stating that since the end of 2008, 52,519 NBS samples from the state of Minnesota had been used for research).

139. Elizabeth Cohen, *The Government Has Your Baby's DNA*, CNN (Feb. 4, 2010), http://www.cnn.com/2010/HEALTH/02/04/baby.dna.government/ (noting that a study in Minnesota found that "more than 20 scientific papers have been published in the United States since 2000 using newborn blood samples").

140. NBSTF, *supra* note 28, at 389 (recommending that each state develop and implement policies for retention of residual DBS, educate parents regarding the storage and uses, and develop model consent forms and information materials for parents); Brad Therrell et al., *Briefing Paper: Considerations and Recommendations for a National Policy Regarding the*

governing what kind of future uses the samples may be put to or requiring that parents be notified of or give consent for such uses.[141] North Dakota, for example, does not require specific consent, stores the samples indefinitely, and permits the use of samples for "'medical, psychological or sociological research.'"[142] Indeed, because many parents do not realize that their child has been screened for various diseases, they are unaware of the possibility that a blood sample from their newborn may be stored in state health departments for potentially long periods of time and possibly shared with others for uses unrelated to NBS.[143]

The laws in a few states are an exception to this rule. In May of 2009, while the first Texas lawsuit challenging the state's practice of storing and using newborn samples for undisclosed research was pending,[144] the Texas Legislature amended its NBS laws to require parents and guardians to be informed that samples were being collected and would be stored indefinitely for potential research purposes.[145] Parents, or children upon reaching adulthood, can now request to have the

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Retention and Use of Dried Blood Spot Specimens After Newborn Screening, RESOURCE REPOSITORY (Aug. 26, 2009), http://resourcerepository.org/documents/1681/briefingpaper:considerationsandrecommendationsforanationalpolicyregardingtheretentionanduseofdriedbloodspotspecimensafternewborns/; *see APHL Position/Policy Statement: Residual Newborn Screening (NBS) Specimens*, APHL (2005), http://www.aphl.org/policy/Documents/residual_newborn_screening_specimens.pdf (suggesting that retention of DBS is important for laboratory quality assurance practices and can also be useful for research among other things); *see also* AM. COLL. OF MED. GENETICS, STANDARDS AND GUIDELINES FOR CLINICAL GENETIC LABORATORIES (2008) (finding it critical, if states do not retain DBS, for parents to have the option to have their children's DBS included in a national repository).

141. Lewis et al., *supra* note 125, at 703, 705, 707 (providing that "thirteen states specify the purposes for which DBS may be used," eight states require parents to be notified of the retention of DBS, and three require "parents to be informed" so that they can request destruction of the DBS). The United States is not the only country where samples are also stored for long periods of time. *See* Kharaboyan et al., *supra* note 130, at 742–43 (describing practices in Australia, Canada, Denmark, France, New Zealand, and the United Kingdom).

142. Whelan, *supra* note 18, at 428.

143. *See generally* TEX. HEALTH & SAFETY CODE ANN. §§ 33.0111–.0112 (West 2010) (showing the ability of a state to carry out such activities with DBS).

144. *See supra* note 18 and accompanying text.

145. *See* Higgins v. Tex. Dep't of Health Servs., 801 F. Supp. 2d 541, 544–45 (W.D. Tex. 2011).

samples destroyed within sixty days[146]—essentially an opt-out-of-research approach. The lawsuit was settled once the State of Texas agreed to destroy over five million coded newborn samples,[147] which had been stored indefinitely for possible research without parental consent.[148]

Minnesota also has a limited opt-out provision, allowing parents to refuse NBS itself or to request the destruction of test results and samples following screening.[149] Even so, the Minnesota Supreme Court ruled in favor of parents who sued the state for storing and authorizing public health research on newborn samples on the grounds that these practices violated Minnesota's genetic privacy law.[150] Although the court construed the NBS statutes to be "an express exception to the Genetic Privacy Act," the storage, dissemination, and use of the samples were not expressly authorized and therefore violated the privacy statute.[151] As a result of this decision, NBS samples in Minnesota were not available for research or public health studies. Recently, however, the Minnesota House of Representatives and the Minnesota Senate passed bills that would change this. If these bills become law, NBS samples would be available for research, unless parents or the child,

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146. *Id.* at 545.

147. Mary Ann Roser, *Samples of Newborns' Blood to Be Destroyed*, AUSTIN AM. STATESMAN, Dec. 23, 2009, at A1 (providing that the state decided that trying to seek consent from all of those parents was a worse option than simply destroying all of the samples). The samples were not identifiable, but because they are coded, a link exists that could be used to identify the child. *Id.*

148. Cohen, *supra* note 139 (noting that in other states it may be very difficult to convince the state to destroy your baby's archived blood sample). A class action filed late 2010 in Texas, also alleging that the state had stored DBS for the purposes of undisclosed research, was dismissed as moot because there was no evidence that the parties' newborn samples were actually used or distributed for research. *Higgins*, 801 F. Supp. 2d at 545, 554.

149. MINN. STAT. § 144.125 (2012); Lore, *supra* note 138 (explaining that absent parents opting out, the NBS test results may become public health data). In Minnesota, for example, the department of health has a contract with the Mayo Clinic for analysis of NBS samples, which allows the Clinic to "keep the samples indefinitely if there is no request for their destruction." *Id.* The samples are not identifiable, although they are coded, and therefore could potentially be linked to the individual. Kharaboyan et al., *supra* note 130, at 744.

150. MINN. STAT. § 13.386 (2013); Bearder v. Minnesota, 806 N.W. 2d 766, 776 (Minn. 2011); Lore, *supra* note 138 (stating that Minnesota has been storing the samples since 1997); *Innocent Blood*, *supra* note 138.

151. *Bearder*, 806 N.W. 2d at 776.

over the age of eighteen, opt out, which they may do at any time.[152]

Oklahoma and Michigan require more than the right to opt out. The Oklahoma Legislature recently enacted a provision that requires "express parental consent" for storage, dissemination, and use of a newborn's DNA.[153] Michigan, after seeking input from researchers, ethicists, community groups, and the state health department's institutional review board, created a specific repository for future research that would require affirmative, informed consent from parents.[154] This approach keeps the research uses of newborn samples separate and distinct from NBS itself, which remains mandatory.[155]

As these lawsuits and this legislation suggest, many secondary uses of DBS raise ethical and even legal concerns, particularly when the uses are not related to the purposes for which the samples were originally collected.[156] Particularly salient are the threats to privacy and confidentiality.[157] In addition, questions of autonomy and research ethics come into play because the newborns potentially become research subjects via their Guthrie cards.[158] Contemporary practices with NBS raise pressing questions as to whether consent must be secured for storage and secondary uses of NBS samples, and if so what kind of consent—general consent for research, or specific, informed consent for a particular use.[159]

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152. *Minnesota House Passes Newborn Screening Bill*, GENOME WEB (May 2, 2014), http://www.genomeweb.com/clinical-genomics/minnesota-house-passes-newborn-screening-bill.

153. OKLA. STAT. ANN. tit. 21, § 1175 (West 2012).

154. *Innocent Blood, supra* note 138; *see also* Denise Chrysler et al., *The Michigan BioTrust for Health: Using Dried Bloodspots for Research to Benefit the Community While Respecting the Individual*, 39 J.L. MED. & ETHICS 98, 98–99 (2011) (discussing the creation of Michigan's Neonatal Biobank).

155. MICH. COMP. LAWS ANN. § 333.5431 (West 2001).

156. *Innocent Blood, supra* note 138.

157. *Id.*

158. *Id.*; *see also* AGR, *supra* note 8, at 65 (discussing Guthrie cards).

159. These issues also tap into a longstanding debate about ownership and control over one's biological material, an issue on which we still have no clear consensus. Sonia M. Suter, *Disentangling Privacy from Property: Toward a Deeper Understanding of Genetic Privacy*, 72 GEO. WASH. L. REV. 737, 803–11 (2004); *see* C. Thomas, *The Use and Control of Heel Prick Blood Samples*, 24 MED. & L. 259, 261–68 (2005) (applying various theories of property ownership to NBS samples).

An important consideration in evaluating the propriety of the long-term storage and future uses of NBS samples is whether the samples are identifiable; that is to say, whether they can be linked directly to the newborn through identifying information or indirectly through a code. NBS blood spots must, of course, be identifiable initially so labs can locate and offer follow-up testing to children with abnormal results. But researchers try to anonymize previously identifiable samples by unlinking them from their source.[160] While some of the possible future uses of newborn samples require the samples to be identifiable—e.g., post-mortem identification, paternity testing, forensics, and future diagnostics—many kinds of research samples might potentially be anonymized, although as I note below, people are increasingly skeptical about the effectiveness of this practice.[161]

Current regulations require informed consent for research on biospecimens that have already been archived and are identifiable or linkable.[162] The Federal Protections for Human Research Subjects, sometimes called the "Common Rule,"[163] require documented informed consent for participation in research.[164] Research on *identifiable* DBS easily falls within the definition of human subject research under the regulations, which includes analysis of "identifiable private information."[165] While state NBS programs have "not traditionally been viewed as subject" to the Common Rule given that they are regulated by state health departments,[166] some scholars argue convincingly that the federal regulations should apply to research on DBS.[167]

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160. NBSTF, *supra* note 28, at 416 (noting that they may have been originally collected without identifiers or with identifiers that have been removed).

161. *Id.* at 416–17; *see infra* text accompanying note 220.

162. Carnahan, *supra* note 123, at 315.

163. *Id.* Seventeen federal agencies have adopted these protections "verbatim." *Id.* at 315 n.102.

164. 45 C.F.R. § 46.117 (2013); *see also* Health Insurance Portability and Accountability Act of 1996 (HIPAA), Pub. L. No. 104-191, 110 Stat. 1936.

165. 45 C.F.R. § 46.102(f) (2013) (defining human subject).

166. Carnahan, *supra* note 123, at 315–16.

167. *Id.* at 316–17 (arguing that federal dollars and policy guidance directly and indirectly support NBS, including the collection, analysis, and storage of "newborn bloodspots for future research purposes"); *e.g.*, Therrell et al., *supra* note 140, at 1, 3.

Under the existing regulations, however, research on de-identified biological samples is generally understood to be exempt from federal protections of human subjects research.[168] Indeed, the Office of Human Research Protections does not "consider research involving *only* coded private information or specimens to involve human subjects . . . if . . . the private information or specimens were not collected specifically for the currently proposed research project . . . and the investigator(s) cannot readily ascertain the identity to the individual(s) to whom the coded private information or specimens pertain."[169] One scholar argues that this exemption does not apply to DBS because they were collected not only as part of a screening program, but also as part of a "*research* program."[170] While sympathetic to the view that the exemption should not apply, I am not persuaded that these samples would be treated differently from any other biospecimens under the research regulations because these samples were not collected with any specific research protocol in mind.

The question of whether and how research should be allowed on NBS or other biosamples reflects tensions between public and private interests, and more specifically between norms that focus on the value of research and norms that focus on individual rights, autonomy, and privacy interests.[171]

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168. 45 C.F.R. § 46.101(b)(4) (2013) (exempting from the research regulations research "involving the collection or study of existing data . . . pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects").

169. U.S. Dep't of Health & Human Servs., OHRP - Guidance on Research Involving Coded Private Information or Biological Specimens (2008), *available at* http://www.hhs.gov/ohrp/policy/cdebiol.html. This interpretation clearly seems to view research on biobanks with coded samples as not involving human subjects research, even though "[t]he increase in genomic data, as well as the increase of computerization of other records about individuals, will only make identifying 'anonymous' biobank files easier and easier." Henry T. Greely, *The Uneasy Ethical and Legal Underpinnings of Large-Scale Genomic Biobanks*, 8 ANN. REV. GENOMICS & HUM. GENETICS 343, 352–55 (2007).

170. Carnahan, *supra* note 123, at 320 (observing that "one purpose" of the collection and storage of the DBS "is for *future* genetic research").

171. Storage of Genetics Materials Comm., Am. Coll. of Med. Genetics, *ACMG Statement: Statement on Storage and Use of Genetic Materials*, 57 AM. J. HUM. GENETICS 1499 (1995). This issue creates tension between the ethical principle of informed consent, which argues in favor of recontacting individuals to obtain their consent, and the serious impracticabilities of doing so.

Similar tensions about autonomy interests versus some conception of the public good arise with respect to the question of whether consent should be required for NBS itself.[172] In trying to determine how best to resolve these tensions, Part III sets up a framework for balancing the conflicting interests and applies this approach to the specific questions of whether some form of consent should be required for: 1) the storage and research uses of NBS samples; and 2) some or all aspects of NBS itself.

III. BALANCING THE INTERESTS

In exploring the tensions between the public good and the individual's privacy and autonomy interests, we can see how biases can influence the weight of the interests.[173] As we shall see below, those who strongly promote research and its benefits to newborns and society tend to undervalue the privacy and autonomy interests at stake. Similarly, the strong proponents of privacy and autonomy tend to undervalue the public value of the long-term retention and research use of DBS. As a result, they reach an impasse, not only because they value things differently, but also because their approaches differ.

Many proponents of expansive access to NBS samples and other archived tissues "tend to rely on a narrow version of consequentialism" to justify a broad range of research practices, while minimizing the privacy and autonomy interests at stake.[174] The benefits of this approach seem "concrete and tangible"[175]: preventing morbidity and mortality in newborns, and gaining knowledge about various inherited disorders to advance medicine and clinical care.[176] The risks of broader access to NBS samples—privacy intrusions and the loss of autonomy interests—"are more amorphous concerns and are therefore less viscerally compelling."[177] Indeed, many of the public benefit proponents easily dismiss the value of autonomy

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172. *See* Suter, *supra* note 50, at 246–50 (discussing value considerations in prenatal testing).

173. Sonia M. Suter, *All in the Family: Privacy and DNA Familial Searching*, 23 HARV. J.L. & TECH. 309, 375–76 (2010) [hereinafter Suter, *AITF*] (discussing a parallel trend with DNA familial searches).

174. *Id.*

175. *Id.*

176. Carnahan, *supra* note 123, at 300.

177. Suter, *AITF*, *supra* note 173, at 375.

and privacy, and informed consent.[178] This view argues for expansive NBS with mandatory testing, long-term retention of samples, and broad access to these samples by researchers without consent.

In contrast, a position that privileges privacy and autonomy would push toward requiring detailed informed consent for all aspects of NBS: the collection of samples, the subsequent analysis, the retention of samples, the manner in which they are stored (coded, identifiable, or anonymized), access to the samples, and uses to which the samples are put.[179] This approach would limit many of the potential research benefits that have come from NBS programs and use of the samples.[180]

Clearly neither extreme fully considers all that is at stake. As a result, I recommend an approach that "does not focus exclusively on one or just a few values or desirable consequences. Instead, it recognizes the competing goods at stake."[181] Because I have described this approach in more detail in an earlier piece, I will only briefly outline the methodology, which borrows from philosopher W.D. Ross.[182] The central premise is that we have various underlying prima facie duties, which may sometimes come into conflict.[183] We have, for example, prima facie duties to protect the public by supporting and encouraging research and identifying children with treatable conditions in a timely manner to minimize morbidity and mortality. We also have prima facie duties to protect the autonomy of the family and the future autonomy of the newborns with respect to medical decision making and participation in research, and duties to protect the privacy of newborns. None of these duties is absolute in the sense that they must always override conflicting duties.[184] Instead, all of these duties are "intrinsically binding"—they hold sway over us, but "they are not always determinative of how we should act in

178. *Id.* at 376.
179. Carnahan, *supra* note 123, at 322–25.
180. *Id.* at 322 (noting that informed consent is problematic because future research methods are unknowable).
181. Suter, *AITF*, *supra* note 173, at 376.
182. *Id.*
183. *Id.* at 376–77.
184. *Id.* at 377.

any given instance . . . . Instead we can only determine what our actual duty is in any circumstance by full reflection."[185]

This approach does not attempt to declare winners and losers when competing values come into play. Rather, it attempts to reach a resolution that may ultimately tip more in the direction of one duty than the other, but which continues to recognize the pull of the competing values.[186] That is to say, when we determine what the actual duty is in any particular circumstance, we should not abandon or forget about the overridden prima facie obligations, because they continue to "exert force on our subsequent attitudes and actions"[187] and leave "residual effects" or "moral traces."[188] If our full reflection leads us to decide that certain research goals are particularly important to society, we may decide to limit autonomy to some extent to allow for that research. The pull of our duty to protect individual autonomy, however, continues to compel us to "approximate as closely as possible the values enshrined in the overridden duty" so that we develop measures that least infringe on parental autonomy.[189]

Considering whether consent should be required in NBS forces us to make difficult choices between various competing values and find ways to give weight, as much as possible, to the overridden prima facie duties. In particular, we must apply this balancing approach to decide: 1) what kind of consent provisions, if any, we should use for NBS itself; and 2) whether

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185. *Id.* I note in this piece that "this methodology does not offer conclusive answers to most moral questions." *Id.* at 378. It is, nevertheless, not arbitrary or subjective. Rather, it requires a kind of "reflective equilibrium" where we "check decisions from general principles against more intuitive judgments about proper outcomes for particular cases." *Id.* at 379. *See generally* JOHN RAWLS, A THEORY OF JUSTICE 15–19, 40–47 (rev. ed. 1999) (describing the "reflective equilibrium").

186. Suter, *AITF*, *supra* note 173, at 378.

187. *Id.*

188. JAMES F. CHILDRESS, MORAL RESPONSIBILITY IN CONFLICTS: ESSAYS ON NONVIOLENCE, WAR, AND CONSCIENCE 69 (1982) (citing Robert Nozick, *Moral Complications and Moral Structures*, 13 NAT. L.F. 1 (1968)); RICHARD B. MILLER, CASUISTRY AND MODERN ETHICS: A POETICS OF PRACTICAL REASONING 47 (1996); Suter, *AITF*, *supra* note 173, at 376 ("[O]verridden values remain significant and continue to exert force and obligations on our actions and deliberations. In other words, the overridden values do not go away; they retain 'moral traces.'").

189. MILLER, *supra* note 188, at 47.

consent should be required, and if so what kind, for the storage and future uses of the samples.

I should emphasize that the issue of consent for NBS itself and consent for storage and future uses need not be treated as a package. Indeed, there are strong arguments for separating the process of screening from the process of the creation of biobanks, as I suggest below, and therefore completely disaggregating the questions of consent. At the moment, however, affirmative consent is generally removed from the entire process. When we disaggregate the two sets of decisions—whether to participate in NBS and whether to participate in the biobank—it becomes clear that the conflicting public/private values are very different. With respect to NBS itself, at least when the conditions screened for develop in infancy and are treatable or subject to amelioration, the conflict is between the state's interest in the well-being of the newborn and the autonomy of the family. With respect to questions of storage and, in particular, research uses of the samples, the public value of research comes into conflict with the private values of the families' autonomy interests and the newborn's privacy and future autonomy interests. Because each set of questions raises different tensions, I address each issue in turn. I begin with the research question because it has received the most attention recently and because it indirectly has implications for the question of consent for NBS itself.

A. RETENTION AND RESEARCH USES OF DBS

In only a few other contexts does the government take one's tissue samples without consent and retain them for extended periods of time: after conviction of certain crimes,[190] and in the military.[191] In the first instance, the conviction results in the loss of certain liberty interests.[192] And in the case of the military, one has a choice not to join the military. But in the context of NBS, samples are usually taken without parental consent and then stored for long periods, potentially to be used

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190. Bonnie L. Taylor, Comment, *Storing DNA Samples of Non-Convicted Persons & the Debate over DNA Database Expansion*, 20 T.M. COOLEY L. REV. 509, 512–14 (2003).

191. Megan Allyse et al., *Ethics Watch: The G.I. Genome: Ethical Implications of Genome Sequencing in the Military*, 12 NATURE REVIEWS GENETICS 589 (2011).

192. Taylor, *supra* note 190, at 514.

for research, an approach that "veers from the norm."[193] As noted, the justifications for doing so in the case of NBS are rooted in a perspective that emphasizes the value of research and that views archived samples as something akin to community property.[194] Some also argue that the public interest and value of research are not just communal interests, but also individual interests because everyone benefits from the research.[195]

Even if we value research, however, we must recognize the competing interests in autonomy and privacy in being able to decide whether and to what extent to participate in research and to control access to personal information. Privacy advocates point out the dignitary interests, sometimes suggesting that biosamples belong to the individual.[196] Serious privacy concerns arise when others have access to our genetic material, which contains "a wealth of personal information such as predisposition to certain diseases, behaviors, physical and mental traits, parentage, and genetic relatedness to others."[197] The fact that the DBS contains genetic information and is likely to be "readily identifiable" leads some to say that consent is

193. Cohen, *supra* note 139.

194. *See* David Korn, *Genetic Privacy, Medical Information Privacy, and the Use of Human Tissue Specimens in Research*, *in* GENETIC TESTING AND THE USE OF INFORMATION 16, 53 (Clarisa Long ed., 1999) (arguing that archived human tissues are "a public resource dedicated to the public good, not, like a savings bank, a depository of private property"); *see also* Rebecca Skloot, *Taking the Least of You*, N.Y. TIMES, Apr. 16, 2006, at M45 ("[P]eople are morally obligated to allow their bits and pieces to be used to advance knowledge to help others. Since everybody benefits, everybody can accept the small risks of having their tissue scraps used in research." (quoting David Korn, *supra*)).

195. Korn, *supra* note 194, at 60; Karen Rothenberg, *The Social Implications of the Use of Stored Tissue Samples: Context, Control, and Community*, *in* GENETIC TESTING AND THE USE OF INFORMATION 84, 85–88 (Clarisa Long ed., 1999) (suggesting that both privacy and research are public and private interests); *see also* Lisa Feuchtbaum et al., *Questioning the Need for Informed Consent: A Case Study of California's Experience with a Pilot Newborn Screening Research Project*, 2 J. EMPIRICAL RES. ON HUM. RES. ETHICS 3, 3 (2007) ("[T]he legitimate needs of society and the interests of newborns should not be sacrificed to respond to the autonomy interests of the few parents who did not wish their infant to participate in the study . . . .").

196. Andrews, *supra* note 2, at 63.

197. Suter, *AITF*, *supra* note 173, at 331.

required whether or not the samples are "linked or linkable."[198] Because this information is "fundamental and basic to our makeup" and plays such "an important, though not monolithic, role in influencing our 'temperament, health, capacities, and physical appearance,'"[199] legislators at the state and federal level have enacted various forms of genetic privacy protections in the last few decades.[200] I, like many others, have argued that genetic information is "integral to the self," and therefore is among the kinds of personal information in which we have strong privacy interests.[201]

Proponents of consent provisions for research on biosamples are also motivated by a commitment to principles of autonomy; the notion that individuals may not be treated as merely a means to an end.[202] Indeed, these ethical principles have led not only to formal declarations about the various ways in which researchers have an ethical obligation to protect research subjects, but also to legal regulations protecting the way in which research may and may not be conducted in the United States.[203] Among the most fundamental principles of these ethical and legal norms are informed consent and the idea that the researchers have a fiduciary obligation to protect research subjects. A decision to become a participant in research either to advance medicine or to benefit others and/or oneself is a self-defining decision. It also creates a relationship of trust because it involves sharing personal information with researchers, imposing on them "special duties of care because of the imbalance of power inherent in the relationship."[204]

The degree to which we emphasize our duties to promote research or to protect autonomy and privacy will determine our

198. Katherine Drabiak-Syed, *Legal Regulation of Banking Newborn Blood Spots for Research: How* Bearder *and* Beleno *Resolved the Question of Consent*, 11 HOUS. J. HEALTH L. & POL'Y 1, 13 (2011).

199. Suter, *AITF*, *supra* note 173, at 332.

200. *See, e.g.*, Genetic Information Nondiscrimination Act of 2008 (GINA), Pub. L. No. 110-233, 122 Stat. 881; *Genetic Privacy Laws*, NAT'L CONF. ST. LEGISLATURES, http://www.ncsl.org/default.aspx?tabid=14287 (last updated Jan. 2008) (describing the full range of state genetic privacy laws).

201. Suter, *supra* note 159, at 773. I have also noted that "genetic information is not uniquely, nor is all genetic information equally, central to the conception of the self." Suter, *AITF*, *supra* note 173, at 334.

202. FURROW ET AL., *supra* note 107, at 405.

203. *See* 45 C.F.R. §§ 46.301–.306 (2013) (otherwise known as the "Common Rule").

204. Suter, *supra* note 159, at 787.

approach to research on DBS. Under the extreme pro-research position, samples should be available in any form for use by researchers for any kind of investigation. Such an approach would seriously undermine the privacy interests of the child and autonomy interests of the family. It would allow the use of the newborn samples in identifiable form, which would privilege research over privacy and autonomy. Not surprisingly, this approach is inconsistent with the well-established consensus that under the Common Rule, identifiable samples cannot be used for research without one's informed consent.[205] The Common Rule recognizes that the value of research, while real, is not absolute and therefore cannot override autonomy at all costs.[206]

At the other, pro-privacy/autonomy extreme, any future use of the samples for research would require detailed informed consent whether the samples were identifiable, coded, or anonymized, regardless of the uses. This approach would privilege privacy and autonomy interests over the value to the public of various research studies, potentially hindering research. It would be extremely difficult (if not impossible) and expensive to implement since it would require researchers to locate families to seek their consent for virtually every future study. Moreover, meaningful informed consent is often impossible to obtain when biospecimens, whether DBS or other forms, are initially collected because the parents or sources of the samples cannot be informed of all possible research uses and outcomes. In some ways, it might even be counter-productive to privacy interests since it would require the samples to remain identifiable while in long-term storage for the purpose of contacting the families.

The current system and recommended approach of some scholars and professional groups might be considered a compromise of sorts; informed consent is required if the samples are identifiable, but otherwise consent is not required for

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205. 45 C.F.R. §§ 46.101(b)(4), 46.111(a)(4) (2013).

206. There are many methodologically sound and highly valuable types of research that we do not allow because values like privacy, autonomy, and the mental and physical well-being of individuals would make such studies unethical. The unfortunate history of human subject research in Nazi Germany and even in this country has taught us important lessons about the limits to which we can endanger others and limit their autonomy simply to further science. FURROW ET AL., *supra* note 107, at 405–13.

anonymized or de-identified samples.[207] The theory, in brief, is that the privacy risks are substantially minimized once identifiers are removed. To the extent that no samples are ever truly anonymized, however, this argument becomes less persuasive. In addition, as some have pointed out, even under this system, sometimes researchers actually use biospecimens with identifiers, rather than in anonymized form, without obtaining consent or Institutional Review Board (IRB) approval.[208]

Regardless of whether we consider the current system appropriate for biobanks in general, we must recognize that NBS biobanks are unique in implicating particularly salient privacy and autonomy interests. First, parents often have not given consent to (or are even aware of) the collection of the biospecimen and NBS in the first place, let alone the long-term storage and potential research on the specimens. Indeed, one study showed that only twelve states mention specimen storage in the informational pamphlet that parents receive for NBS.[209] With other biobanks, it is likely that the source of the specimen consented to (and knew about) the removal of the sample from his or her body (whether or not consent was given for later uses of the sample).

Second, these samples are obtained from minors and therefore any research on these samples is research on children, who are treated under the Common Rule as a vulnerable class deserving of heightened protection.[210] While minors can participate in research, there are very limited instances in

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207. Amy L. McGuire & Laura M. Beskow, *Informed Consent in Genomics and Genetic Research*, 11 ANN. REV. GENOMICS & HUM. GENETICS 361, 370 (2010).

208. Drabiak-Syed, *supra* note 198, at 43. When the plaintiff in the *Bearder* litigation requested documentation from the Minnesota Department of Health (MDH) regarding its process of de-identification of samples for research, the MDH stated that it had no such documents, suggesting that "there is no established de-identification procedure and that the process and standards vary from project to project and are subject to subjective standards." Whelan, *supra* note 18, at 441 (internal quotation marks omitted).

209. SEC'YS ADVISORY COMM. ON HERITABLE DISORDERS IN NEWBORNS & CHILDREN, CONSIDERATIONS AND RECOMMENDATIONS FOR NATIONAL GUIDANCE REGARDING THE RETENTION AND USE OF RESIDUAL DRIED BLOOD SPOT SPECIMENS AFTER NEWBORN SCREENING 16 (2009) [hereinafter ACHDNC] (citing personal communication with Aaron Goldenberg).

210. *See* 45 C.F.R. §§ 46.401–.409 (2013) (describing "Additional Protections for Children Involved as Research Subjects").

which consent for participation is not required. For example, even the least problematic category of research on children—"[r]esearch not involving greater than minimal risk"—still requires the child's assent and parental consent,[211] unless the general waiver provisions for informed consent apply.[212] Scholars have debated whether the waiver provisions should apply in this context.[213] The crux of the matter turns on whether informed consent is practicable or not. As one scholar notes, even when researchers do not have to obtain informed consent under the regulations, they often do, demonstrating that it is not always impracticable.[214] When children are involved and their biospecimens are retained for long periods of time, there is a strong argument that they should have the right (upon reaching the age of majority) to decide for themselves whether they want to be research participants.[215]

Third, as I shall argue in more detail below, the state, as protector of the newborn and as mandator of the collection of the DBS, has a fiduciary obligation to protect the autonomy and privacy interests of the newborn with respect to the collection, retention, and use of the samples. For all of these reasons, whatever concerns we may have about the use of biobanks without consent (informed or general) are further heightened in this context.

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211. 45 C.F.R. § 46.404.

212. 45 C.F.R. § 46.116(d) (2013) (waiving informed consent requirements when the research "involves no more than minimal risk to the subjects . . . [t]he waiver or alteration will not adversely affect the rights and welfare of the subjects . . . [t]he research could not practicably be carried out without the waiver or alteration," and when appropriate, "the subjects will be provided with additional pertinent information after participation").

213. *Compare* ACHDNC, *supra* note 209, at 19 ("A balanced consideration of concerns justifies waiving informed consent for population-based newborn screening research using de-identified specimens when a clinically well-defined test and an effective therapy are present."), *with* Carnahan, *supra* note 123, at 320–21 (challenging the notion that informed consent would be "impracticable" because "a physician-patient relationship already exists between the physician and the mother-to-be, and it is typically the physician that is responsible for obtaining the bloodspot for screening and research"), *and* Drabiak-Syed, *supra* note 198, at 38 (suggesting that waiver has "been used as a creative mechanism to overcome administrative barriers").

214. Ellen Wright Clayton, *Patients and Biobanks*, 51 VILL. L. REV. 793, 796–97 (2006).

215. David Gurwitz et al., *Children and Population Biobanks*, 325 SCI. 818, 818 (2009).

As a result, we should not weigh the interest in favor of research as strongly in this context as we might with respect to other types of biobanks. Indeed, this strongly supports the view that we should prohibit the use of DBS for any research.[216] While this would certainly limit the privacy and autonomy risks for the newborn and his or her family, to the extent that this population offers unique possibilities for research, one might argue that such a proposal goes too far. It is undoubtedly true that much of the research done on DBS need not be done on that particular population. But some forms of research may benefit substantially by collecting data from a pool, like the NBS samples, which represents the population so well. In addition, to the extent that any clinical data are combined with research on the DBS, research from birth through later life might offer unique insights into various disease processes that would be harder to obtain with other populations. Given that research of these samples poses heightened concerns, however, if any research on DBS should be allowed, it should be limited to research that benefits the pediatric population. Michigan's approach, for example, recognizes the importance of using newborn samples only for research that is relevant to the pediatric community.[217]

To the extent that any research goes forward on DBS, for all of the reasons described above, it is appropriate to give families (and the child upon reaching the age of majority) some control over whether the DBS are archived for research purposes. Consistent with current requirements for research on biospecimens, informed consent should be obtained for research on identifiable NBS samples generally (except in the rare instances where a waiver could apply).

Under the current interpretations of the Common Rule, however, affirmative consent would not be required for de-identified samples,[218] which is problematic in the NBS context. As biobanks generally become more prevalent and central to genomics research, scholars have debated whether this approach is ethically justifiable, not just with respect to NBS, but for all biobanks. Scholars have argued that "a person has an

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216. Hank Greely has argued that there is simply no reason for researchers to utilize DBS when there are other biorepositories to use. Author's personal communication.

217. Chrysler et al., *supra* note 154, at 99.

218. McGuire & Beskow, *supra* note 207, at 370.

interest in consenting or not consenting to be part of research," even if it includes analysis of biospecimens.[219] Growing concerns about the inability to truly anonymize biological samples[220] have led to further calls to rethink the current approach toward research on biospecimens.[221] Indeed, in response to advances "in genetic and information technologies that make complete de-identification of biospecimens impossible," the Department of Health and Human Services proposed changes to the consent requirements for research on biospecimens.[222] Specifically, the proposed changes would eliminate the ability to do research on de-identified biological samples without consent. Instead, it would require "written *general* consent" for research use of archival biospecimens, whether or not researchers ultimately decide to use identifiers.[223] The intended general written consent would allow individuals "to say no to all future research," and give them the option to say yes or no to "a handful of special categories of research with biospecimens" that might raise "unique concerns . . . for a significant segment of the public."[224] In addition, the proposed changes would allow

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219. *See, e.g.*, Greely, *supra* note 169, at 356.

220. *See, e.g.*, *id.* at 351–52; Melissa Gymrek et al., *Identifying Personal Genomes by Surname Inference*, 339 SCI. 321, 321 (2013); Nils Homer et al., *Resolving Individuals Contributing Trace Amounts of DNA to Highly Complex Mixtures Using High-Density SNP Genotyping Microarrays*, 4 PUB. LIBR. SCI. GENETICS, Aug. 29, 2008, at 1–2; Zhen Lin et al., *Genomic Research and Human Subject Privacy,* 305 SCI. 183, 183 (2004); Amy L. McGuire & Richard A. Gibbs, *No Longer De-Identified*, 312 SCI. 370, 370–71 (2006); Laura L. Rodriguez et al., *The Complexities of Genomic Identifiability*, 339 SCI. 275, 275–76 (2013).

221. *See, e.g.*, Lori B. Andrews, *Harnessing the Benefits of Biobanks*, 33 J.L. MED & ETHICS 22, 24 (2005); Carnahan, *supra* note 123, at 320.

222. Human Subjects Research Protections: Enhancing Protections for Research Subjects and Reducing Burden, Delay, and Ambiguity for Investigators, 76 Fed. Reg. 44,512, 44,525 (proposed July 26, 2011) (to be codified at 45 C.F.R. pts. 46, 160, 164). These were part of a broader proposed overhaul of the "Common Rule." *Id.* at 44,514.

223. *Id.* at 44,519 (emphasis added). The proposed regulations would move away from the concept of "exempt research" and create a new category of "excused research" that is intended both to "increase protections"—by requiring general consent as opposed to no consent for all biospecimens (as well as for pre-existing data collected for research, whether or not the researcher uses identifiers, and for pre-existing data that were collected for purposes other than research, if the researcher uses identifiers)—"and broaden the types of studies covered," by allowing researchers to use identified biospecimens as long as they had general consent. *Id.* at 44,518–19.

224. *Id.* at 44,519–20 (giving as examples the creation of cell lines or reproductive research).

for waivers in some (unspecified) instances.[225] Although these proposed regulations have not been adopted so far, they reflect an attempt to balance the pressures to promote research and protect individual privacy and autonomy.[226]

Following a modified version of the proposed amendments to the regulations for human subjects research, states should ask for *general* consent for the storage of DBS for future research uses of de-identified DBS.[227] Parents would be entitled to say no to all future research, yes to all future research, or no to a handful of specific categories of research that might be problematic.[228] In addition, children, upon reaching the age of majority, should be able to refuse consent for research or for particular categories of research.[229]

The focus on general, as opposed to detailed informed, consent serves two functions. It attempts to give parents (and the future adult the newborn will become) some autonomy protections while recognizing the value of research.[230] It concedes the pro-research view that fully informed consent in this context truly is problematic; at the time the samples are collected, there may not be any specific plans for research, let alone for specific research protocols.[231] Thus, it is simply impossible to inform parents about the details of possible future research. In addition, the circumstances in which the samples are collected—during the newborn period—do not easily lend themselves to the lengthy discussions that informed consent

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225. The advance notice of proposed rulemaking (ANPRM), however, notes that the waivers "would not necessarily be the same as those for other types of research." *Id.* at 44,520.

226. *Id.*

227. *Id.* at 44,519. I call this a modified version because the ANPRM would require general consent for both the use of identified and identifiable samples. In my view, as long as informed consent is required for identifiable samples in other contexts, there is no argument for affording NBS biobanks less protection than other biobanks. Moreover, the rationale for using samples in this form would likely be to follow clinical outcomes, which itself would require considerable efforts to contact families or physicians to obtain clinical information.

228. *Id.* at 44,518–20.

229. *Id.* at 44,524.

230. Feuchtbaum et al., *supra* note 195, at 8–9 (discussing parental autonomy protections).

231. Elster, *supra* note 135, at 187–88.

would require, even if the specific future research protocols were known.[232]

Of course, if we were to separate the NBS process from the collection of samples for research, then this removes many of the challenges of obtaining consent during the newborn period. Such an approach might be justified by the concerns that the research is not in any one newborn's best interest, but instead serves the public good.[233] As a result, we should eliminate any pressure to consent to research that might occur during the newborn period, especially if parents do not fully understand that the question of screening is not conceptually or practically linked to whether or not research is done.

But disaggregating consent for screening from consent for research does not eliminate the general problem of obtaining fully informed consent for research on pathology samples, given the impossibility of knowing about all future research endeavors in advance. Moreover, such disaggregation potentially removes one of the benefits of collecting DBS during the newborn period—the potential of collecting samples that represent the population. The challenges of tracking down families after that period would undoubtedly diminish the yield of samples available for research, potentially even more than the process of trying to obtain more complete informed consent. A lesser, but real, concern is that families that wanted to support such research but were not tracked down would lose out on the chance to consent to research. Of course, seeking consent for retention of samples for research in the prenatal period might lessen these concerns, although this would not be helpful in cases where women do not receive prenatal care.[234] Thus, while some powerful reasons argue for separating consent for research from consent for NBS, we should recognize that such an approach is not without costs.

At whatever stage the consent process occurs for research on DBS, I am advocating what is essentially an opt-in approach for future research. Undoubtedly, even this approach would be less favorable to the research community than being able to access de-identified samples without any consent requirement,

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232. *Id.*

233. Drabiak-Syed, *supra* note 198, at 36–38 (focusing on the benefit of the majority).

234. Whelan, *supra* note 18, at 452 (noting that not all women receive prenatal care).

because surely the latter approach would maximize the number of available samples. As a second choice, they would likely prefer opt-out to opt-in provisions under the theory that they are likely to have a larger pool of samples if parents must act affirmatively to *prevent* the storage of the samples, as opposed to requiring parents' affirmative consent *for* storage and future research.[235] One consideration in choosing opt-in versus opt-out approaches is what the legislative default goals are. If the incentives are to promote research, the "nudging" of an opt-out approach may be viewed as making it more likely that such samples are available.[236] But given the many concerns surrounding research on DBS, it is hard to argue we should be trying to "nudge" families into participating in research.

In fact, the data so far suggest that it is debatable how great the risk is that people would decline participation in research. Several studies suggest that a large percentage of parents would consent to participate in research.[237] A 2008 study, for example, found that 90% of mothers would agree to participate in an NBS biobank with no restrictions on the type of research performed.[238] Another study found that 76.2% of parents were "very or somewhat willing" to permit storage of and research on DBS, whereas if consent were not obtained, only 28.2% would be "very or somewhat willing" to allow the use of DBS for research.[239] On the other hand, Texas's limited experience with opt-out provisions suggests that it had some, though not a significant, effect on the size of the newborn pool. In a roughly six-month period, 240,000 samples were collected

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235. *Innocent Blood*, *supra* note 138 (explaining how any samples moving forward require consent as part of the opt-in program).

236. *See* RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS 83–86 (2008) (noting the importance of the default position for opt-out v. opt-in rules).

237. *E.g.*, Feuchtbaum et al., *supra* note 195, at 7–8; Alon B. Neidich et al., *Empirical Data About Women's Attitudes Towards a Hypothetical Pediatric Biobank*, 146A AM. J. MED. GENETICS 297, 299 (2008); B.A. Tarini et al., *Not Without My Permission: Parents' Willingness to Permit Use of Newborn Screening Samples for Research*, 13 PUB. HEALTH GENOMICS 125, 130 (2010).

238. Neidich et al., *supra* note 237, at 302; *see also* Feuchtbaum et al., *supra* note 195, at 7 (stating that although not all parents were asked to participate in a study of NBS because of the burdens on the hospital, ninety percent of those asked consented to enroll their NBS in the study to research NBS testing methods and to identify additional genetic diseases).

239. Tarini et al., *supra* note 237, at 128–29 (finding that women had misperceptions about what participation in a biobank would entail).

and the state received 6900 requests to destroy samples—a rate of 2.8%.[240] We do not know how these numbers would compare with an opt-in provision or what parents understood about storage and possible future uses when they opted out.

In addition, there are potentially legitimate concerns about the possibility of consent bias when parents opt in. Many argue that giving people the opportunity to say no would not only reduce the pool of biospecimens available for research because of "uninformed denial,"[241] but would also lead to consent bias in the biospecimens that are available.[242] Given that the pool of newborns is so vast, there may be reason to think that the effects of consent bias might be lessened, albeit not completely eliminated, by the sheer number of samples potentially available.

Even if evidence shows that the pool of research samples might be smaller with an opt-in provision or that there is a greater risk of consent bias, this alone is not a reason to reject these measures to protect autonomy.[243] The entire justification for removing consent requirements from NBS generally is the notion that the screening program is intended to benefit newborns.[244] Removing consent for participation in future research on DBS cannot be justified on the same grounds.[245] The extent to which the research benefits newborns may vary, but even research that is primarily geared toward benefiting newborns will provide much more indirect benefits than the actual screening for treatable and serious conditions.[246] Research that does not focus on the newborn or pediatric population offers even less benefit to newborns and cannot at all justify the lack of consent.[247] Thus, as noted earlier, any

240. Roser, *supra* note 147, at A1.

241. Korn, *supra* note 194, at 48.

242. *E.g.*, Barbara J. Evans, *Much Ado About Data Ownership*, 25 HARV. J.L. & TECH. 69, 95–98 (2011); Kharaboyan et al., *supra* note 130, at 747.

243. Drabiak-Syed, *supra* note 198, at 36 (noting that the "benefit to the majority is not alone a sufficient interest to override individual autonomy"); Whelan, *supra* note 18, at 453 ("As a society, we cannot allow administrative costs or burdens to justify infringements on individual rights, parental rights, and genetic privacy.").

244. Drabiak-Syed, *supra* note 198, at 36.

245. *Innocent Blood*, *supra* note 138.

246. Feuchtbaum et al., *supra* note 195, at 7–9.

247. *Id.* at 11–12.

research on DBS should ideally be limited to that which benefits the pediatric population.

One additional concern with the opt-in approach is that requiring affirmative consent for retention and research uses of DBS will lead some parents to opt out of NBS altogether in jurisdictions where that is possible.[248] Here, the value of providing parental autonomy and the child's future autonomy is set against the potential harms to newborns if severe and treatable conditions are not identified in the newborn period.[249] This concern might, therefore, argue for decoupling consent for NBS from the consent for research uses of DBS.

There is a strong argument to be made the other way, however. Whether or not the consent process for NBS and research are disaggregated, seeking parental consent for future research on the DBS helps establish the public's trust in the NBS process generally.[250] Recent attention to long-term storage and research uses of these samples may lead parents to think of NBS, not so much as a program intended to protect the health of newborns, but as an effort to create a universal research pool.[251] This may create push back with respect to NBS altogether, causing parents to opt out of NBS to resist what they perceive as the heavy hand of government.[252] As Dr. Jeffery Botkin suggests, denying parents the chance to opt out of future research may undermine the public's trust in the entire endeavor.[253] Indeed, it is precisely such suspicion and loss of trust that led to the lawsuits in Texas and Minnesota.[254] As one parent in the Texas lawsuit explained, "To me, this whole thing is about consent . . . . If they had asked me I probably would have consented. The fact that it was a secret program really made me so suspicious of the true motives, there's no way I would consent now."[255] Thus, as long as any research is done on the DBS, whether consent is obtained in the future or during the newborn period, the public needs to know

248. *Id.* at 11.
249. *Id.* at 8–9.
250. Drabiak-Syed, *supra* note 184, at 12–13, 23, 42.
251. *Id.* at 23, 35–36.
252. *Id.* at 35–36.
253. *Innocent Blood, supra* note 138 (quoting Jeffrey R. Boktin).
254. Drabiak-Syed, *supra* note 198, at 25–34.
255. Roser, *supra* note 147, at A1; *see also* Whelan, *supra* note 18, at 442 ("As one parent succinctly stated: 'I want to have the choice.'").

that any use of these samples requires affirmative consent from parents. The state should not *presume* consent.

Not only is the public's trust important to the sustainability of the NBS project as a whole, but trust is also inherent in the relationship the state creates between itself and the child in setting up NBS. The most persuasive justification for NBS is the *parens patriae* notion that the state steps in to act as parent for the child.[256] This creates a trust-based, fiduciary relationship (which goes beyond the ordinary fiduciary obligation the state owes its citizens) given that the state takes over some aspects of the child's care for the well-being of the child.[257] As a consequence, a strong obligation exists not only to ensure that NBS maximizes the well-being of the child, but to ensure that any ancillary uses of the samples do not in any way undermine the best interests of the child, even for the benefit of society as a whole.

Michigan's creation of the BioTrust for Health, which is intended to facilitate and promote research on the DBS of NBS, was modeled on the concept of a charitable trust.[258] Under this model, the source of the specimen (in this case the parent acting on behalf of the child) "formally expresses" the desire to transfer the specimen into the control of the trustee (the state) who will keep the sample for the benefit of the beneficiary (the general public).[259] Important to this approach is the notion that the transfer is *intentional and freely given*, and that the recipient of biospecimens (in this case the state) "has a responsibility to serve as a trustee, or steward, of the tissue to ensure protection of the contribution."[260] This model suggests three things: first, that parents should consent to the use of their newborn's samples for inclusion in the research biobank; second, that the samples are to be used for the benefit of the public; and third, and most important, that the recipient has a fiduciary obligation not only to develop clear rules about the kinds of uses to which these samples can be put, but also to implement security measures to protect the confidentiality of the

256. AGR, *supra* note 8, at 261.

257. *Id.*

258. Chrysler et al., *supra* note 154, at 98 (citing David J. Winickoff & Richard Winickoff, *The Charitable Trust as a Model for Genomic Biobanks*, 349 NEW ENG. J. MED. 1180, 1180 (2003)).

259. Winickoff & Winickoff, *supra* note 258, at 1182–83.

260. *Id.* at 1182.

information in the samples.[261] Given the limits of de-identification and anonymization in protecting privacy,[262] it is particularly important that the state develop explicit guidelines as to the legitimate uses of the samples both in terms of the best interests of the newborns and the public and in terms of security measures.

Indeed, the charitable trust model does not require that the state hold the DBS. Instead, a non-state charitable trust could be created and charged with the obligation of holding the samples and ensuring that their use is for the benefit of the public. The fact that the state would not possess the DBS and that this approach would disentangle the NBS process from the research aspects would likely help promote public trust.

While there are legitimate concerns about the impracticabilities of obtaining informed consent about future research uses, efforts should be made to inform parents about the general nature of the permissible and impermissible uses of the samples as well as security provisions. Such efforts would not only protect the autonomy interests of the family, but might also indirectly promote research. If families believe that the government has given careful attention to the kinds of uses that it will and will not allow, and has been attentive to the security of this personal information, families may be more inclined to participate. Otherwise, the public may not trust the state, believing, at best, that it has been negligent in protecting against problematic uses of the samples or, at worst, that the state may have malignant plans for such samples, which is why it has not set limits on these future uses.

B. CONSENT FOR NBS ITSELF

A conclusion that parental consent should be required for storage and research use of a newborn's DBS does not necessarily mean that consent should also be required for NBS itself. In fact, Michigan, whose BioTrust approach for research on DBS is commendable, requires written consent for the inclusion of the samples in the biobank (and the right of a child upon age of majority to have their DBS removed), but it does

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261. *See id.* at 1182–83 (describing the charitable trust model generally and emphasizing the factors asserted in the text).

262. Greely, *supra* note 169, at 352–55.

not require consent for the screening.[263] Moreover, the balance of public and private interests argues less strongly for affirmative consent with respect to NBS than in the research context since achieving high rates of NBS not only benefits the newborn, but also parents and society as a whole.[264] Even though I concede that the case for consent is less strong in this context, the recent and likely future expansions in NBS make an increasingly compelling case for rethinking parental consent in this context as well.[265]

To be sure, there are serious challenges in requiring true informed consent for the screening itself. Given the number of diseases screened for, obtaining meaningful informed consent of the sort that the law demands for a physically invasive and risky medical procedure would be virtually impossible for each and every condition in the NBS panel.[266] The likely expansion of the panel of diseases and possibility of whole genome sequencing in the future only enhances this problem. Whatever challenges conveying this wealth of information presents in ordinary circumstances are magnified by the fact that the disclosures typically occur during the newborn period, when parents are unlikely to be able to process the details of the nature of each of these conditions, the various treatment options for affected children, and the likelihood each of the conditions will manifest symptoms.[267] Additional concerns surrounding informed consent are the economic and logistical

263. Chrysler et al., *supra* note 154, at 100.

264. Feuchtbaum et al., *supra* note 195, at 8–12.

265. Even if consent should occur for NBS, however, it does not follow that it should occur at the same time as consent for research. Indeed, as noted above, there are some powerful reasons to separate out the two consent processes.

266. This is a problem generally with any kind of multiplex testing. *See, e.g.*, Council on Ethical & Judicial Affairs, Am. Med. Ass'n, *Multiplex Genetic Testing*, HASTINGS CENTER REP., July–Aug. 1998, at 15, 15–18 (explaining multiplex genetic testing and informed consent within this context); Robert J. Wells, Correspondence, *Generic Consent for Genetic Screening*, 331 NEW ENG. J. MED. 1024, 1024 (1994) ("Burdening us all with a system of 'enforceable' standards . . . will keep us ignorant by delaying the gathering of information needed to make these kinds of determinations."); *see also* Greely, *supra* note 169, at 352–55, 357–59 (discussing the hurdles in obtaining informed consent for genetic research and testing).

267. AGR, *supra* note 8, at 6 (explaining the disclosure methods during the newborn period).

burdens such a requirement would place on health care providers and the public health system.[268]

How logistically challenging it is to obtain consent for NBS, however, is debatable. One much cited pilot study for a new NBS technology confirms some of these worries. The research study, which required informed consent, found that obtaining written informed consent was a "serious logistical burden" for the hospitals involved.[269] As a result, the researchers only achieved forty-seven percent participation in the study.[270] On the other hand, a study in Germany suggested that much higher participation rates could be achieved when written consent was sought.[271] In that case, almost ninety-nine percent of the parents consented to NBS.[272] Similarly, an older study of Maryland's previous informed consent approach to NBS found "no evidence that the parental consent regulation had a negative effect on the public's health. . . . [or] that the [NBS] program had become less cost-effective."[273] The data seems mixed as to the burden that seeking informed or written consent imposes.

To say, however, that obtaining true informed consent is impossible, results in unacceptably low yields of parental consent, or is effective but unduly expensive, does not mean we should abandon all efforts to seek *any* form of parental consent.[274] An approach that requires affirmative parental consent—i.e., an opt-in approach—would offer the next best form of respecting parental autonomy. Most states, however, have chosen the opt-out approach, which theoretically still offers some parental control because it creates the right for parents who greatly oppose NBS to decline screening of their

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268. *Id.* at 156–57.

269. Feuchtbaum et al., *supra* note 195, at 6.

270. *See id.* at 7 (stating that only forty-seven percent of newborns participated in the MS/MS screening during the pilot study's time frame).

271. Bernhard Liebl et al., *Very High Compliance in an Expanded MS–MS-Based Newborn Screening Program Despite Written Parental Consent*, 34 PREVENTIVE MED. 127, 127 (2002).

272. *Id.* at 127, 130–31.

273. Faden et al., *supra* note 80, at 1351.

274. *See* Ainsley Newson, *Should Parental Refusals of Newborn Screening Be Respected?*, 15 CAMBRIDGE Q. HEALTHCARE ETHICS 135, 140, 144 (2006) ("Although parental autonomy is not, of course, legally or morally limitless, parents should (and do) enjoy a degree of freedom from state interference in private and family life.").

newborn.[275] In order for an opt-out option to offer any true semblance of respecting parental autonomy, however, parents must understand that they have an option to opt out, which requires some awareness and general understanding of the NBS process and the option to opt out.[276] Unfortunately, that rarely happens.[277] This may be because providers fail to inform parents, because so much is happening during the newborn period that parents cannot absorb or process whatever information they might get, or some combination of the two. As a result, there is a strong case for NBS education to occur in the prenatal period when there is more time for reflection, discussion, and comprehension.[278] Although, again, this is only helpful for women who receive prenatal care.

Even if education regarding NBS were enhanced by requiring NBS education during the prenatal period, there is reason to think that an opt-out approach would still be less than optimal if the goal is parental education. The incentives simply are too few to educate parents under an opt-out as compared to an opt-in approach. Under an opt-out approach, the default is to test, which creates no incentive to discuss NBS with parents.[279] Testing will occur with or without such a discussion. A statutory requirement to discuss NBS might not be a sufficient incentive to educate the families in light of the many other demands on health care providers' time. In contrast, under an opt-in approach, the default is not to test unless parents consent, which creates strong incentives to discuss NBS with parents, even if only in general terms.[280]

An additional argument in favor of the opt-in approach, given the goal of parental education, is that it is more cost-

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275. Feuchtbaum et al., *supra* note 195, at 9.

276. Moody & Choudhry, *supra* note 9, at 246–48.

277. *See id.* at 240, 244 (noting that parents "are not even aware that they have a clear choice to make" in the United Kingdom's opt-out program, and finding in their own study that 41.7% of respondents "did not feel able to decline," while many thought NBS was "compulsory").

278. *See, e.g.*, MICH. DEP'T OF CMTY. HEALTH, NEWBORN SCREENING GUIDE FOR HOSPITALS 19 (2014) ("Education is ideally done during the prenatal period.").

279. Faden et al., *supra* note 80, at 1350 (discussing how mothers believe a routine default procedure does not require consent or discussion).

280. *Id.* at 1351 (describing the procedure in Maryland, which would appear to be similar to the current suggestion).

effective than full-blown informed consent would be.[281] The study of Maryland's program established, albeit many years ago, that parents can be educated adequately about newborn screening *generally*—not with respect to the details of every condition—in no more than five minutes.[282] Further, there are cost-effective methods, such as decision aids, which are being developed for a range of medical decisions,[283] to provide parents with an overview of NBS. Indeed, some have advocated a system that would provide basic information about NBS to parents with options for access to more detailed information should they want it.[284] Such an approach would further promote autonomy by allowing people to decide how much information to receive.

Were there evidence to suggest that an opt-in approach would lead to a great deal of uninformed denial, this might be a powerful reason to forgo some protections of parental autonomy to prevent (the admittedly small number of) newborns from suffering from debilitating or life-threatening illnesses. But evidence suggests, as we shall see, that involving parents in the decision-making process may actually *enhance* the effectiveness of NBS, and therefore opt-in provisions may further both goals—protecting the health of the newborn population and promoting parental autonomy.[285]

A study conducted over two decades ago showed that the refusal rate for NBS is really quite low in the states where NBS is truly voluntary.[286] It found that Maryland and New Hampshire, out of twelve states studied, had the highest percentage of NBS: ninety-eight percent of their newborns.[287]

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281. *See id.* ("There was also no evidence that the program had become less cost-effective because of increased costs to the health care system.").

282. *See id.* at 1350 ("Most nurses . . . responded that obtaining consent or refusal took from one to five minutes.").

283. *See, e.g.*, Elie A. Akl et al., *A Decision Aid for COPD Patients Considering Inhaled Steroid Therapy: Development and Before and After Pilot Testing*, BMC MED. INFORMATICS & DECISION MAKING, May 15, 2007, at 1, 4–6 (discussing the use of decision aids for COPD).

284. Harrell, *supra* note 38, at 849–50.

285. Jean-Louis Dhondt, *Implementation of Informed Consent for a Cystic Fibrosis Newborn Screening Program in France: Low Refusal Rates for Optional Testing*, 147 J. PEDIATRICS S106, S107–08 (Supp. Sept. 2005); Liebl et al., *supra* note 271, at 130–31.

286. Andrews, *supra* note 2, at 60.

287. *Id.*

Maryland had a program that required informed consent[288] (it now has an opt-out approach[289]), and New Hampshire allows parents to refuse NBS for any reason.[290] In contrast, the other ten states, all with mandatory screening programs that allow parental refusal only for religious reasons, screened fewer newborns. One state managed to screen a mere fifty-eight percent of its neonates.[291] More recent studies show that parental consent is over ninety percent when parents are allowed to opt out of screening or even sometimes required to consent affirmatively.[292] A possible explanation for these data is that a voluntary program that informs and educates parents about NBS induces parents to ensure actively that their children will actually get screened.[293] By contrast, mandatory programs—especially those in which parents are not well-educated about NBS—lack this additional "check on the procedure," resulting in a lower yield of children screened.[294]

Interestingly, most parents do not believe that informed, or sometimes even *any*, parental consent is necessary for NBS,[295] at least with respect to conditions that present in infancy. On first glance, these findings might cut in favor of maintaining the status quo. In one study, parents did, however, want choice.[296] Nearly three-quarters of parents preferred opting out and a

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288. PRESIDENT'S COUNCIL ON BIOETHICS, *supra* note 45.

289. MD. CODE ANN., HEALTH–GEN. § 13-109 (West 2013).

290. N.H. REV. STAT. ANN. § 132:10-c (2013).

291. Andrews, *supra* note 2, at 60–61. This study did not investigate an important question, which is how effective the education efforts are in these, as opposed to other, opt-out programs.

292. Dhondt, *supra* note 285, at S106; Liebl et al., *supra* note 271, at 130–31; Evelyn P. Parsons et al., *Mothers' Accounts of Screening Newborn Babies in Wales (UK)*, 23 MIDWIFERY 59, 62–63 (2007).

293. Liebl et al., *supra* note 271, at 130–31. One author questions whether the "consent" procedures in these voluntary programs are truly informed because consent is given at the time of screening. She suggests that parents will say yes to anything right after birth, which could result in artificially high consent rates and could explain why the voluntary programs have such high participation rates. Harrell, *supra* note 38, at 850.

294. Andrews, *supra* note 2, at 60.

295. Elizabeth D. Campbell & Lainie Friedman Ross, *Incorporating Newborn Screening into Prenatal Care*, 190 AM. J. OBSTETRICS & GYNECOLOGY 876, 876–77 (2004); Faden et al., *supra* note 80, at 1350–51 (stating that forty-six percent felt that their consent should not be sought); Moody & Choudhry, *supra* note 9, at 246–48.

296. Moody & Choudhry, *supra* note 9, at 244–46.

little over one-quarter preferred opt-in approaches.[297] However, when asked about mandatory screening for conditions that do not present in infancy, such as Duchenne muscular dystrophy, which presents between three and ten years of age, and Alzheimer's disease, which presents in adulthood, a majority of parents opposed mandatory screening.[298] This may reflect the fact that there is little that can be done to prevent these conditions from developing in the newborn period or at all. On the other hand, another study found that most parents support mandatory screening of diseases that present in infancy, even if no treatment is available,[299] suggesting that for some parents elimination of the diagnostic odyssey, even if nothing can be done, is important for childhood illnesses.

The fact that parents are not clamoring to give consent for NBS or that they seem to prefer opt-out over opt-in approaches, ironically, may support an opt-in approach. The typical reason for their views is a concern that other parents would not consent. This supports the findings that when consent is required, there is actually a high level of acquiescence.[300] In other words, the majority of parents would likely consent to NBS themselves; they do not want consent requirements because they fear that *other* parents would not consent. This reasoning alone does not, of course, necessarily overcome the concerns of cost, time, and logistical demands associated with affirmative consent.[301]

What further argues in favor of the opt-in approach is the fact that parents consistently express a strong desire for *education* and *information* regarding NBS, which they are not getting.[302] Overall, studies suggest that parents "were more troubled over the lack of NBS education than by the lack of

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297. *Id.* at 246.

298. L.E. Hasegawa et al., *Parental Attitudes Toward Ethical and Social Issues Surrounding the Expansion of Newborn Screening Using New Technologies*, 14 PUB. HEALTH GENOMICS 298, 303 (2011); *see also* Campbell & Ross, *supra* note 295, at 876–77.

299. Hasegawa et al., *supra* note 298, at 303–04.

300. *See supra* notes 286–94 and accompanying text.

301. *See* Elster, *supra* note 135, at 187–89 (discussing the ethical and legal issues regarding informed consent).

302. TIMMERMANS & BUCHBINDER, *supra* note 8, at 61 ("Public opinion research suggests that few new parents know about newborn screening."); Hasegawa et al., *supra* note 298, at 302. *But see* Whelan, *supra* note 18, at 428 ("[A] majority of parents are aware of the initial screening.").

consent."[303] Many urge that such education should happen in the less hectic prenatal, as opposed to newborn, period when they would be less preoccupied.[304] If the goal is primarily to satisfy parental requests for information, it may be that requiring affirmative consent is the best way to do that. Studies have shown that seeking affirmative consent can increase parental knowledge in the context of research studies.[305] In addition, as noted above, the incentives to provide some information about NBS are greater with an opt-in as compared with an opt-out approach. Thus, a powerful justification for requiring opt-in for NBS itself is to enhance the chances that parents understand something about NBS, which can satisfy their desires and likely promote the effectiveness of NBS.

If we could trust that the education would happen in the prenatal, or even newborn, period, the case for opting in would be weaker. The current inadequacy of parental education, however, not only supports the opt-in requirement as a method to try to ensure that such education occurs;[306] it is relevant in another respect. An opt-out approach is only protective of autonomous decision making it if is *informed* refusal.[307] If parents are not adequately educated about NBS, or even worse that NBS occurs and that they can refuse, the opt-out approach makes a mockery of the notion of autonomous decision making and informed refusal. Instead, it merely leaves parents with an empty legal right to refuse. Even if most parents, when educated about NBS, would choose not to opt out, many who do not opt out are not making an affirmative choice because they

303. Hasegawa et al., *supra* note 297, at 303; *see also* NEDRA S. WHITEHEAD ET AL., DEVELOPING A CONJOINT ANALYSIS SURVEY OF PARENTAL ATTITUDES REGARDING VOLUNTARY NEWBORN SCREENING 6 (2010), *available at* http://www.rti.org/pubs/mr-0014-1003-whitehead.pdf ("Most parents would like more information on newborn screening . . . ."); Campbell & Ross, *supra* note 295, at 877 (examining the need for increased prenatal NBS education); Faden et al., *supra* note 80, at 1350 (providing that around eighty percent wanted to be informed that NBS was done).

304. WHITEHEAD ET AL., *supra* note 303, at 6; Campbell & Ross, *supra* note 295, at 877.

305. Neil A. Holtzman et al., *Effect of Parental Informed Consent on Mothers' Knowledge of Newborn Screening*, 72 PEDIATRICS 807, 811 (1983); Parsons et al., *supra* note 292, at 63–65.

306. Campbell & Ross, *supra* note 295, at 877 (discussing how parents are strongly requesting the necessary education, especially during the prenatal period).

307. Newson, *supra* note 274, at 141 (showing how an informed decision to refuse consent does not override autonomy).

did not know about NBS or the opportunity to opt out.[308] In short, the opt-out approach under the current circumstances is so far from true consent or informed decision making that it is hard to argue that it does anything at all to promote autonomy.[309]

If providers were to offer the kind of information about NBS that would make the opt-out approach truly informed refusal, the process would be quite close to informed *consent*. At that point, the distinctions between opt-out and opt-in are simply not that great. Indeed, studies show that if individuals are adequately informed, the number who opt in is the inverse of those who opt out.[310] One of the reasons for the opt-out is the idea of "nudging" people to make the "right" choices.[311] Given that the parent community is, based both on parents' views and surveys of parents' choices, not a community that needs to be nudged with respect to NBS, and given the added incentives to educate parents that opt-ins provide, the case of opt-in over opt-out becomes greater.

While there has been a long tradition opposing an opt-in approach, the reasons for reconsidering this approach are quickly growing.[312] First, the fact that the broader panel of diseases increases the risks of false positives or the possibility of incidental findings of uncertain clinical relevance means that some of the psychosocial risks of NBS are increasing.[313] Parental awareness of NBS may prepare parents for and therefore decrease the anxiety and confusion associated with false positives and diagnostically ambiguous results, for example.[314] Parents who understand in advance that NBS is merely a *screening*, and not a diagnostic, procedure and that a positive result is not determinative are less likely to experience

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308. *Innocent Blood, supra* note 138 (explaining that without the proper education the parents are not truly given the option to opt out).

309. Whelan, *supra* note 18, at 448 (describing opt-out programs as "'not a true model of consent'" but as a mere "'substitute for consent'").

310. Liebl et al., *supra* note 271, at 127 (specifying that lack of knowledge was a significant barrier to providing consent).

311. Feuchtbaum et al., *supra* note 195, at 8–10 (discussing the positive effect of having the option to opt out).

312. *Cf. id.* at 9 (most states favor the opt-out approach).

313. *See* Fyrö & Bodegård, *supra* note 59, at 107, 111 (noting the "persistent anxiety" associated with false positives); *supra* text accompanying notes 58–72.

314. *See* WHITEHEAD ET AL., *supra* note 303, at 14–19 (describing the anxiety and depression felt by parents following a false positive).

anxiety with respect to a false positive than parents who did not even know their child was screened.[315] To the extent that an opt-in approach promotes parents' awareness of NBS, this approach might function, in part, as a prophylactic to this concern.

Second, as the panel of diseases screened for expands to include diseases for which there is limited or no ameliorative treatment in the newborn period, the rationale for testing without consent disappears. The entire justification for screening without consent is the idea that the state is protecting newborns from suffering the harms of treatable conditions, which is not true with untreatable conditions.[316] In this instance, as with storing and doing research on DBS, the *parens patriae* notion used to justify screening treatable conditions without consent does not exist. As a result, the argument for affirmative consent in these cases becomes significantly stronger.

The fact that there is serious consideration of including whole genome or exome sequencing in NBS[317] should give us even more reason to be skeptical of opt-out approaches, for both of the reasons discussed above. Whatever concerns we might have about expanded panels of NBS with respect to false positives, incidental and ambiguous findings, and information about conditions for which there is no treatment are bound to be magnified considerably by the sheer amount of information that whole genome/exome sequencing (WG/ES) can generate. Indeed, for that reason, there is a very strong case to be made against nudging parents toward consent for WG/ES NBS and a very strong argument for giving parents affirmative choice—i.e., the opt-in approach.

Even if one were to argue that opt-outs are important to "nudge" parents into consenting to testing for serious, treatable conditions, as states expand their NBS panels to include conditions for which there are no treatments or WG/ES, this rationale cannot apply to the full range of screening. Rather than use an opt-out approach for all of the NBS, it would be preferable to tier the decision-making process so that there is only an option to opt out of screening for treatable conditions,

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315. *See id.* at 19 (explaining that information reduced this stress).

316. *See* Faden et al., *supra* note 80, at 1350–51 (discussing the support of parents who believe consent is not necessary for routine testing).

317. *See supra* notes 52–54 and accompanying text.

and perhaps only for those that express in childhood. Parents, however, would have to opt in for the rest. Of course, for the reasons I gave above, I believe opt-in for all NBS is preferable. Moreover, the administrative difficulties of setting up two consent approaches for different types of diseases further argues for a single approach, in this case, opt-in.[318] But given the strong impetus in favor of opt-out for treatable conditions, it seems extremely important to ensure that consent is *affirmative*, and not presumed, when it comes to conditions for which there is no treatment, especially if they are late-onset conditions.

Finally, my arguments for seeking affirmative consent for the storage and future use of the DBS offer a final reason to advocate for opt-in approaches to NBS generally. Efforts to seek consent for research and storage of samples would effectively necessitate a discussion about NBS generally. It is only a minimal extra step to seek consent for the screening itself. Some might argue that each new decision that parents are confronted with or asked to make complicates and slows down the overall process. It seems difficult, however, to discuss the collection, storage, and research use of DBS without first explaining NBS and its purpose, at least in general terms. Given that parental awareness of NBS is likely to promote successful NBS, and given that parents want to be educated about the program, the general discussions about NBS that an affirmative consent rule would require seem very much in line with what would be required for a discussion of storage and research uses. As a result, promoting parental awareness of NBS through affirmative consent seems well worth the time. While this might not satisfy the notion of fully informed consent, it might achieve the best compromise between parental autonomy and the common good. It fulfills our prima facie duties to promote individual autonomy, while also honoring our prima facie duties as a society to protect the physical welfare of newborns by informing parents about NBS generally and seeking, rather than simply presuming, their affirmative consent.

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318. Feuchtbaum et al., *supra* note 195, at 10–11.

CONCLUSION

As I have argued, the dignitary principle of respect that is central to autonomy and consent should remain central to all aspects of the NBS program from the moment the samples are collected to the moment the state considers using the samples. While autonomy should not be the overriding principle in determining what approach to take, there is a risk in deciding that the state's interest in helping newborns and advancing science will run roughshod over the family's autonomy interests and the child's privacy and future autonomy interests in determining the extent to which he or she wants to participate in research. As we have seen, many of the public goods may actually be advanced by approaches that recognize the value of autonomy and privacy, with appropriate limits, so as not to hinder the ability to protect newborns or engage in certain valuable research projects.

Underlying the goal of achieving the appropriate balance between the public good and individual interests is a third consideration: the need for transparency when the government has control over samples with highly personal information. Whatever balance of autonomy and promotion of research governments choose, they owe a fiduciary obligation to the citizenry to act not only for the benefit of the public, but to assure there is public authorization and transparency. The public's trust in the government is at stake in the development of NBS research programs.[319] This argues for educating the public not only about the existing NBS policies, but also about new approaches the state is considering so that the public may share in deliberations over the delicate balance between the public and private interests. To quote John Rawls, it is essential for a "well-ordered society" to resolve such difficult matters based on "the ideals and principles expressed by society's conception of political justice, and *conducted open to view on that basis*."[320] Until the government does a better job of educating parents about the full spectrum of issues and decisions it has made with respect to NBS, this will not be possible. This article is a call to the states to ensure that they move toward such openness.

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319. *See supra* notes 249–56 and accompanying text.

320. JOHN RAWLS, POLITICAL LIBERALISM 213 (expanded ed. 2005) (emphasis added).

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Third Party Access to Health Information: Issues in Genetics, National Committee on Vital and Health Statistics, Subcommittee on Privacy and Confidentiality, Washington, D.C., January 12, 2005

Disentangling Privacy from Property: Toward a Deeper Understanding of Genetic Privacy, Health Law Teachers Conference, Wilmington, Delaware, June 7, 2003

Genetic Privacy, GENETICS POLICY AND LAW: A NATIONAL FORUM, National Conference of State Legislatures, Washington, D.C., October 5, 2001

Genetics Legislation: Cause and Effect, THE BUSINESS OF MEDICINE, The Health Law Teachers 25th Anniversary Conference, Boston, MA, June 1, 2001

Property or Privacy: How Should We Protect Medical Privacy?, Greenwall Fellowship Program, Washington, D.C., May 8, 2001

Property Rights and Reproductive Technologies, National Association of Women Judges Seminar, Washington, D.C., March 24, 2000

The Ethics and Legal Issues of Human Cloning, National Association of Women Judges Seminar, Washington, D.C., March 24, 2000

Challenges in Drafting Cloning Legislation, NATIONAL CONFERENCE OF STATE LEGISLATURES 25TH ANNUAL MEETING, May 27, 1999

Changing Landscapes: Evolving Decision Making Approaches in Genetics, GENETIC TESTING, American Society for Bioethics and Humanities Annual Meeting, Houston, TX, Nov. 20, 1998

The Legal Aspects of Genetic Testing, CANCER GENETICS FOR THE ONCOLOGY PROFESSIONAL: CURRENT APPLICATIONS & THERAPEUTIC APPROACHES, New York, NY, Sept. 24, 1998

Setting Public Policy for Genetics, GIANT STEPS IN GENETICS, Chesapeake College Performing Arts Center, Wye Mills, MD, Apr. 7, 1998

Ambivalent Unanimity, COURTING DEATH, Univ. of Michigan, Ann Arbor, MI, Nov. 14, 1997

Legal and Ethical Issues in Newborn Screening for Hearing Loss, CDC, Atlanta, GA, Oct. 21, 1997

A Fresh Look at Nondirectiveness, Plenary Speaker, 1996 National Society of Genetic Counselors Annual Education Conference, San Francisco, CA, Oct. 28, 1996

Sex Selection and Nondirectiveness, University of Chicago Law School Roundtable Symposium on Genetics and the Law, Chicago, IL, Jan 20, 1996

PROFESSIONAL ACTIVITIES

2016-present **Editorial Board, OBM Genetics**

2016-present **Working Group Member of ELSI-funded project, "Goals and Practices for Next-Generation Prenatal Testing"**
This project includes an international working group of leaders of major clinical societies, clinical researchers, social scientists, philosophers, lawyers, and patient representatives to explore the ethics, law, and policy issues surrounding next-generation prenatal testing.

2014- present **Ethics Consultant, The Sudden Death in the Young (SDY) Registry**
This initiative, funded by the Centers for Disease Control in partnership with the National Institutes of Health, will utilize child death review to collect comprehensive data from multiple sources about the circumstances and factors associated with SDY deaths to help public health officials, prevention groups, and policy makers better implement effective prevention strategies.

2008-present **Biotech/Medical Board, Ethics Board, and Legal Board for Lifeboat Foundation**
Lifeboat Foundation is a think tank that includes philosophers, economists, biologists, nanotechnologists, educators, policy experts, lawyers, ethicists, neuroscientists, physicists, etc. to help consider the risks and possible misuse of increasingly powerful technologies, like genetic engineering, nanotechnology, and robotics.

2000-2007 **External Advisory Board of NIH-Funded REVEAL Study**
REVEAL (Risk Evaluation and Education for Alzheimer's disease) is a large-scale research study to evaluate the factors that influence adult offspring of individuals with Alzheimer=s disease to undergo genetic testing for Alzheimer=s disease. The External Advisory Board monitors the study to ensure that it protects the interests of the participants of the study.

2001-2006 **Expert Panel of American College of Medical Genetics Newborn Screening Project**
HRSA-funded interdisciplinary project to outline a process of standardization of outcomes and guidelines for state newborn screening programs and to define responsibilities for collecting and evaluating outcome data.

2000-2006 **Non-Medical Institutional Review Board,** George Washington University Law School
Multidisciplinary committee that provides oversight for all non-clinical or non-medical research in the social sciences, including research into human behavior and psychology, education, political science, law and criminology, culture, and the arts.

2002-2003 **Working Group of Greenwall-Funded Grant: AEthics and Cell Engineering@**
Multidisciplinary group that examined the ethical, legal, and scientific issues regarding stem cell research with focus on the selection of source of stem cells as well as the selection of

stem cell lines from which human therapeutics will be developed. Publication of two articles.

2002-2003 **Core Group of NIH-Funded Grant: AGerm-Line Interventions and Human Research Ethics"**
The Core Group examined how policy provisions and ethical principles would bear on research proposals to alter the genome of a human embryo when the goal is to allow that embryo to develop into a child.

1999-2001 **National Conference of State Legislatures Blue Ribbon Panel**
Chaired the Blue Ribbon Panel on Human Genetics Technologies Committee on Privacy, which assisted the National Conference of State Legislatures= Legislative Task Force in developing a state policy framework for genetic technologies.

1999-2001 **Genetics Advisory Committee for NIH-Funded Grant: AGenetics Legislation@**
Wrote grant for the funding for the Genetics Legislation Project, which provided legislators and other policy-makers with objective, comprehensive, and scholarly information about genetics -- science, law, and ethics -- to help facilitate drafting of sound genetics-related legislation. Provided oversight for the project.

1997-98 **Michigan Commission on Genetic Privacy and Progress,** Lansing, MI
Appointed by Governor Engler to serve on one-year, eleven-member. The commission recommended model state statutory and administrative policies to protect the privacy of genetic information, prevent discrimination, and regulate uses of genetic information to safeguard the interests of the public.

1997-1998 **Genome Technology & Reproduction: Values and Public Policy,** Ann Arbor, MI
Consultant on project investigating community views of reproductive genetics. Researched legal and professional standards related to reproductive genetics and developed policy recommendations. Co-facilitator in session on privacy and confidentiality in the national dissemination conference.

INTERESTS Photography – Jewelry-Making - Soloist Ann Arbor Ballet Theater (1989-94) – Travel– Languages: Spanish (advanced), German (conversational) - Piano: Michigan State Finalist 1981

BIOTRUST FREQUENTLY ASKED QUESTIONS

EXHIBIT EE
OUTSIDE LEGAL COUNSEL PLC
www.olcplc.com

What are blood spots?

Soon after birth a few drops of blood are taken from a newborn's heel. The drops fill five or six spots on a filter paper card. These "blood spots" are used for newborn screening. Newborn screening ensures babies with rare diseases such as phenylketonuria (PKU), cystic fibrosis and sickle cell disease are found early for treatment. To learn more about newborn screening please visit www.michigan.gov/newbornscreening.

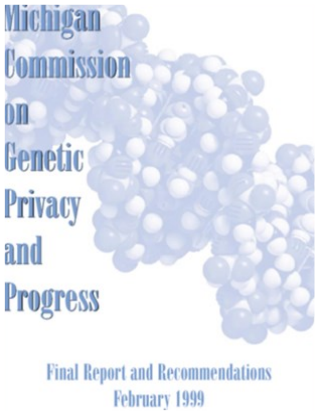
What do I need to know about blood spots?

All of the blood spots are not always needed. Five or six blood spots are collected to ensure there is enough for all of the newborn screening tests. If there is a positive (abnormal) test, the lab has enough spots to double check the result. This limits the number of newborns who need to have their blood drawn again and helps to ensure a disorder is treated as soon as possible. Once newborn screening is done, any unused parts and whole blood spots are stored for up to 100 years. One unused spot is kept by the state public health lab for use by a parent or person (>18y), if needed. The rest of the blood spots are stored at a secure site called the Michigan Neonatal Biobank (www.mnbb.org).

How long have Michigan blood spots been stored?

Blood spots dating back to July 1984 are being stored. Any blood spots received by the state lab on infants born before July 1984 have been destroyed.

Why have blood spots been stored?



Good lab practice requires that blood spots be kept for a length of time after newborn screening is done. The state lab has always stored blood spots after newborn screening, but the length of time has changed over the years. In the 1970s, blood spots were stored for 7 years and then destroyed. In the 1980s, the State of Michigan received legal advice to store blood spots until a child reached 21.5 years. In 1999, a Governor's task force called the Michigan Commission on Genetic Privacy and Progress recommended storing leftover blood spots indefinitely (forever) because of their value for future research. State law allows the Department of Health and Human Services to set the period of time for storage. In 2017, the retention policy was updated to save blood spots for up to 100 years.

Important Reasons to Store Blood Spots

- Blood spots are used to ensure quality newborn screening.
- Blood spots are also stored because they may be helpful to the baby's family in the future.
- Blood spots may also help researchers better understand diseases or find ways to improve health.

BIOTRUST FREQUENTLY ASKED QUESTIONS

How have stored blood spots been used?

The state lab used blood spots to add newborn screening for cystic fibrosis in 2007 and for SCID (Severe Combined Immunodeficiency) in 2011.

The state lab used blood spots to protect the public's health by studying the spread of infectious diseases or public health epidemics. Anonymous samples were used in the 1990s to find out how many newborns were exposed to HIV.

Researchers used blood spots to look for better ways to diagnose leukemia and to test for mercury levels to find out if pregnant mothers were eating safe amounts of fish.

Parents have asked that their own child's blood spot be sent to researchers for studies; and to help diagnose a disorder or find reasons for a child's untimely death.

Why use left-over blood spots for research?

Blood spots contain genetic and other kinds of biomarkers that may be useful for studying birth defects or chronic diseases. Blood spots may also show if there was exposure to infections or toxins (such as pesticides or lead) before birth. Blood spots are no longer needed after newborn screening is done. Because many blood spots can be provided at one time, it is easier for researchers to study very large numbers of people from all over the state. This is simpler than trying to collect a new sample from each person and may help speed up the chance of new discoveries, improve quality, and possibly reduce the cost of research. For more details about the research done using Michigan's stored blood spots please visit the "Research" page on the BioTrust website (www.michigan.gov/biotrust).

Are Michigan's blood spots used for cloning or stem cell research?

No. Blood spots cannot be used for cloning. Michigan law also prohibits human cloning for any purpose and prohibits the use of state funds for human cloning. Therefore, blood spots cannot be used for cloning. Stem cells are specialized cells that currently can only be isolated from certain types of tissues which do not include left-over blood spots from newborn screening. Thus, Michigan's blood spots are not stored for stem cell research.

What has been done with my child's (or my own) blood spots?

It is not possible to tell exactly which blood spots were used in the past for medical or public health research because all directly identifiable information was removed. New steps are now in place so the Department of Health and Human Services can track the blood spots but still maintain privacy and confidentiality. For more details please read the "*How Is Privacy Protected*?" FAQ page.

It is unlikely that all of your stored blood spots in the biobank will be used in research even if selected for one or more research studies. The choice to continue to allow research use of your child's (or your own) blood spots is yours to make. Please learn more and visit the "*Consent Options*" page on the BioTrust website (www.michigan.gov/biotrust).

BIOTRUST FREQUENTLY ASKED QUESTIONS

EXHIBIT FF
OUTSIDE LEGAL COUNSEL PLC
www.olcplc.com

What Is The Michigan BioTrust for Health?

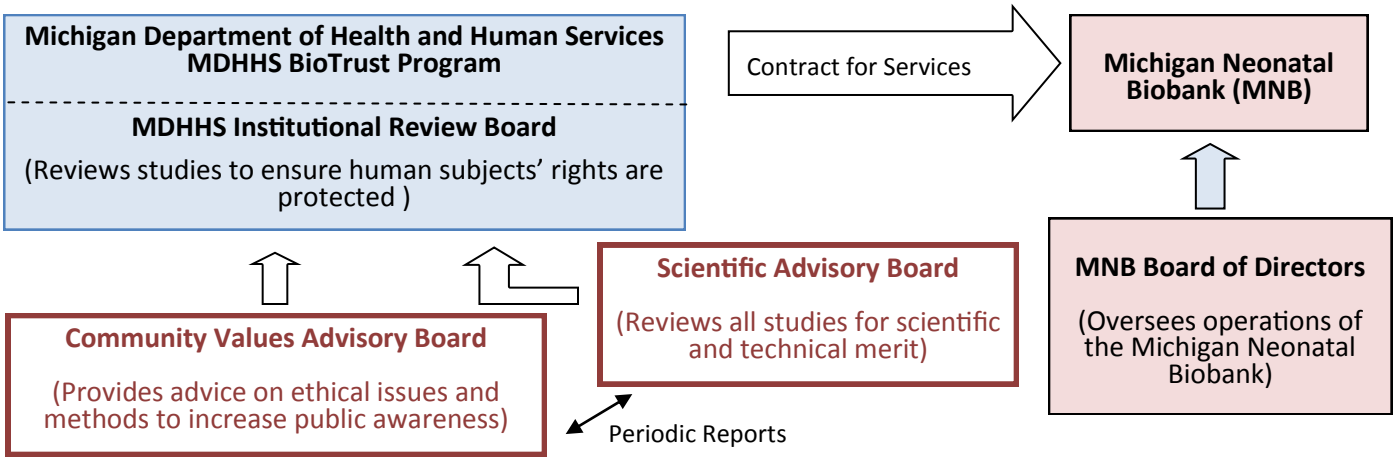
The ***BioTrust*** is a program run by the Department of Health and Human Services (MDHHS) to oversee the storage and use of Michigan's blood spots that remain after newborn screening is completed. Program components include outreach and community engagement, policy development, blood spot storage and coordination of research.

Who is in charge of the BioTrust?

MDHHS is responsible for the blood spot samples, holding them "in trust" for future research. The Michigan Neonatal Biobank (*www.mnbb.org*), a 501c3 non-profit charitable organization, is responsible for storage and day-to-day management of the blood spots.

Who helps MDHHS guide the BioTrust?

Four different advisory or review boards help guide BioTrust policies and operations. Board members represent the major state universities, research institutions, disease and advocacy organizations, community groups and the public.



What are the goals of the BioTrust?

The primary goals are to: (1) make blood spots more useful for medical and public health research while protecting privacy, (2) store blood spots to better preserve the samples, (3) encourage research, (4) engage and inform the public and (5) allow personal decision-making.

What kind of research does the BioTrust allow?

The only studies allowed are for medical and public health research. Guiding principles were developed with input from the Community Values Advisory Board. For more details and a list of studies using Michigan blood spots, please visit the "Research" page on the BioTrust website (www.michigan.gov/biotrust).

Do law enforcement officials or insurance companies have access to the BioTrust?

No. The BioTrust has been designated a medical research project by the MDHHS Chief Medical Executive. Under state law, the samples, data and other information included as part of this medical research project are protected and are not subject to forced disclosure to third parties.

To learn more please reach us by telephone (*toll free* 1-866-673-9939) or email (biotrust@michigan.gov).

BIOTRUST FREQUENTLY ASKED QUESTIONS

What Is The Michigan Neonatal Biobank?

The ***Michigan Neonatal Biobank (MNB) is a 501(c)3 non-profit charitable organization serving as the repository for storage and management of Michigan's newborn screening blood spot samples.***

What is a biobank?

A biobank is a place that collects, stores, processes and distributes biological samples. In some instances, a biobank also stores the data associated with those materials. Biobanks may be used for clinical care or for health research. In the United States, research biobanks are governed by ethical principles for human subject research established by federal regulations.

The Michigan Neonatal Biobank (MNB)

The MNB is a temperature controlled secure facility at Wayne State University's Biobanking Center of Excellence in Tech Town (www.mnbb.org). The only samples currently stored at the MNB are blood spots left-over from Michigan's newborn screen. The MNB cannot access data and only receives blood spots and linked data that have been labeled with a code. Blood spots collected since 2009 are stored at –20°C. Blood spots collected between 1996 and 2008 are stored in a temperature and humidity controlled space while blood spots collected between July 1984 and 1995 are stored at ambient temperature.

Who oversees the MNB?

Oversight of the biobank is provided by a board of directors. One board member is appointed from each of the institutions that collaborated to establish the MNB– the Michigan Department of Health and Human Services, Van Andel Institute, Michigan State University and the University of Michigan.

What is the difference between the Michigan BioTrust for Health and the MNB?

Michigan BioTrust for Health

The BioTrust is a program run by the Department of Health and Human Services to oversee Michigan's stored blood spots and their use in health research. The BioTrust encompasses out-reach and community engagement, policy development as well as coordination and approval of research requesting blood spots.

The MNB is the storage repository for Michigan's residual newborn screening blood spot samples. The Department of Health and Human Services contracts with Wayne State University for services. While securely storing and optimally preserving blood spots, the biobank also works to promote the use of these samples in health research.

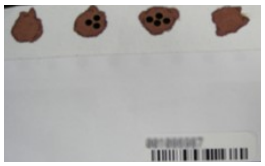
BIOTRUST FREQUENTLY ASKED QUESTIONS

EXHIBIT HH
OUTSIDE LEGAL COUNSEL PLC
www.olcplc.com

How Does the BioTrust Protect Your Privacy?

There are many levels of security at the Michigan Neonatal Biobank where blood spots are stored. Blood spots are stored using a code and not a person's name. Details that could pinpoint a child or family are removed. The Department of Health and Human Services (MDHHS) has been granted the highest level of protection, a Certificate of Confidentiality from the United States Department of Health and Human Services.

Blood spots are separated from the newborn screening card and labeled with a storage code, then sent to the Michigan Neonatal Biobank for storage.



1 After newborn screening is completed, the filter paper containing left-over blood spots is separated from the newborn screening card that has the baby's directly identifiable information. A code is assigned to five remaining blood spots before transfer to the Michigan Neonatal Biobank for storage. The same code is applied to the sixth blood spot that remains in the State Lab for storage in case a parent or person (over 18 years) needs the spot. The Michigan Neonatal Biobank can not access and does not receive any directly identifiable information.

Requests for blood spots and data must be approved by MDHHS Institutional Review Board, BioTrust Scientific Advisory Board and MDHHS Programs.

Michigan BioTrust for Health

2 Research requests are reviewed and approved by the MDHHS Institutional Review Board and Scientific Advisory Board to ensure protection of human subjects. Both boards must approve a study before blood spots are released. If a research study requires samples meeting certain criteria or asks for accompanying data, the MDHHS Program housing the data must approve its release. MDHHS will then conduct database linkages to select the right blood spots while still keeping blood spots and data confidential and coded.

Michigan Neonatal Biobank replaces storage code with a research code. Blood spots labeled with the research code given to researcher.

MNB michigan neonatal biobank

3 Once MDHHS identifies the blood spots and potential data required for an approved study, the Biobank receives a list of storage codes to retrieve blood spots for the study. Before the blood spots and potential coded data are released to a researcher the Biobank assigns another, different code. Thus, the code a researcher sees is two steps removed from the original newborn screening card number.

Researchers requesting identified blood spots or data must get consent from subjects for use in the specific study.

BIOTRUST FREQUENTLY ASKED QUESTIONS

What are Your Options?

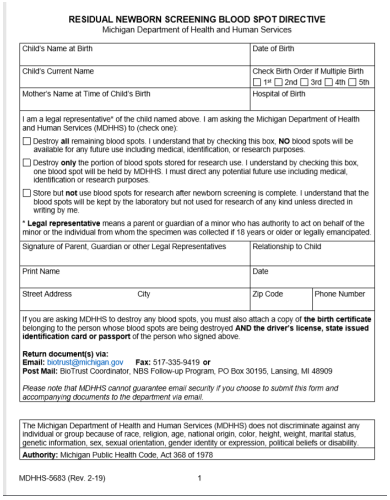
For more details on your consent options please visit the "Consent" page on the BioTrust website. (www.michigan.gov/biotrust)

Were you or your child born in Michigan before July 1984?

Blood spots received by the State Laboratory on infants born before July 1984 have been destroyed.

Were you or your child born in Michigan between July 1984 and May 1, 2010?

Today, blood spots from over four million people are stored. Blood spots collected between July 1984 and May 1, 2010, are coded and may be used in health research under a waiver of informed consent granted by the Michigan Department of Health and Human Services (MDHHS) Institutional Review Board. These blood spots may also be requested by a parent or person (>18y) for their own use. If you want to continue to allow the use of coded blood spots in health research, you do not need to do anything. If you do not want your or your child's blood spots made available for future health research you have two options to **opt-out**. You may fill out a form to: (1) request that blood spots remain stored but not used in future research, or (2) request that blood spots be destroyed. The lab requires verification that you are the legal representative entitled to make the request to destroy blood spots. You must submit your State ID or driver's license as well as a copy of your child's birth certificate.



RESIDUAL NEWBORN SCREENING BLOOD SPOT DIRECTIVE
Michigan Department of Health and Human Services

Child's Name at Birth	Date of Birth
Child's Current Name	Check Birth Order if Multiple Birth ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th
Mother's Name at Time of Child's Birth	Hospital of Birth

I am a legal representative* of the child named above. I am asking the Michigan Department of Health and Human Services (MDHHS) to (check one):

☐ Destroy **all** remaining blood spots. I understand that by checking this box, **NO** blood spots will be available for any future use including medical, identification, or research purposes.

☐ Destroy **only** the portion of blood spots stored for research use. I understand by checking this box, one blood spot will be held by MDHHS. I must direct any potential future use including medical, identification or research purposes.

☐ Store but **not** use blood spots for research after newborn screening is complete. I understand that the blood spots will be kept by the laboratory but not used for research of any kind unless directed in writing by me.

* **Legal representative** means a parent or guardian of a minor who has authority to act on behalf of the minor or the individual from whom the specimen was collected if 18 years or older or legally emancipated.

Signature of Parent, Guardian or other Legal Representatives	Relationship to Child	
Print Name	Date	
Street Address City	Zip Code	Phone Number

If you are asking MDHHS to destroy any blood spots, you must also attach a copy of **the birth certificate** belonging to the person whose blood spots are being destroyed **AND the driver's license, state issued identification card or passport** of the person who signed above.

Return document(s) via:
Email: biotrust@michigan.gov **Fax:** 517-335-9419 **or**
Post Mail: BioTrust Coordinator, NBS Follow-up Program, PO Box 30195, Lansing, MI 48909

Please note that MDHHS cannot guarantee email security if you choose to submit this form and accompanying documents to the department via email.

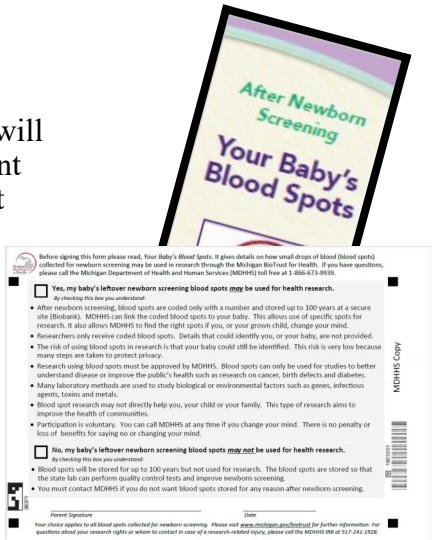
The Michigan Department of Health and Human Services (MDHHS) does not discriminate against any individual or group because of race, religion, age, national origin, color, height, weight, marital status, genetic information, sex, sexual orientation, gender identity or expression, political beliefs or disability.

Authority: Michigan Public Health Code, Act 368 of 1978

MDHHS-5683 (Rev. 2-19) 1

Was your child born in Michigan after April 30, 2010?

Blood spots from an infant born after April 30, 2010, will be stored for 100 years after newborn screening is done. However, the blood spots will not be used in research through the BioTrust unless a signed parental consent form is on file with the State Laboratory. New parents are given a BioTrust consent form to record whether "yes" they want blood spots made available for research or "no" they do not. One full blood spot will still be saved for future use by the child or family, should it ever be needed. *Please note, if a parent declines participation in the BioTrust, blood spots are still stored unless a form to destroy the blood spots is returned to the State Laboratory.*



To make a personal choice about blood spot use, please contact the Michigan Department of Health and Human Services.

Call 1-866-673-9939 or Email *biotrust@michigan.gov*

www.michigan.gov/biotrust

Michigan Neonatal Biobank (/)

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Research

The Michigan Neonatal Biobank stores the residual dried blood spot samples that were collected from Michigan newborns during the past 29 years as part of the state's Newborn Screening program. There are nearly four million dried blood spot cards in the Biobank.

The dried blood spots can be used for studies on genetic and chronic diseases, genomics and infectious disease, and for prevalence studies. For approved research studies the samples can also be linked by the Michigan Department of Community Health to newborn screening results and statewide public health laboratories making it possible to request samples that are associated with a known health outcome.

How are the cards stored?

Cards from the years 2009 to date are stored frozen at -20C;
Cards from 1996 through 2008 are stored in temperature and humidity controlled space;
Older cards are currently stored at ambient temperature.

What can be measured using neonatal dried blood spots?

More than 160 different analytes or polymorphisms are cited in literature as having been measured from dried blood spot specimens for epidemiological studies. The list includes not only biological markers such as DNA, but also infectious agents and potential environmental contaminants such as heavy metals. And new nanotechnologies make it possible to measure thousands of genes, gene transcripts, proteins, metabolites, infectious agents, drugs, and toxins from small samples when they are stored under optimal conditions.

How have Michigan's samples been used?

Michigan's samples have been used to improve current newborn screening tests; to develop new screening tests for other conditions; and for approved medical and public health research to better understand underlying causes of

disease and possible interventions to improve health outcomes. To open a list of current and past studies that use dried blood spots from the Biobank click here.

Requesting Samples

Initial inquiries and requests for assistance with study design can be sent to the Michigan Neonatal Biobank at mnbb@wayne.edu (mailto:mbbb@wayne.edu) or contact us at 313-577-2130.

Requests for samples and linked datasets are submitted on the Request for Samples form (see the link to Forms, above).

Michigan Neonatal Biobank

440 Burroughs Suite 320

Detroit, Michigan 48202

Phone 313-577-2130

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MNB michigan neonatal biobank

Providing Blood Specimens to Researchers Across the World

Our Specimens

Inventory includes over five million residual newborn screening dried blood spot specimens representing nearly every Michigan birth since October 1987.

Dried Blood Spots Specimens and MDHHS Data

After obtaining the appropriate approvals, MDHHS can link blood spot specimens to Michigan's public health registries making it possible to request de-identified and non-unique specimens with a known health outcome.

Important Resource

Over 160 biomarkers and compounds have been measured in dried blood spots, from DNA and proteins to metals and infectious agents. They are an excellent source of specimens for both epidemiological investigations and studies of how genes interact with the environment, as well as for assay development.

Your Research

Researchers have used specimens for studies that look at:

- Methylation patterns in cases of autism, ADHD, and CHD.

- Health outcomes in babies conceived by IVF.
- Assay development or improvement for Spinal Muscular Atrophy (SMA) and Muscular Dystrophy (MD).
- The effect on hearing of pre-natal exposure to heavy metals.
- The influence of the epigenetic processes on the prediction of Fetal Alcohol Spectrum Disorders.
- Exposures to mercury, lead and tobacco.
- And more…

News

Medical News Today - New Method Will Triple Amount of Genetic Information From Newborn Blood Spot Screenings (/news/medical-news-today-new-method-will-triple-amount-of-genetic-information-from-newborn-blood-spot-screenings--28217)

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Michigan Neonatal Biobank

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Michigan Neonatal Biobank (/)

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User fees

The Michigan Neonatal Biobank charges a user fee to offset the cost of providing samples to approved research programs. Questions about user fees can be directed to the Biobank at welcome@mnbb.org (mailto:welcome@mnbb.org) or gayle.kusch@wayne.edu (mailto:nchrist@med.wayne.edu).

Application Fee

There is no application fee. Inquiries are welcome.

User Fee

The user fee for a 1/8" punch from a random sample is $10.00. Discounts are available for large quantity orders. There is an additional charge for rare samples and for small orders.

Linked Data Fee

The dried blood spots can be linked to information found in the State's public health registries. When linked data is requested there is a charge of $850.00 for each database queried plus $ 1.00 per case or control. The Linked Data Fee is paid in advance and it is non-refundable. In lieu of cash or check an institution's Purchase Order may be used to guarantee payment of this fee.

Shipping

Non-standard shipping costs - for example shipping large orders, out of state delivery, or sending frozen samples - may be charged to the requestor.

Purchase Orders

An institution's Purchase Order may be required for large orders.

440 Burroughs Suite 320

Detroit, Michigan 48202

Phone 313-577-2130

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Researcher Name:	Institution:	Address:	Year of Approval:	Number of DBS Approved:
Patricia McCann	Minnesota Department of Health	625 North Robert Street St. Paul, MN 55155	2009	200
Keld Sorenson	Luminex		2009	1500
James Resau	Van Andel Institute		2009	20
Sue Land	Wayne State University		2008	99
Ray Bahado-Singh	Wayne State University	3750 Woodward, Ste 220A	2008	312
Jeffrey Taub	Wayne State University		2008	102
Beena Sood	Wayne State University	3901 Beaubien Blvd, 4H42, Detroit, MI 482010	2004	1200
Dana Barr	Centers for Disease Control and Prevention	4770 Buford Hwy, MSF17, Atlanta, GA 30341	2007	15
Nigel Paneth	Michigan State University	909 Fee Rd, B691, West Fee Hall, Department of Epidemiology and Biostatistics, East Lansing, MI 48824	2005	900
Dennis Smith	Luminex Corporation	12212 Technology Blvd, Austin, Texas 78727	2010	1200
Logan Spector	University of Minnesota	420 Delaware St. SE, MMC 715, Minneapolis, MN 55455	2010	350
Ray Bahado-Singh	Wayne State University	3750 Woodward, Ste 220A	2010	24
Mike Hogan	Genomics USA	1622 W Colonial Parkway, Inverness, IL 60060	2010	40
Steven Dobrowolski	ARUP Laboratories		2010	3000
Kevin Cavanagh	Michigan Department of Community Health	Bureau of Labs, Lansing, MI 48909	2011	2500
Doug Ruden	Wayne State University		2011	300
Ray Bahado-Singh	Wayne State University	Hutzel Women's Hospital, 3990 John R, Box 163, Detroit, MI 48201	2011	119
John Hannigan	Wayne State University	71 E Ferry St, Detroit, MI 48202	2011	30

Alexandra Burt	Michigan State University	316 Physics Road, East Lansing, MI 48824	2012	200
Thomas Christensen	Astoria-Pacific, Inc.	15130 82nd Dr, Clackamas, OR 97015	2012	11
Vamsee Pamula	Advanced Liquid Logic	615 Davis Drive, Suite #800, Morrisville, NC 27560	2013	50
Moriah Thomason	Wayne State University	715 East Ferry St, Detroit, MI 48202	2013	174
Christopher Monk	University of Michigan	200 East Hall, 530 Church Street, Ann Arbor, MI 48109	2013	300
Mark Russell	University of Michigan	1150 W Medical Center Dr, Ann Arbor, MI 48109	2013	390
Stephen Krawetz	Wayne state medical	540 E Canfield, Detroit, MI 48201	2013	150
Christopher J. Trentacosta	Wayne State University	5057 Woodward Ave, 7th Floor, Detroit, MI 48202	2013	60
Alexandra Burt	Michigan State University	316 Physics Road, East Lansing, MI 48824	2013	35
Thomas Langan	University of Buffalo	701 Ellicott Street, Buffalo, NY 14203	2013	9
Allison Aiello/erin case	University of North Carolina/University of Michigan	2101C Mcgavran-Greenberg Hall, 135 Dauer Drive, Campus Box 7435, Chapel Hill, NC 27599	2013	200
James Pivarnik	Michigan State University	308 W Circle Dr, East Lansing, MI 48824	2013	50
Richard Neitzel	University of Michigan	1415 Washington Heights, 6611 SPH I, Ann Arbor, MI 48103	2013	500
Mei Baker	Wisconsin Department of Health	465 Henry Mall, Madison, Wisconsin, 53706	2013	300
Nigel Paneth	Michigan State University	909 Fee Rd, B691, West Fee Hall, Department of Epidemiology and Biostatistics, East Lansing, MI 48824	2014	1100
Julie Lumeng	University of Michigan	1415 Washington Heights, Ann Arbor, MI 48103	2014	306
Kelli Ryckman	University of Iowa	145 N Riverside Dr, CPHB S414. Iowa City, Iowa. 52242	2014	650

Belinda Needham	University of Michigan	1415 Washington Heights, 2663 SPH Tower, Ann Arbor, MI 48109	2014	225
Jenny Poynter	University of Minnesota	420 Delaware St SE, MMC 715, Minneapolis, MN 55455	2014	1000
Patrice Held	Wisconsin NBS Program	465 Henry Mall, Madison, Wisconsin, 53706	2014	6
Laura Rozek	University of Michigan	1415 Washington Heights, Ann Arbor, MI 48109	2014	200
Ineke Ahlers	Future Diagnostic Solutions	Nieuweweg 279, 6603BN Wijchen, the Netherlands	2014	100
Carrie Costin	University Hospitals Case Medical Center	11100 Euclid Avenue, Lakeside 1500, Cleveland, OH 44106	2014	45
Karen Rabin	Baylor College of Medicine	1102 Bates St, Suite 750.01, Houston, TX 77030	2014	450
Randall Armant	Wayne State University	CS Mott Center for Human Growth & Development, 275 East Hancock St. Detroit, MI 48201	2015	300
Phillip Lupo	Baylor College of Medicine	One Baylor Plaza, MS-BCM305, Houston, TX 77030	2015	300
Erin Marcotte	University of Minnesota	420 Delaware St SE, MMC 715, Minneapolis, MN 55455	2015	420
Laurie Livshin	PerkinElmer	940 winter st, Waltham, MA 02451	2015	10
Matt Huentelman	Translational Genomics Research Institute	445 N 5th Street, Phoenix, AR 85004	2015	90
Gary Latham	Asuragen	2150 Woodward St Suite 100, Austin, TX 78744	2015	10000
Graeme Bell	University of Chicago	5841 S Maryland Avenue, AMB N214A, MC 1027, Chicago, IL 60637	2018	11500
Mary Seeterlin	MDHHS/Perkin Elmer	3350 N. MLK Jr. Blvd. Lansing, MI 48906	2018	4550

Dawn Misra	Wayne State University	6135 Woodward Avenue, Detroit, MI 48202	2018	1400
Dawn Misra	Wayne State University	6135 Woodward Avenue, Detroit, MI 48202	2018	500
Logan Spector	University of Minnesota		2018	6250
Arindam Bhattacharjee	Baebies, Inc	615 Davis Dr, Suite 800, Durham, NC 27709	2018	450
Nedra Whitehead	RTI International	6110 Executive Blvd, Suite 902, Rockville, MD 20852	2018	3000
Dawn Misra	Wayne State University	6135 Woodward Avenue, Detroit, MI 48202	2017	1700
Sarah Elsea	Baylor College of Medicine	One Baylor Plaza, NABS 2015, Houstin, TX 77030	2017	220
Karen Racicot	Michigan State University	333 Bostwick Ave SW, 4018 VAI, Phase II	2017	500
Daniel Ory	Washington University	Box 8086, 600 S Euclid Ave, St. Louis, MO 63110	2016	40
Moriah Thomason	Wayne State University	71 E Ferry St, Detroit, MI 48202	2016	160
Andrea Cassidy	Henry Ford Health System	One Ford Place, Detroit, MI 48202	2016	20
Phillp Lupo	Baylor College of Medicine	One Baylor Plaza, MS: BCM305, Houston, TX 77030	2016	600
Tammy Movsas	Zietchick Research Institute		2016	1100
Dr. Joseph Thakuria	Veritas Genetics	99 Conifer Hills Drive, Danvers, MA 01923	2016	42
Hakon Hakonarson	Children's Hospital of Philadelphia	3601 Civic Center Blvd, Abramson Research Center, Room 1016F, 19104	2016	25
Amanda Janitz	University of Oklahoma Health Sciences Center	801 NE 13th St., CHB 309, Oklahoma City, OK, 73104	2019	260
Jennifer Straughen	Henry Ford Health System	1 Ford Place, suite 3E, Detroit, MI 48202	2018	10
Amanda Simanek	University of Wisconsin	1240 N 12th St, Milwaukee, WI 53201	2019	1000
Eric Engels/Sharon Savage	National Cancer Institute	8717 Grovemont Circle, ATC, Room 149, Gaithersburg, MD 20877	2019	40

UNITED STATES DISTRICT COURT

FOR THE EASTERN DISTRICT OF MICHIGAN

ADAM KANUSZEWSKI, et al,

Plaintiffs, Case No. 18-cv-10472

v

MICHIGAN DEPARTMENT OF HEALTH
AND HUMAN SERVICES,

Defendant.

/

VIDEO CONFERENCE DEPOSITION OF ANTONIO YANCEY

Taken by the Plaintiffs on the 7th day of October, 2020, via Zoom, at 12:00 p.m.

APPEARANCES:

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Via Zoom Video Conference
Wednesday, October 7, 2020 - At 12:02 p.m.

REPORTER: Do you solemnly swear or affirm that the testimony you're about to give shall be the whole truth?

DR. YANCEY: I do.

MR. ELLISON: Good morning, Doctor. My name is Attorney Phillip Ellison. I'm counsel for four parents and nine children in a case that's been brought in the Eastern District Court known as the Kanuszewski vs the Department of Health and Human Services case.

ANTONIO YANCEY

having been called by the Plaintiffs and sworn:

EXAMINATION

BY MR. ELLISON:

Q What I'm going -- today we're doing your deposition. Have you ever done a deposition before?

A. I have.

Q. You have. Okay. All right. Just know as a matter of practice that I'm a little more nonspecific than I sometimes try to be, so if my question is not clear in any way, you're not going to insult me or otherwise upset me in any way if you say, "Phil, that doesn't make sense. Can you ask it another way?" or "Try again." Okay? So feel free to jump in if it doesn't make sense, all right?

A. Okay.

Q. What I'm going to do today, do you have access -- I mean, I can see you on the screen right now. I'm going to show some documents on a computer screen. Do you have the ability to see those? I know I see a light that's pretty bright behind you there, but can you see the screen okay if I were to share a document?

A. Yeah, I see them.

Q. Okay. Fair enough. I don't need you to adjust, as long as you can see it. You're a little more of an outline because you're real bright behind you, but that's fine for me so it doesn't matter for me.

MR. KENNEDY: You've got a halo, Doctor.

THE WITNESS: I was just thinking that.

MR. ELLISON: Well, it's better than my horns that usually show up behind me here.

THE WITNESS: Right, right.

Q. Anyway, all right. Well, let's get started here then. Just for the record you are Dr. Antonio Yancey, correct?

A. Correct.

Q. All right. And you are -- and I'm just -- to make this quick, you're the director of the Michigan Neonatal Biobank, correct?

A. Correct.

Q. All right. How long have you served in that role as a director of the Biobank?

A Since April of 2017.
Q And what does that role consist of?
A So I'm pretty much the -- I mean, I'm the director, so I'm responsible for the overall operations of the Biobank. I'm responsible for all of the financials for the Biobank, just pretty much what a typical director would do, just oversee operations and the finance. That includes logistical stuff in terms of building -- the building and assets that are in the lab, just typical things that a director would do.
Q Sure. So you would be -- not to put words in your mouth, but you would be in charge of all of the personnel and equipment, and assets of the Biobank?
A That's correct.
Q All right. And as I understand it also, you serve in administration at Wayne State University as well?
A Right. So I'm the associate vice president for research operations for Wayne State University. I'm actually a Wayne State University employee. I'm not employed by the Biobank and one of my responsibilities as the associate vice president for the Biobank -- I mean as the director, sorry --
Q Take your time. Take your time. Not a problem.
A Yeah. One of my responsibilities as the associate vice president of research operations is to manage the Biobank.
Q Okay. Do you get any compensation from the Biobank as part

of your duties?
A I do not.
Q All right. Let me ask it this way: If you were to take a new position or retire today or decide, "I no longer want to be here in the lovely State of Michigan anymore" and you go somewhere else, the person it that would assume your role at Wayne State University would also assume the directorship of the Biobank?
A That is correct. So there was a predecessor that worked for -- prior to me taking over, I think for at least the last ten years. This has always been set up that way here the individual that's managing the Biobank, they also have other responsibilities within a division of research, and it just varies on the position itself but again, I was put into the position in 2017 when my predecessor left the University.
Q As part of this -- as part of your role with the Biobank, I've come to learn and maybe you can confirm for me that you're part of a board of directors with the Biobank, correct?
A That's correct.
Q All right. Just so we're clear for the record today, when I reference the Biobank, that's the shorthand version of what I'm referring to as the Michigan Neonatal Biobank, Inc. Fair enough?
A That's correct.

Q All right. I'm going to share my -- we're going to see if this works right now. I'm going to try to share my screen and we'll see if I can make this -- okay. Can you see on the screen right? You can see, well, your picture right there?
A It's me.
Q All right. Fantastic. This is a -- I'm just going to represent --
A That's when I was younger.
Q Well, I always joke I like the younger pictures of me. There's less facial real estate, as I tell people, right? So we all look better yesteryear, but let's blame COVID. We'll blame COVID for all of that, right?
A. Right, right.
Q Anyway, what I've been presented, just for the record, that this is what I presented to the witness as Exhibit M for purposes of this deposition.
(Deposition Exhibit M marked)
Q. Doctor, this is a -- and I'm just going to represent to you this is a printout of the board of directors page of the Michigan -- of the Biobank website. I see -- I'm going to present to you there's four -- excuse me. There's six photographs with six people identified. Are those the current members of the board of directors for the Biobank?
A. That's correct.

Q. All right. Do you know how they got their roles with the Biobank as on the board of directors?
A. I do not.
Q. I noticed looking at the sheet here with the six of you that you're the only one that's got the word "director" underneath that. What distinguishes you as a director versus the other five that are there in that capacity?
A. So again, I'm the actual director of the Biobank, and so pretty much, again, I'm over -- I see over -- I see the operations for the Biobank, but I also have an appointment on the board too, and the rest of these individuals are strictly board members, so they don't have anything to do with the day-to-day operations where I do.
Q Again, not to put words in your mouth, but you'd be like the manager, but you also have a participation on the board of directors as well, correct?
A Correct. I'm the director of the Biobank, correct.
Q Well, let me ask it this way: When there's a board meeting of the board of directors for the Biobank, you would participate in that board of directors meeting, correct?
A That would be correct.
Q All right. Do you have a vote? Well, let me lay a foundation. Does the board of directors vote on matters of Biobank concerns?
A Yeah. They -- we do. I mean, it's more like -- pretty

much -- it's not anything formal, think. It's more discussion and collaborations with conversations and decisions of that sort, but I guess the answer would be yes.

Q I'm going to ask it this way: I mean, one of the things -- my wife -- my wife is a school board president, right? So, you know, there is not, as you can imagine, a lot of hotly contested -- you know, like the Supreme Court is a 5-4 decision. Those thins are done by discussion. They reach a consensus at these board meetings, so long as there's no dissent. Is that -- would that be a fair characterization of how this board operates?

A Correct.

Q All right. And you would be a person that would participate and would try to reach a consensus with the other five members of the board for issues that come up that go before the board of directors?

A No, that's not correct.

Q That's not correct? Okay.

A. I don't have -- yeah. I'm the secretary of the board, so my job pretty much is to facilitate the agendas and, you know, kind of organize the meetings, but I don't have a decision in any of the discussions at all.

Q Okay. All right. Fair enough. And that's why we get these depositions, I get to learn such things. Okay. I guess what I want to start with -- I'm going to turn that -- let's

see here. Just to be clear, is there -- other than these six -- well, you identified the five board members plus you as the director. Is there anybody else that's involved with the board of directors for the Biobank?

A In terms of board of directors?

Q Yes.

A No.

Q I'm just going to leave -- I'll tell you what I'm going to do. I'm just going to leave that there, see if that works. Nope. I did that wrong. All right. So we'll jump back and forth a little bit here.

A Okay.

Q This is the new world order. I've done exactly three depositions by Zoom. We don't normally -- we always usually do these in person with printouts in front of everybody. What I want to kind of understand that you can help educate me and ultimately, through this deposition, the Court, is what is the nature of the role of the Biobank vis-a-vis Can you explain that?

A Yeah. So the Biobank really in simple terms, is that we're just a depository, a storage area, so our job is to strictly store the blood spots. That's what we do.

Q Okay. Well, what's -- now you guys are formulated as an independent -- legally -- I guess legally independent nonprofit corporation, correct?

A Correct. We are a 501(c).

Q. Okay. And hence why you have a board of directors?

A. Correct.

Q. Right. Let me ask this: Let's just pretend for the sake of argument that my son was born three years ago. His -- we'll get into how blood gets in in just a minute, but let's just assume for the sake of discussion that his blood spot is in your Biobank, okay? Can I just come to you guys and say, "Give me his blood sample back"?

A. No, you cannot.

Q. Okay. That's what I want to understand. What role do -- does the Biobank fulfill or operate under as it connects to the Michigan Department of Health and Human Services?

A Okay. So our job is merely -- I'm going to probably say the word "storage" a lot, because that's what we are.

Q Fair enough.

A So basically, our relationship with the State is that we're basically just a storage facility, so what happens is is that any residual blood spots that are left from testing at the State lab, those are basically sent to the Biobank, to the operations that I manage, and then our job is to get those blood spots and we basically store them in our storage facility. That's pretty much what we do, so when those blood spots come, they come from the -- Lansing sends them to the State of Michigan building on West Grand Boulevard,

which is walking distance from our facility. We have an employed that picks up those and they're called the residuals, just leftover again from the State. My team picks up those blood spots and what we do is we catalog them into a system and then eventually from that system it goes into a storage facility that's temperature controlled. And so, we have no idea, you know, who the blood spots are. They come with us with I believe it's an eight-digit number, what's called like a -- it's an association with a Julian date, but there is no -- there is no information on that and our job is basically to store them in numerical order in terms of the Julian date and they go into our storage facility, so that's what we do.

Q Okay. Let me ask this then. Why, if you know -- and, again I should be clear. I know you've done a deposition before. If you don't know the answer to a question, it's perfectly fine to tell me you don't know.

A Okay.

Q Do you know why you -- why the Biobank is structured as a nonprofit rather than simply the Department of Health and Human Services just simply having a cooler themselves or renting a facility themselves? Why do we need the Biobank?

A I have no idea. That was probably way before my time. I never -- I don't know the answer to that.

Q Okay. Now, in your role as director of the Biobank, I know

one of the allegations in this complaint that I've made against you is that you're acting either in concert with or are a state actor. I guess what I'm trying to understand is who -- I mean, you've talked about your board of directors this morning. Who is in charge over you in terms of the Biobank?

A So I report -- well, I report to the -- it's kind of the way it's structured, because I'm a Wayne State employee I report to the vice president of research for Wayne State University. That's who I report to in terms of Wayne State. But then I also report to the board as a whole. So I have two -- you know, basically two supervisors, if you would, but primarily all of my evaluations, my performance is all done by the vice president for research for Wayne State University. There is no input or anything that goes to the VP of research in terms of my performance, so I really kind of really see myself I guess technically reporting to the vice president for research.

Q When you say research, that would be at Wayne State University, correct?

A. That is correct.

Q. One of the things -- let me just say I'm sympathetic to what you're trying to articulate because I've been trying to sort out the legal structure of how things fit together, and just my statement, not whether you agree with it, but it's

complicated.

A Right.

Q Let me ask this question: One of the things that I've been trying to figure out is as I started -- kind of the top of this line of questions is assume I have my son's -- my son's blood sample is in your guys' Biobank, right? It's in one of the cards and as I've nicknamed them in my mind, the coolers, right? Temperature-controlled facilities, fair?

A Right.

Q Okay. And just let me tell you, I'm going to use probably the wrong words too when it comes to -- I'm not a science person, so if you need to correct me --

A Right.

Q -- please feel free.

A. Okay.

Q So I imagine these blood samples on these Guthrie cards that have been cut up into squares are in a cooler; would that be fair?

A. Yes, it's fair.

Q. Okay. And they're --

A. Some are in -- let me clarify that. There are some that are in a cooler and some that are not in a cooler.

Q. Okay.

A. So some --

Q. Let's get that -- I was going to ask about that, so let's

get that one out of the way. Why are some of these in coolers and why are some of them at ambient temperatures?

A So at some point -- and I can't -- this is before my time. I can just kind of tell you a little bit of what I've learned from different people. At one point the State had made a decision to refrigerate the blood spots in order to basically -- and basically to -- what word am I looking for? To keep the spots more viable, I guess, in terms of potential research. So what happens is typically -- someone made a decision and I guess there's research and literature out there regarding this, that if you refrigerate the blood spots, basically the integrity of them are basically protected for a longer period of time, so that's all that means. At some point the State made a decision based on research that's out there in the research world that if you refrigerate these blood spots, then they'll last longer. The integrity, you know, and all those kinds of things are more viable or more from a liability perspective you can trust them, I guess, in terms of -- you can trust them more in terms of whatever research you're doing, so just the viability of the blood spot itself; it's supposed to last longer.

Q Okay.

A So they did that -- and I believe it's -- I can just tell you from -- I believe it's 2000 and -- I want to say for the

last -- we've had them about eight years. No, we had them from 2008 to current that are refrigerated in our Biobank.

Q Okay. And when we talk about the ones before 2008, those would be just stored at normal ambient everyday room temperature, fair?

A That's fair.

Q Okay. However, would you agree that both pre-2008 ambient temperature spots, stores spots, and post-2008 refrigerated spots are both spots that have been made available for access for researchers or for the punches that are sought by researchers out in the public?

A That's correct.

Q All right. Let me ask this. I mean, I kind of skipped over and jumped ahead a little bit. What is your background in terms of scientific understanding? I mean, you're a doctor. I know you're Dr. Yancey. I've seen that on there.

A Right.

Q What is your background? What's your educational background and field of study.

A So I'm not a scientist at all. I have a doctorate in organizational leadership, so basically my doctorate is all business-related. I do nothing with science at all in no capacity.

Q So you're about like me. The extent of our knowledge is Band-Aids and Robitussin, you know?

A There you go. There you go.
Q All right. So good. We can speak on non-scientific terms going forward.
A Yes.
Q All right. The question you mentioned earlier that the State decided to, you know, for example, separate out refrigerated after 2008 and non-refrigerated ambient before that. What role does the State have in making such a decision like that as it applies to the Biobank?
A What decision that they have?
Q What I guess I'm trying to understand -- forgive me. I'm going to be a little long-winded here with this. What I'm trying to understand is the Biobank is a separate legal entity as a nonprofit.
A Right.
Q That's my representation to you. I think you even answered that earlier.
A Right.
Q But a lot of -- I see in the discovery that's been provided by the State and by Mr. Kennedy, who is your attorney, is that the State seems to be calling the shots. State officials over at the Michigan Department of Health and Human Services are calling the shots and making decisions about the use, storage, availability of spots, access to spots, and that the Biobank folks are following or otherwise

agreeing to that process.
A Uh-huh (affirmative).
Q Make me understand what the role is between -- again, let me start off -- let me strike that and start off by saying am I wrong, and then follow up by explain to me how can you -- how can you explain to me and vis-a-vis the judge what the nature of the relationship is between the state officials at the Department of Health and Human Services as it applies to all of these activities going on at the Biobank?
A So the Biobank deposits -- or I guess there's two components from my perspective. One is that yes, you do have the State that is involved in all of the IRB approvals, all of the operation process, and so they're making those decisions at the state level. And then they've contracted us to basically be the bio depository just in terms of the storage, and so, I mean, to answer your question, yes, the State does make some calls, but primarily they don't make any calls regarding the depository bank within itself. That is a call that's made by the board, which as you can see is a collaboration. We have a person from the State, and then all of our other partners from the other universities that sit on this board, so it's fair to say that with some processes the State are making the call, but when it comes to the bio depository within itself, the storage facility, they're not really making the call for that. That would be

the board that's making the ultimate calls for that piece. So there are so many components before it gets to us, and that's when the State gets the lead on those components.
Q And to be fair, when the board makes a decision, you as a role of the director, effectuate those decisions and whatever those decisions may be?
A That would be correct, yes.
Q So say, for example, going back to the example I was starting with with my son, and this is again just as a reference point for me. My son has got some blood samples, some dry blood spots in the Biobank right now. Let's say I wanted to get those -- I wanted to get those spots removed from the Biobank and I no longer wanted you to have access to them. Could I come to you, first of all, and say, "Please remove those spots"?
A No, absolutely not.
Q Why not?
A Because I wouldn't even know how to identify your son's spots because there would be no -- there are no names that are associated with it, so I wouldn't even know, you know, where to go, where to pull it, what shelf it's on. I wouldn't have any of that information.
Q Okay. Let me play another what-if.
A. Okay.
Q. Pretend I came -- for whatever reason I came to you with the

-- I call them -- I've seen them referenced in there, called ascension numbers? Is that fair?
A. Yes.
Q. Okay. I come to you with my son's ascension numbers and I say, "I would like" -- "These are my son's ascension numbers which identify the specific blood spot wherever it's stored in the facility. Go get those. I want those and I want to take them with me when I come to see you at your office at TechTown," right? Can I do that with you?
A You cannot.
Q Okay. Explain to me why not that in that sense.
A Because our job is primarily -- we deal strictly with researchers. We don't have any contact with any of the general public in reference to pulling blood spots. It would have to go through the State, and then the State would communicate to me to pull a particular blood spot from the bank. We don't interact with the general public. We only interact with researches only when we've been given approval by the State of Michigan to interact with the researcher, but we definitely never, ever deal with the general public non-researchers.
Q Okay. We're going to get into that in a little more detail in a couple minutes.
A Okay.
Q But let me ask this question: As you get talking about --

you know, let's focus on the example with my son, for example.

A Okay.

Q I want to be able to get his sample removed from the Biobank, okay?

A Okay.

Q. How can I go about doing that?

A. You would have to contact the State of Michigan to request that they be pulled.

Q So if the State of Michigan provided you with direction that said, "Hey, here is Phil Ellison's son's number. Go pull that one and we either want to destroy or otherwise give that sample back," you would act in accordance with that directive?

A That would be correct.

Q All right. And let's go the other way around. Let's pretend my second son is born, and the State hands off a sample to you and says, "Store this in the Biobank," you're working in agreement in concert with them to put it into the Biobank at the State's direction, fair?

A I need you to repeat that question one more time.

Q Sure; sure. So I was just talking about my first son.

A Right.

Q And we're talking about taking a sample out, so I have a second son.

A Okay.

Q And he's born today, right? Thank goodness I've only got one, but let's just say I have a second son, right?

A Okay.

Q His sample is taken. The State newborn screening program does the testing on it. They send that sample over to you and they say, "File this into the cooler."

A Uh-huh (affirmative).

Q Right?

A Uh-huh (affirmative).

Q I mean, you would be acting in accordance and in joint concert with them to put that material into the storage facility for long-term storage like all the other samples?

A That's correct.

Q Do you have any discretion or any option to say, "I'm not going to," -- as the director to say, "I'm not going to have certain samples come into my facility"?

A No.

Q Would there be any reason why you would deny storing samples?

A No, not really. The only thing I can of that -- and this is not an issue today, but at some point there could be an issue of capacity, room capacity.

Q Well, we're not at that point today, are we?

A No.

Q All right. Fair enough. Does the board of directors have any say on whether a sample is pulled for destruction or added, and the same example of son one and son two I've just been giving you, do they have any control over that?

A Not at all.

Q Let me ask this: Why not? Why don't you or the board of directors have any say in that, considering you guys are in charge of the nonprofit?

A We are in charge of the -- our job again -- I'm just going to repeat this again.

Q Fair enough.

A It's to act as a storage facility on behalf of the State, so all our job basically is to store whatever spots the State is sending over to us. Our job is to store those and to keep them safe, obviously, too, but that's what we do, so the board doesn't have any decision in terms of, you know, what blood spots come, what blood spots get moved or pulled. They don't act in that capacity and, furthermore, the board is not responsible for the -- you know, the day-to-day operations are handled by me and my team of people, so they don't get involved at that level.

Q All right. Let me ask this: The blood samples when they're stored at the Biobank, who owns them, if you know?

A I'm assuming that the State of Michigan owns them.

Q Okay. Now when you say -- and, again to be fair, I try to

be the fair attorney with these depositions.

A Yeah; yeah.

Q Do you know the State owns them or are you just simply guessing?

A I'm guessing. I don't know. I should have answered that I don't know the information to that question.

Q And that's fair. I only what you to answer what you can tell me here today, okay?

A I don't know the answer to that question.

Q Would you have any opinion, as the director of the Biobank, as to whether I own my son's blood spots that are in your bio?

A My personal opinion or --

Q Well, I mean, I'm asking -- I guess what I'm trying to understand is that there's blood, the blood spots come from the bodies -- I mean, live bodies, obviously, not dead bodies, but live bodies of children that ultimately make its way following the newborn screening to your facility at the Biobank. I guess I'm trying to understand do you, as the director of the Biobank, have a position as to who owns those blood spots?

A Yeah. I believe that --

MR. KENNEDY: I'm going to object just to the extent that it calls for my client to reach a legal conclusion, but other than that, Doctor, you can answer.

A Okay. So this is just -- this would just be my opinion based on just my experience as a professor and knowing a lot about records and things of that sort. So the actual record -- the information, the content, belongs to the -- to the individual, and I would say that the physical, the tangible piece, probably would be owned by, in this case the State or healthcare provider if we're talking about medical records. So I think the content, you know, belongs to the patient or in this case to the child or the parents, and then the physical components, the actual cards and things like that belongs to the actual facility, i.e. the State Lab or the State. That's my opinion of how it should work.

Q Okay. I'm going to --

A And I say that because of the simple fact that I do know that if someone wants to have their card removed and just based on the requests that I get from the State of Michigan, that a card can be removed at any time. All the parent would have to do is request that it be removed and it's my understanding, and I just know this from my operations, that the State will then tell me to send the card back to them, and I'm assuming that card is destroyed at that time, and that's --

Q Okay. Let me ask this, though, and I guess we can finish that thought here. I was trying to establish -- and forgive me. There's some questions I know the answer to these.

A Yeah.

Q It's just this is my opportunity to ask you to get them on the record.

A Right.

Q So bear with me.

A Yeah.

Q I was asking a little bit earlier about the concept of me coming to you to remove those cards, and you said you couldn't do that?

A That's correct.

Q All right. And you said -- I believe you answered, and if not, please correct me and tell me the answer, that the board of directors can't direct that a blood sample of my son can be pulled and given back to me or destroyed, correct?

A That's correct.

Q Okay. Who would?

A The State.

Q All right. Who at the State has that authority? Who do you take that direction from?

A So we have a state coordinator that we deal with where most of our communications come from. Her name is Shelby, I believe, and I kind of went blank on her last name. But we have -- Atkinson, A-t-k-I-n-s-o-n. She's the liaison for the State of Michigan and that's pretty much who we have all

of our interaction with.

Q Let me show you -- I'm going to pull up right here an email, a set of emails.

A Okay.

Q Let me see if I can make this work. Yep, here we go. Okay. I just want to use this as kind of a reference point, okay?

A. Okay.

Q. I know I made a big deal in the court case about the Trans-Hit Bio aspect thing and I know that never went to fruition, and I get all of that. But I want to show these emails here as a concept.

A. Okay.

Q. My understanding -- and I'm just -- to shortcut this, my understanding is that Trans-Hit Bio is a -- I call them a blood broker, but they're a sample broker that reached out to the Biobank to potentially make contact to buy or have access to blood spots.

A. Okay.

Q. Fair enough?

A. I don't know really who Trans-Hit Bio -- I don't recall who this person is, but if you say --

Q. Okay. Let's scroll down here because I think they emailed you originally.

A. Okay. And they may have, yeah. Okay.

Q. You're like me, you get 4,000 mails a day?

A. Probably 10,000.

Q. So here's an email, November 2nd, 2017, a woman named Sophie Dahan.

A. Yeah, I remember this.

Q. Okay. All right. As I understand it -- I don't want to get into the finer points of this, but I understand they reached out to you to see if they could potentially buy samples from the Biobank?

A. That's correct.

Q All right. So as I understand it, is that you forwarded that discussion to Dr. Shah and Dr. Lyon-Callo, and I'm going to show you up here -- oh, I'm sorry. I'm mistaken; let me correct that. You sent it to Carrie Langbo.

A. Yeah.

Q. Who is that?

A. So Carrie Langbo is no longer with the State, from my understanding. The new person is the Shelby Atkinson person.

Q. Shelby. That was going to be my question. Carrie -- Shelby is the new Carrie, correct?

A. That's correct, yes.

Q. All right. So you forward that email on to them, it looks like a couple of days later, about reviewing it and there's some emails back and forth to this aspect, but what I want to show here, there's an email back to Carrie where -- I'm

just going to again shortcut this. Dr. Lyon-Callo and Dr. Shah discussed this with Legal. They went back and forth with this and they ultimately decided that they did not want Trans-Hit Bio to be able to buy samples from the Biobank.

A. Okay.

Q. All right. Do you recall -- and then it looks like that they ultimately said, "Please thank Dr. Yancey for reaching out about this potential."

A. Okay.

Q. To me it appears that they're calling the shots about the use or access to those bio samples, those blood samples themselves. Is that fair?

A. I think so, yes.

Q. Okay. What role does Dr. Shah and Dr. Lyon-Callo play in regards to the Biobank?

A. So Sarah I believe is the --

Q. Let me be clear. So Sarah is Dr. Sarah Lyon-Callo, correct?

A. That's correct.

Q. Okay.

A So Carrie at that time reported to Sarah. So I guess I'm -- so, yeah. We interact with them throughout the day, but they make the calls in terms of -- I don't -- my team, we don't get involved. When things come directly to us like requests for blood spots or, you know, what is the approval process, we send everything over back to the DHHS and

haven't seen her name in -- they have a lot of turnover, so there has been -- you know, there are a lot of people that I worked with when I first started in '17 that are not here anymore. It's constant, you know, turnover. They move on to different areas, so I haven't talked to Sarah in years, I don't think.

Q Okay. Well, let me finish out, and as to Dr. Shah, is he one of the decision makers?

A Yes, he is.

Q So let me ask this question: If you got an email from Dr. Shah that said you're authorized -- the Biobank is authorized to disperse ten punches to a particular researcher, would that be in your mind authorization from the State?

A. Yes and no. I've never got a request from him because he's not involved in the operations, but I know that Dr. Shah is in charge of the State Lab, so I would assume that it would be okay if I got a request from him, but that would be very unusual because he's not involved at that level.

Q. Okay. What about if Dr. Lyon-Callo had sent you a similar directive by email that this particular researcher can have access to, say just as an example, ten samples?

A. Yeah, because I believe at that time this was the director, and so, you know, if they send me a request to pull it, I would pull it.

they're the individuals that make the decision in terms of who gets approved and who can basically use the blood spots for whatever research purposes. So I'm not involved in that piece, so to answer your question it is DHHS who is making those types of decisions or --

Q Would Dr. -- I'm sorry. Go ahead. I didn't mean to interrupt you; go ahead.

A -- or making the decisions in terms of who are and can use blood spots for whatever research purposes. So, again, going back, my job is strictly to act as a depository for the blood spots, so I'm not involved in these types of decisions at all, I'm not, and so in our guidance from these individuals, Sarah. Now, you know, again, Sarah is not here -- Carrie is not here. Shelby is our primary contact for the State of Michigan, so in terms of the approval processes and all those kinds of things, it's handled at the State level and not by the Biobank.

Q Okay. Let me ask this: Is Dr. Lyon-Callo one of the decision-makers on behalf of the Department of Health and Human Services with the Biobank?

A I'm not really -- I don't interact with her, so I don't know the answer to that, to be honest with you.

Q Okay. And what about --

A My (indiscernible) is copied on the email sometimes, but I don't even know if this person is still there because I

Q Okay. All right. Fair enough. Let's make a note here.

A Uh-huh (affirmative).

Q So I guess during all of this -- I guess to bottom line all of this, when you get a directive from the State to do something about the Biobank, you're acting in concert with whatever it is that they're telling you to do, fair?

A That would be correct.

Q Okay. Let's change gears a little bit. Okay. What role -- so let's talk about the Biobank just generally at a high level, okay?

A Okay.

Q As I understand, I think you confirmed earlier, it's a nonprofit corporation, correct?

A Correct.

Q All right. And we talked about your board of directors. What role does Wayne, MSU, You of M and VanAndel apply as to the operation of the Biobank?

A So as I mentioned, for the most part it may have been a different arrangement prior to when I got there. It's supposed to be a partnership between all of the universities. I think Wayne, and that's probably because, you know, I guess Wayne is the person that's actually appointing the director of the operations. I think that Wayne State, by me being an employee of Wayne State and all of my predecessor, that we're probably more involved in the

overall operations than our other partners. It's each person sits on the board. You know, there is a university affiliation for each member on the board, and so again I think from a collaborative perspective you can get input from that way, but just in terms of operations I would say that Wayne State, primarily me at this particular given time, will be more involved. We -- I think when it first started it was more of a real partnership where they handled -- they donated the software to use for the scanning of the blood spots, and then the You of M would contribute some things financially, but that has changed, at least since I've been here. We're pretty much the primary coordinators in terms of the operations of the storage facility.

Q Okay. Let me ask this: I'm just kind of covering different areas on this. We were talking about as I understand, each of those four entities appoints someone to serve as their representative on the board of directors, true?

A That's true.

Q Is any one of those particular individuals the current chairman or chairperson of the board?

A Yes. That would be Ed.

Q I'm sorry?

A Ed.

Q Oh, Ed?

A Yes. He's the -- he acts as the president of the board.

Q Do you know if that was done pursuant to any sort of vote or any sort of particular process?

A I don't know that information.

Q In the last year when -- I mean, let me ask it this way: Does the board meet on a regular basis?

A We do. We meet twice a year.

Q Okay. In the time that you've been on the board has there ever been a vote to nominate and accept Ed as the chairman or is it just gone without saying?

A Gone without saying.

Q All right. As part of -- let me see if I have that here. As part of -- as part of the discovery in this process, I have asked for a number of documents from the State Defendants that have been happily provided. I'm sharing with you what's been marked as Exhibit Number A for purposes of this deposition, and this is a document that was provided to me in response to that discovery. Take a moment and take a look at this.

(Deposition Exhibit A marked)

Q. Just let me know when you're ready.

A. Okay.

Q Okay. Taking a look at this, I've been asking you some oral questions about the nature of the relationship between the Biobank and the board of directors and the Department of Health and Human Services. Does this picture or graphic

accurately depict the relative relationships between those three entities that we've been discussing?

A. Yes. Well, I can only speak for the Biobank. I can't speak on the other side because I'm not really sure about some of the -- I don't get involved with the advisory boards really. I do attend some of their meetings, but I don't understand all of the logistics regarding it. I can only tell you on the right side in terms of my reporting structure, how that works, but I do know that they do have a scientific advisory board. I just kind of know that information just from, you know, interacting with them and just in terms of when they tell me that someone has to get approval, so I know that there is a SAB board, but in terms of the community advisory or advisory board, I do know that they -- because I've participated in some of the advisory boards. I think they have a meeting once a year and I've been invited to attend that, but I can't go on record by saying that this is completely how their structure is because I don't get involved on their side.

Q. Let me clarify my question. Let's take out -- looking at this graphic, if we take out the community advisory -- or community values advisory board and the scientific advisory board boxes, and we have the three that's left, and that was the three I was referencing, does the text and information as this is structured a proper diagram of how these three

entities, being DHHS, Biobank, and the board of directors fit with each other?

A. Yes, those are correct.

Q. And as they describe their services -- as they describe the bullet points in each box as to what each of them does, is that an accurate description of what each of them does?

A. I can speak for some of the things in this black box for what they do. There's some I can't. I have no idea what they mean whey they say "honest broker." I mean, "public education." I'm not involved in that piece, so I can't --

Q. Okay. Let me ask this question: In just the Biobank box are those statements correct?

A Okay. Yes, it is. I'm not really sure about the -- they have MDHHS non-voting representative. I'm not sure what that means.

Q. I'm sorry. I just want you to focus on just the Biobank box, not the --

A. Okay.

Q. Are those bullets there correct on what you guys do at the Biobank?

A. Yes, that's correct. Let me clarify something, though. So it says assigned study specific ID codes to remain confidentiality, so I just need to clarify that because that's very important.

Q. Okay. Please do.

A. So what happens is that anytime that a study is approved by the State, that ascension -- the ascension number that we talked about, that eight-digit number, what happens is that when it says here, we also assign our own number too that's attached to that ascension number. So it's identifiable, and then we go through another process of doing another identifiable number by adding another two-digit or three-digit number on top of that number that comes in, so if a researcher ever needed to know, you know, what number was pulled for what, we're able to kind of tell them that. So if the number 12345678 comes from the State, we'll add a 01, 02, 03. It depends on how many spots they're given.

Q Okay. So from that information, you could look at that number in your database and you could tell what spots have been pulled --

A For that reason.

Q -- according to what study then, correct?

A Correct.

Q Okay. If a researcher wanted to have access to the Biobank spots, say they needed a thousand of them just as a hypothetical.

A Uh-huh (affirmative).

Q Could they make that request directly to you and have that request fulfilled?

A No.

Q All right. What process would have to be -- as you understand it has to be fulfilled for having access to blood spots for research purposes?

A We refer them back to DHHS for approval.

Q What process, if you know, do they undertake? I don't need the scientific part of it. I'm talking -- I want to take this to kind of a 35,000 foot level. What process do they undertake to let you know -- well, strike that. Let me start that question over. See, I start with a great idea up here and it just doesn't come out through the mouth the right way. I guess what I want to know is what process do you understand occurs when someone wants to have access to blood spots and you send them over to DHHS? What happens before the point that it comes back to you and the State says, "Give them the 1,000 spots"?

A So it's my understanding that it goes -- I mean, the researcher would have to elaborate on the reason, I guess, for the research, why they need the spots to study. It's my understanding that they go through a variety of different communities including the scientific advisory board, you know, if -- of course, if the research is even approved. And then it has to go through a variety of IRB committees for approval, so that's my understanding, but I don't know how the initial decision is made in terms of who they allow and for what purpose, and those kinds of things, so I'm not

involved and I don't understand that piece.

Q Okay. But you would agree that you act in joint concert with the State, though. When the State says, "Give them these samples," you guys do it over at the Biobank?

A Repeat that question.

Q Fair enough. So what I'm wanting to understand is the State -- somebody at the State, be it Shelby or Carrie, says, "The State has approved this research study," you guys in agreement with them whether you -- you know, you basically hand over that material and agree to do so at their direction?

A That's correct. So once a person is approved, we receive an email telling us that a researcher has been approved and eventually we will get a request to pull the blood spots, so they basically make the decision in terms of what blood spots are pulled from the depository.

Q At that point right there, say you get a -- you get an email from -- like the email you were just describing that says, "Pull these 1,000 spots for," you know, to sell a punch, right, or provide a punch to a researcher. Do you take any steps to contact whose blood spots they are or their parents to get consent to give those samples out?

A No.

Q Okay. Why not?

A Because we're not involved in that process. We're just a

storage facility.

Q. All right. Do you know as part of -- at the time that a research project is proposed and being reviewed by the State and ultimately for approval, does the State attempt to contact the person whose blood spot that belongs to or their parents to get their consent as part of -- before giving out that particular spot?

A. I don't know that information.

Q. Have you ever heard of it happening?

A. (Indiscernible) --

Q. You cut out there for a second.

MR. KENNEDY: I'd just object to the extent it calls for hearsay.

Q Okay. Go ahead, Dr. Yancey. I should have explained when we do objections, unless he directs you not to answer, we fight it out with the judge later whether my question is any good or not. So you answer the question nonetheless, okay?

A Okay.

Q My question to you was have you ever heard of the State providing --

MR. ELLISON: Jeremy, I acknowledge your objection for restating the question.

Q. Have you ever heard of the State actually contacting the person whose blood spot it belongs to or their parents when approving a study?

A. No.

Q You as the director of the Biobank, do you require that consent be obtained from the person whose blood spot it belongs to or their parent prior to giving out what blood sample?

A No.

Q. Does the board of directors at Biobank require that?

A. No.

Q Has there ever been a discussion or decision about whether consent needed to be obtained before giving out samples? And again, this is in the context of when a study has been approved.

A No.

Q Do you believe as the director -- and again, I'm asking you as director, in your role of director of the Biobank -- that such consent is required?

A Do I believe?

Q Yeah, do you believe it's required?

A It's my understanding that all of that is done way before it gets over to us at the Biobank, all the consent forms, just knowing a little bit about the process. You know, it's my understanding that the consent forms are all done, you know, way before it gets over to us in terms of the storage facility. So I've always assumed that there's been a consent filed -- a consent form on file.

Q I'm going to ask you -- acknowledging this is a hypothetically question, I'm asking you this in your capacity as director of the Biobank. Let's assume for the sake of argument that that consent was not obtained from somebody's sample who is in the Biobank. Do you think you have an obligation to obtain consent before giving a blood spot for an approved study out to a researcher when that blood spot belongs to a person or their parent?

A I think a consent form should always be, you know, the primary decision before any blood spot is given to anyone. But, again, I don't get involved in that process.

Q Fair enough. I understand that. Let me ask this question: Do you as the director or anybody under you who is under your purview at the Biobank, do you guys check each blood spot to make sure of the -- let me try that again. That came out bad. I guess what I'm trying to -- what I'm trying to understand is do you guys -- when you get a statement or a directive from the State that says, "Give out these 1,000 blood spots to the researcher," do you guys go back and check to make sure that consent was obtained before giving out any of those samples?

A No.

Q Any reason why not?

A For one, when we get the information, remember we're not getting any names. We're just getting a number, and so we

would have no idea who the blood spot belonged to to be able to get a consent form, and then if we were to get a consent form, then we would be exposed to someone's personal information and that's not how the Biobank is set up.

Q Okay. Does the Biobank -- and, again. Forgive me. There's questions I know the answers to, but I've got to ask you as part of this.

A Yes.

Q Does the Biobank in any way ask or otherwise obtain its own consent form from each donor of the blood spot before putting it into the Biobank?

A No.

Q Same question except as to removing a blood spot and giving it to a researcher. Is any sort of consent obtained by the Biobank itself?

A No.

Q Does the Biobank store any of the consent forms -- let me back up. Let me preface this the right way. You just testified earlier that consent forms were obtained as part of the earlier part of the process.

A I'm assuming that it was. I can't go on official record. I'm just giving you just, you know, general experience, just, you know, in seeing different emails and things of that sort and kind of understanding a little bit about when I first got in the role, I went on the internet and did

research about how this while piece worked and I've got a little bit of information. So I can't -- do you know what I mean? I just want to be clear that I don't -- I'm just telling you from I guess a private or personal, not in my -- not in my capacity as a director because I'm not involved in many of these components that you're asking about.

Q Well, let me ask it this way. Let me ask you this way. Does the Biobank have access to or otherwise store any consent forms of any type related to the blood samples that are stored at the facility?

A No.

Q Do you know where -- if there are consent forms, where those consent forms would be stored at?

A No, I don't know where they would be stored at.

Q Let me ask kind of a weird question. Let's just assume for the sake of argument that the judge in this case finds that consent was not properly obtained, and these samples are being held contrary to consent. Do you have the -- if the judge was to order you to return these samples back to their owners, would you have the authority to direct your employees to fulfill that task?

A No.

Q Who would?

A The State.

Q And when you say the State --

A The reason why, we wouldn't know -- if the judge -- if there was an order that came through, I wouldn't be able to return them because I wouldn't even know who they belonged to because we're not able to identify the individual. Because we operate as a 501(c) company, I'm assuming that if there's a court order and they said, "You've got to give these blood spots up," I would refer them back to the State.

Q Let me ask you this: If the judge -- again, I'm acknowledging this as a hypothetical, okay? If the judge says, "These samples have to be destroyed." Would you have the ability to destroy those samples as the director of the Biobank?

A No.

Q Who would be the person that would have to make the decision to destroy those -- or would have to be the one to give the command to destroy those samples?

A I'm not sure who that person would be, particularly at the state level, but I would assume that it would have to be someone at the State level because that's who we interact with.

Q Okay. As I understand, there is a postextraction request system that's been put into place that allows parents to ask for samples to be destroyed after they've gotten into the Biobank, true?

A I don't know about that system.

Q Okay. Have you ever been, as the director, know about or seen or otherwise been directed by anybody at the State to destroy samples at the request of a parent?

A We do not destroy any samples. We've received requests to pull samples.

Q Okay. So let me just give you a -- well, I'll give you a straight-up one. I made such a request when I found out my son's blood samples were in your Biobank, okay?

A Okay.

Q I filled out the form. I sent it in. A few weeks -- a few months later after I sued them -- that's another issue; don't worry about that -- I get a letter back that says, "Your son's samples have been destroyed."

A Okay.

Q To your knowledge, how would those samples have gotten out of the Biobank and been destroyed, if you know?

A So what happens is when those -- I do kind of recall that form now. So any time that form is completed, what happens is we get an email -- I get an email basically from the State and the State basically tells me to pull ascension number blah, blah, blah, and then I go into the storage area and we pull that blood spot. We're getting daily blood spots every single day from the State of Michigan, you know, all of the current ones that are being done and there are still older ones that we're still trying to get stored, so

there's a bag that we get every day with the current blood spots, and what we do is we put that particular blood spot, based on the number that they emailed us about, and we put it in a storage bag and, you know, there is a piece of paper we complete that basically -- it's like a little carbon receipt just to let them know that -- we keep a copy on file so that we know for a fact that they requested that and we put that in the catalog spot, and we send it on its way to the State.

Q Okay. So this kind of brings me back to where we started on this discussion of the idea if I wanted my son's blood sample destroyed, I can't come to you. I can't come to your board of directors. I've got to go through the State officials at DHHS?

A That's correct.

Q All right. Okay. Let's switch -- I'm going to take this off for a second, and I'm going to open up another one. Oh, here it is right here.

(Deposition Exhibit K marked)

Q. All right. I'm giving you what I've marked as Exhibit K for purpose of this deposition. Again, I'll represent to you this is a document that the State Defendants provided me as part of the discovery process.

A. Okay.

Q. As I understand looking at this form -- I'll give you a

chance to look at it -- this is the price list for getting access to samples and/or portions of samples, which I've come to learn is called punches or a portion of that blood sample.

A. Correct.

Q. Take a look at that and see if you can confirm that this is the case.

A. So, yeah. What you're showing me is a listing of what we charge for the processing of blood spots. Not the processing, but the administrative costs that are involved with processing.

Q. Okay. So if, for example, I was a Michigan academic, meaning I'm taking that to mean a Michigan university researcher, and I wanted a whole random sample punch, a whole spot, for example --

A. Okay. Let me back up a little bit. I'm taking a look at this, so this particular -- this is not -- this is something -- so there are costs that the State has, and then there are charges that we have on our end. This is not one of our documents that we have for the Biobank, so this doesn't look like -- yeah, this is not -- I don't know what this is.

Q. Okay. Let me ask this question --

A. Yeah, I do have -- we do charge. I do have a -- we do have our own price list, but these are not our rates at all. This is something that the State does. They charge, and

then we charge also.

Q. All right. That's something new. I haven't -- you've just educated me on something I did not put together before, and so I want to explore that a little bit, so my questions may be a little weird in that respect. Looking at this spreadsheet right here, are these the prices the Biobank charges researchers?

A. These are -- this list is not a current list. I don't know how old this is, but this is not -- it's very similar to this amount, but these amounts don't look familiar. We have like a three-layer tier system for our blood spots.

Q. If you have a request to get access to punches or whole spots for distribution to a researcher or to a -- in my mind I want to use the word "customer," but someone who's trying to get access to the spots themselves for whatever purpose, do you guys have a price list that I could get access to?

A. Yes. It's on our -- if you go to our -- it's on -- I believe it's on our website, but we have our own price structure that we can get you a copy of.

Q. Okay. What I'm going to ask you to do is would you get a copy of that to your attorney?

A. Okay.

Q. So I'm going to make a request for that because this is something I've never -- I've always -- well, I guess maybe I've wrongly assumed that this was the price for the whole

package on the thing.

A. No, and you know what? I don't know if this is an older -- it doesn't have like the Biobank on here. I don't -- this -- this just doesn't look familiar to me. I'm just going to be honest with you. I don't know. I do know that the State also does charging on their end and we charge on our end, but this doesn't look like -- I know for a fact this is not my current pricing system. It could be an older document that you have and they've changed the way -- the Biobank had changed the way in terms of the payment structure. It looks familiar just in terms of the prices are a little bit close and some areas are not. We only have a three-tier system, so this has -- one, two, three, four, five; out of state academic, out of state government. I've never seen this, so I don't know what it is.

Q Okay. All right. So just, if you could, get that over to Mr. Kennedy, and I'll make that request, you know, in due course.

A Okay.

Q Let me ask this question, and I'm kind of just flying by the seat of my pants right now. If you guys -- the State charges whatever it charges. Biobank charges whatever it charges. Do you guys send your bill to the State so they added onto this, do you know? Or do you bill directly to the researcher?

A No, we bill directly to the researchers.

Q All right. And what happens to that money that you guys collect?

A It comes back into the Biobank.

Q Okay. So it just gets put into the general fund of the Biobank?

A Yes.

Q Do you guys know if you get any of this money -- again, let me just -- we'll just assume for the sake of argument right now that what you're looking at right now as Exhibit K is the price list that the DHHS charges the researchers.

A. Okay.

Q. Do you know if you get any of that money or a percentage of that money at all?

A. We do not.

Q. That's going to transition me to my next bar here. How does the Biobank operate in terms of funding?

A. Okay.

Q. How does -- what kind of -- I mean, looking at this, looking at the number, I'm going to represent to you from the data the State sent me, 63,009 samples have been provided so far, at least as to what's been disclosed to me. That works out to about -- assuming -- even assuming it's $9 a piece, I mean we're talking a half a million dollars. Maybe it's a little bit more. How does the Biobank operate in terms of

funding?

A. So we operate a variety of ways. We have a variety of funding that comes through to pay for the operational expenses with the Biobank. One is that we get a grant from the State of Michigan every year and that grant is approximately 140,000, I believe, per year. It's actually -- it's actually -- I believe it's 154. 14,000 of that money goes back to the University in what we call indirect costs, and that's just the money, the F&A that comes back to the University, so our actual physical amount is $140,000 from that grant. We use that, and then we also use the money that we collect for the spots, for the processing, the administrative costs that are associated with the processing of these blood spots for the researchers. Our average charge is currently -- I believe it's $10 per punch now, and so the money we collect from that goes into the operational cost. And then also there are some other funding sources, for example, we have students that are employed by Wayne State University that is paid by Wayne State University, but they actually help process the blood spots for us, so that's not --

Q Is that like work-study kids?

A Correct. Work-study, and then we also have what's called temporary technicians, so these are people that are basically -- they don't meet the eligibly of a full-time

student or part-time student, and we can hire them as a temporary worker, and then we just pay them a salary.

Q Okay. All right.

A And they get paid by -- everybody gets paid by Wayne State University, and then we also have an operational manager full-time that works for the Biobank and he's also paid. Then we have a variety of other different operational costs like rents. We have to pay for the freezer bank itself. We have a big high payment that we pay, so basically all of that money goes to the operational expenses. The grant doesn't cover nowhere near -- probably the grant covers approximately I would say 40 to 50 percent of our overall operational expenses.

Q Okay. Do you get any money from any private sources?

A No.

Q Do you get any money from -- setting aside, obviously, the work study, the salary part of this with the kids and the temporaries, does Wayne State, U of M, MSU, and VanAndel, do they supply any money?

A No, not currently. We would like for them to, but --

Q. Yeah, right.

A. -- they don't. I believe at one point prior to me it used to be more and I was explaining that earlier. It was more of they give financial contributions, but I think over the years that's changed and Wayne State would be the primary

person that would basically donate on behalf of the --

Q Okay. The pricing that you guys charge that we're talking about that goes back to your general fund as part of your funding, prices you charge for the punches, is that something that's established by the State or your board of directors?

A It's established by the board of directors.

Q Does that have to be approved by the State at all? Do you know?

A No, it does not.

Q Understanding you're not an attorney and have probably a better life, do you happen to know if there's any legal authority that authorizes the Biobank to charge fees for providing those samples?

A I have no information of that, no.

Q And once you guys determine whatever the fee is, you just -- I mean, is it like an invoice you send to the researcher?

A Yes, we send them an invoice. We have a billing system.

Q Let me do this: I'm going to see if we can just -- just as an example for this -- yeah, right here. I'm going to present to you what is -- your lawyer -- your lawyer provided me a whole bunch of documents.

A. Okay.

(Deposition Exhibit F marked)

Q. This is Exhibit F for purposes of this deposition. Here it

is. Okay. This would be -- I'm presenting Exhibit F. This would be an example of an invoice you would send in this, "Future Diagnostic Solutions"?

A. Correct, yep.

Q. All right.

A. Can you go down a little bit? I want to see the title of the --

Q. This?

A. Yeah, yep. Okay. Thank you. I wanted to make sure it's our invoice. That's a copy of our invoice.

Q. Okay. All right. And the second page of this is -- with counsel's okay I will produce these. I'd like to be able to redact the account number.

A. Yeah, I was going to say we really need to redact that.

MR. ELLISON: Jeremy and Aaron, would you have any objection to me redacting that when I submit those to the court reporter?

MR. KENNEDY: No.

MR. LEVIN: No.

MR. ELLISON: Okay. All right. I think the same thing here. They've got an account number here on these checks as well.

Q This, for example -- I mean, this would be a check I've seen made out to the Biobank which matches the number right here?

A Yep.

Q And so you guys would get a payment?

A That is correct.

Q Okay. But just -- I mean, I guess to kind of finish this thought out, though, you would not have sent them these samples unless the State had approved for you guys to send the sample?

A That would be correct.

Q Okay. We're almost done. A couple of details I just want to get ahold of. As I understand from the various pieces of literature I've seen, there are samples that are currently within the Biobank that go back to -- I've seen a 1984 and 1987. Do you know one way or the other how far back the samples go that are being stored?

A. Okay. So this is always a hard question for me and I started to write it down for you. So we have '96 and current -- '96 to current. When I say current, give and take that it takes --

Q. Well, you're getting samples every day, you said, so --

A. Well, yeah, but then they're doing the testing. It's at the lab, and so it takes about -- it's a two-week lag time, I guess is what I'm trying to tell you, but we should have everything from '96 to current.

Q. Okay. Is there -- so on the -- on some of the literature it says -- even some of your own literature is saying that it goes back to like the -- I've seen one that says July of

1984, another one that says 1987.
A. Yeah.
Q. Do you have any information about if that's true, how far that goes back?
A. I don't know how far they go back, but I do know that -- and I should tell you this, that every day we get current blood spots and then sometimes -- the plan is to eventually have us to store all of the blood spots from when the program first started, and I believe it was '84, maybe '85, I thought. I don't know. But in any case, there's a backlog to get those spots over to us, so sometimes we get current and we may get something, you know, from -- since we're in 2009, they would go to 2008. So we would get some -- you know, some of the older spots for us to store for 2008. The plan is to eventually have them all housed and stored with us, but the State hasn't been able to get those older spots to us because there is things they have to do on their end. So eventually, the plan is for us to have all of the spots from when the program first started when the State started testing. I don't know how feasible that would be, as the director of the Biobank, because we wouldn't have -- I mean, I mentioned earlier there will be room capacity issues and we're going to run into that problem in a couple years, and so that will need to be a conversation that we have with the board. But we do get -- we're current getting older stuff

and we get current stuff at the same time.
Q Let me ask you this: Say I wanted -- I'm a researcher and I want samples from 1988, for example. Where would those be stored? Where would I get those?
A You would get them from the State.
Q. Do you know where the actual physical samples from 1988 are stored?
A. I think it's in your own State Lab. Somewhere in the State Lab is what I understand.
Q. I mean, you don't know for sure one way or the other?
A. No, I don't.
Q. Okay.
A. I just know that it's at the State.
Q. Let me ask this question: I've learned that there's a storage facility that the State has that's storing samples in Lansing off the -- not at the lab site, but at an offsite storage facility. Does that help at all in refreshing your recollection at all?
A. No, it doesn't. I don't get --
Q Fair enough. At your -- for the samples that you do have, who has actual physical access to those samples?
A Just me and the operations manager that I have there.
Q. So that was Chris?
A. That's Christopher Kraus.
Q. Is he still there?

A. Yes, he is.
Q. Okay. Another question that I'm hoping you can answer is how many samples do you think you have at the Biobank?
A. I could not tell you that.
Q. I mean, are we talking hundreds? Are we talking --
A. I could probably tell you that, but it would take me some time to tell you that. Let me clarify that. We have thousands and thousands. I mean, the room is -- we've got -- I mean, we have hundreds of thousands of them. I could tell you that; it would just take me a little while.
Q. I've heard -- I've heard that the State's got 4 million and I've heard they've got 7 million. I've heard -- I mean, the numbers -- I was just curios if you knew offhand on that.
A. No.
Q. Okay. Are you familiar at all -- you somewhat hinted at it earlier, but are you familiar at all when the State has made the assertion that they act as the honest broker?
A Uh-huh (affirmative).
Q Do you understand what that concept means at all?
A No, I mentioned that earlier. That's the first time I've ever seen that.
Q Do you have the ability, if I was to come down there and say, you know, "Dr. Yancey, I'd like you to" -- "I got approval from the State because I'm here on behalf of the Court. I'd like you to pull a sample of my sister's child,"

for example, and I know you somewhat answered but I want to make sure I've got it clear for the record. I come down there. You haven't talked to the State. I haven't talked to the State. I just have an approval from the judge to say, "Go get Phil's sister's son's sample," right?
A. Uh-huh (affirmative).
Q. Do you have the capability to be able to locate that sample if I was to do that say tomorrow?
A. With a name?
Q. With just a name, yes.
A. No, no. There are no names at all on anything, any blood spot out of all of the hundreds of thousands that we have. No name.
Q Okay. But to be clear, you couldn't go to a computer also and say -- type in this guy's name or the kid's name or birth date or some other thing and look up and say -- unless you actually have that number from the State to correlate it; fair enough?
A That is fair.
Q Okay. So sorry because I actually split my question there. Let me make sure I get it clear the right way.
A Okay.
Q So you would not have the ability, for example, to type in a child's name, social security number, date of birth and be able to find that sample from your computer or any sort of

index onsite at the Biobank?
A That is correct.
Q Okay. So by extension, my next question, which I kind of veered into was that the only way you could pull a particular person's sample would be if the State provided you with the ascension number that is associated with that particular sample?
A That is correct.
Q At the facility do you maintain any other data -- well, let me ask it this way: Any other data that you maintain relative to the samples? And let me give you some examples of what I mean. Child's name, blood type, date of birth, their weight when they were born, the time that they were born, any physical or physiological data that would allow you to associate with a particular sample?
A No.
Q Let's pretend -- I'm just going to -- let's do a pretend here. This is a hypothetically. I want to pull -- I'm a researcher. I want to pull 100 samples of blood samples from children born after the Flint water crisis, and I want to be able to see what -- I'm researching something with blood, right? Do you have any capability to be able to say, "I can pull these samples based on the zip code," for example?
A No.

Q All right. Could I do that with information -- could I -- well, let me ask you this: If I wanted those samples, is there some way that you know of that the State could provide me with a list of ascension numbers to be able to pull those samples?
A Yeah, I'm certain that -- yeah; yes.
Q Okay. So the State has the data, you have the blood?
A That's correct.
Q All right. Do you know what information is available from the State in terms of data associated with particular -- with individual blood spots?
A No, I do not.
Q Is there any sort of documentation that you guys -- you know, what if I was a researcher contacting you saying, you know, "Dr. Yancey, I'd like these" -- "I'd like the samples with these particular characteristics," how would I go about getting that?
A. So they would be referred back to Shelby at the State of Michigan and I'm sure that they have a way that, you know, they can identify that information at the State level, but I don't have that information.
Q Fair enough. Fair enough. Okay. Acknowledging our joke at the beginning about Band-Aids and Robitussin, humor me.
A Right.
Q Do you have any knowledge or expertise as to what sort of

information can be extracted out of blood samples?
A No.
Q I have these -- my questions into blocks. You've answered a lot of them here. Forgive me if I asked you this: You said you're not dealing with any aspect of the consent process for the ongoing storage, use, or research uses for the blood samples, correct?
A Correct.
Q Let me -- I'm going to share a screen with you right here.
A Okay.
Q We're on the downward slope. It took a little longer than I thought, but we're almost done here.
(Deposition Exhibit E marked)
Q. I'm presenting you what's been marked by the deposition as Exhibit Number E. These have been provided by the State and I'm just going to scroll through them real quick, just kind of in a slow scroll, but if you want to look at anything in particular please let me know. These as I understand are various consent forms that the State claims provides consent.
A. Okay.
Q. It's my representation, not necessarily the State's representation.
A. Gotcha.
Q. Looking at these, have you ever seen these forms before?

A. I've probably seen it once in our operations book, just a general form. You know, I think I've seen this when I first started, just a copy of the form, but I don't get any of these forms.
Q. I'm going to again represent to you this is my representation, not necessarily the State's or anybody else's, but my representation is that if these are in fact the consent forms, there's no reference to the Biobank anywhere in these documents. My question -- I want to make sure. I want to be 100 percent clear. There are no other consent forms related to the Biobank that you're aware of, fair?
A. So the Bio Trust is the Biobank.
Q. Okay. You're jumping to my next section, believe it or not, but we can jump to that right now because I'm trying -- that's one of the questions I want to -- I haven't been able to get a clear understanding on, but bear with me for just one second here. Let's just separate out the Bio Trust for Health as something for a second, just set that aside.
A. Okay.
Q. Looking at these forms, these are not forms that you -- you or the Biobank have created, correct?
A. Right.
Q. All right. And again, recognizing whatever the Bio Trust is. We'll talk about that in a second. There's no other

consent forms at all that you have on file, obtained, or executed or got in any way related to the blood samples, true?

A. Correct.

Q All right. Did you have anything -- and I say you meaning the Biobank, the Biobank have anything to do, to your knowledge, with the drafting of these consent forms?

A Not during my time.

Q Okay. Fair enough. And again, I appreciate it. Just what you know, okay?

A Right.

Q I'm going to make one more representation to you. For example, let's take a look at -- not the best copy in the world, but this is a copy -- this is, for example, Ms. LaPorte's son, and this one is -- this is -- just for reference, this is a consent form for the child we've identified. By federal law, we've got to identify them by initials for federal court purposes, but it's Child EMO. Looking right here, Ms. LaPorte indicated "No, my baby's blood spots may not be used for health research." But it goes on to say right below that the blood spots will be stored forever, but not used for research. Is that -- do you have any information or explanation as to why when someone does not want -- when a parent does not want their child's blood spot being used, that the blood spot will

nevertheless be stored forever?

A. No.

Q Do you have any information as to whether or not a blood spot will or will not be included as part of the Biobank storage program if they click or select no, they don't want to be part of any health research?

A No.

Q Does the Biobank have any sort of process or procedure in place to identify -- that they know of to identify those samples that are in the Biobank but do not want to be part of the research or potential research projects?

A No.

Q Again, would you agree that that would be information that probably would have to be obtained from the State?

A Correct.

Q You answered that. Do you know of any details or standards by which parents are told about the Biobank program during the time that consent is being obtained?

A No.

Q Have you been asked or otherwise -- strike that. I take attorney/client privilege very carefully. Have you ever ascertained by your own actions or directed someone at your direction to determine whether or not the nine children who are part of this case, that their samples are within the Biobank facility?

A Have I? Repeat that. I'm sorry.

Q Fair enough. I just want to you know if you or Chris -- because you had mentioned earlier that only you and Chris have access to the samples themselves, correct?

A Right.

Q Have you ever been asked or directed to go and check to see if these nine children's samples are in the warehouse, the coolers?

A No; no.

Q Do you know a Harry Hawkins over at DHHS?

A No.

Q Do you know -- I'm just -- Harry Hawkins passed away in the course of this case. He worked at DHHS. Do you happen to know what position he held or -- what I'm trying to find out, do you know who his replacement is?

A. No, I do not.

(Deposition Exhibit B marked)

Q All right. The last -- I'm down to the last piece here. I'm going to show you -- let me go through the exhibits here. Can you see that -- without me redoing that, can you see the like bluish-purple graphic?

A. Uh-huh (affirmative).

Q. Okay. Good, so I don't have to redo that. All right. Taking a look at that, and we can zoom in if we need to a little bit, take a moment to take a look at that.

A. Okay.

Q. Okay. Does this accurately depict your understanding of what happens to leftover blood spots after the newborn screening process is complete?

A. I can't really answer that. I mean, I can answer some parts of this document, but some I could not.

Q. Okay. One of the things I -- again, this is my representation.

A. Okay.

Q. One of the things I've learned as part of this is that of the blood spots that are the leftovers, some of them are stored by the State and the balance of those are sent over to you at the Biobank. Do you know that to be true?

A. Yes. I do know that they keep -- they do reserve some spots, and then they send the rest over to us for storage. I do know that piece.

Q. Okay. So there's actually -- in addition to your storage facility, there is a second one with similar blood spots, some within the State DHHS system?

A. I do understand that to be correct, yes.

Q. Do you know why -- do you have any knowledge or understanding as to why the State has these two separate processes, meaning one being you with the Biobank and one being them with these other samples?

A I don't know that answer, but I do know that sometimes they

have to go back and retest things, I guess, and they want it to be readily available. I really don't know the answer.

Q Do you happen too know where physically those other blood spots, those -- the ones the State retains but doesn't send to you, where they store those at?

A. No, I do not.

Q. You're not in charge or responsible for the storage of those in any way?

A. No, I'm not.

Q. Do you know what the State uses those other blood spots for? I mean, you mentioned -- you said you had suspected about other testing, but do you specifically know why they -- what they use those for?

A. No. I've just heard that they use it for to retest at times, but I don't know the answer to that, I guess.

Q Let's see here. So let me -- can you see my mouse?

A Uh-huh (affirmative).

Q All right. Good. Right here, this spot right here, this one blood spot is stored by the State Lab for only your personal use if needed. That's not the Biobank, correct?

A That's correct.

Q All right. Not to put words in your mouth, but I'm looking at here, your likely -- your option A and option B, correct?

A. The blood spots go into a safe storage (indiscernible). Yeah, I'm A, and then the blood spots go into safe storage

and will not be used for research to treat -- yep, and I could be B, but the State could possibly be B too.

Q. Okay. All right. Can you explain your knowledge as to what is the Michigan Bio Trust for Health, as opposed to or different from or the same as the Michigan Neonatal Biobank?

A. So I'm going to be real honest with you. I'm not that savvy in that area.

Q. I'm glad you're honest. I appreciate that.

A. This was before my time. I've tried to understand it and read on it a little bit. This is my understanding: So the Bio Trust was set up, I want to say -- I can't remember the year. It was set up as a program to manage the operations of the storage -- of the blood spot storage. Why it was set up that way, how they became a 501(c), blah, blah, I have no idea. I just -- I was just told, "This is your new area and you're going to be managing" under my other 50 million areas that I manage. But that's how I got involved in this. I didn't want it. It just came to me because the boss said, "You're going to have it," so I haven't had -- you know, I don't know the history, to be honest with you, you know, about the whole -- the Biobank and why they chose to set it up the way they did. I don't really have that information. I know that the Bio Trust, I can say this, that it's a variety of stakeholders, so you have the partners with Wayne State and You of M, VanAndel, et cetera, the State, you

know, so there are a variety of stakeholders that are involved in, you know, the management of that, and that could have been the reason why it was set up as a trust, but I don't have that history.

Q. Okay. Fair enough. Lastly -- or actually, I've got -- the last exhibit I want to show -- well, let me make sure. Let me look here. Just a couple of small follow-ups. Looking at --

(Deposition Exhibit G marked)

Q. I'm presenting you what's been marked as Exhibit Number G for purposes of the deposition. This has been provided by the State as the -- what I call the old brochure, and that's my name I give it, the one before the current one that's out called "After Newborn Screening." Do you have any -- did you have any involvement with the drafting of this document?

A. No.

Q. All right. Have you -- do you use this document or otherwise know of this document for purposes of the Biobank's operation?

A. I don't -- this looks like -- I think I may have seen this at one point in the office. I'm not sure. It looks a little -- it doesn't look like a current one. I don't know how old this is, but I've seen -- I think I've seen this document before.

Q. Okay. Does this --

A. It looks familiar.

Q. Okay. Let me ask this question: Does this document to your knowledge control or otherwise are a part of the way you operate your Biobank?

A. I'm not understanding that question.

Q. I guess let me say it this way: This is something the State created, it's not something the Biobank uses for its operation; would you agree with that?

A. Correct.

(Deposition Exhibit H marked)

Q. I'm going to present to you now what's Exhibit H.

A. Okay.

Q. Again, this is what I call the new brochure.

A. Okay.

Q. There's two sides to it here. Did you have any involvement with the drafting and the putting together of this particular brochure?

A. No, I do not.

Q. Okay. Do you know if your predecessor did?

A. I don't know that information.

Q. And again, this is not something you guys created, used, or maintain as part of the Biobank operations, fair?

A. Okay. So when you say use, I will have to tell you that I've seen some of these at the facility.

Q. Okay.

A. So sometimes what happens is that -- and I don't know if this is the right one, but we obviously do promote the Biobank at Wayne State University for our researchers, and so I've attended different -- any time that we hire faculty, part of my job is to promote the Biobank for research purposes to the researchers, so I've used some of the pamphlets that have already been created. I use those when we do what we call new faculty orientation, so I may share that information along with some other promotional type stuff.

Q. Okay.

A. So the Biobank is promoted for research purposes so that -- you know, so that new faculty know that we do have a way of -- you know, of using blood spots for research.

Q. Okay. I want to get that zoomed in here. I want to draw your attention -- if you can, make sure you can see. On the bottom left-hand corner on your screen where I'm circling the Certificate of Confidentiality.

A. Okay.

Q. Do you see that there?

A. Yep.

Q. Okay. Does that -- does the Certificate of Confidentiality mean anything to you regarding the operation of the Biobank?

A. No.

Q. All right. That's not something that you know about that

was either sought or petitioned for under your directorship?

A. No.

Q. All right. Okay. Two more here. I want to zoom out here.

(Deposition Exhibit O marked)

Q. This is a document that I will represent that used to be on your old website. I'm not sure if it made the transition in the time from the update. Do you recognize this?

A. I do.

Q. All right. Is this one of your brochures?

A. It's one of my brochures, correct.

Q. All right. Was this something you created or had created?

A. I made modifications to it when I came onboard because some of the information may have changed.

Q. Okay. Can you tell --

A. My marketing department -- I have a marketing department that does all of our brochures and things.

Q. Okay. Fair enough. And again, I don't know if I said it but this is Exhibit O for purposes of this deposition. Looking at -- if you can look toward the top right-hand side, I'm looking at those carts, that picture right there.

A. Yep.

Q. Is that the carts of how the blood samples are stored?

A. That is correct.

Q. And again, it's up to you if you want to take a chance to read this here, but based on that you acknowledged that this

is a Biobank brochure, the information contained in it is accurate at least as of the time that they made the brochure; would you agree?

A. That is correct.

Q. All right. Fair enough. Lastly here, before I go to the Complaint, this one right here.

(Deposition Exhibit L marked)

Q. To your knowledge, these are -- I'm presenting to you what's been marked as Exhibit L. These are various documents I've got as part of another lawsuit I have going against the State, myself and my wife.

A. You scared me there for a minute. I see this charge of open murder and I thought -- the first thing I thought, oh my God, did I -- have I been charged for something that I don't know about? My heart just literally dropped there.

Q. Well, I can tell you I'm not charging you with nothing on that whatsoever, so anyway, these are documents that were in response to the other case in which I asked about whether law enforcement had access to the samples at the Biobank.

A. Okay.

Q. These are some of the documents -- and I'm representing to you that were provided in response to that discovery in the other case.

A. Okay.

Q. Do you recognize any of these documents as something that

you had to deal with?

A. Yeah. I remember either myself or my manager, I remember getting this or something like this when we first started. He may have gotten served with something.

Q. Okay.

A. I do remember this. It was probably at the beginning when I first started, because -- what's this, 2017? '18? Yeah.

Q. They blocked the date. I don't know. That's --

A. Yeah, I remember being served or he got served for this.

Q. Okay. Do you recall whether or not the subpoena -- just whatever the document was, and I would represent it's a subpoena of some sort, that those -- that the samples were provided in response to those -- that legal demand?

A. I wouldn't know that information because this particular -- this particular document was referred over to the State.

Q. Okay. Do you remember at all whether the Biobank pulled any samples in response to a subpoena?

A. I wouldn't be able to give you that information because I wouldn't even know who it was, so we get requests all the time from them to pull something, so I wouldn't be able to know if that number was associated with this person.

Q. Okay. So I don't want to put words in your mouth, but just you would have got -- if there would have been a subpoena to the State, for example, like, for example, right here, the one I have in front of you on the screen. It's page 2 of

Exhibit L and someone is being charged with open murder and it was subpoena directed to the Department of Community Mental Health, State Public Health Lab Lansing, care of Harry Hawkins. If they had gotten that and they needed to provide that to the court, this would have just been a request to your office to pull like any other request would have been?

A. Yes.

Q All right. And you don't know any firsthand knowledge of actually receiving a subpoena yourself?

A No. But we've -- like I said, I'm not sure. We've gotten -- I remember one subpoena since I've been there and again, I don't know if it was for this person, but I do remember being served. It may have been -- it may have been actually for this case, so I don't -- I don't know.

Q. Okay. But you can't --

A. In any case, if I had gotten a document like this, it would have immediately went to the State of Michigan.

Q. Okay. Fair enough. And you don't know sitting here right now whether or not these subpoenas or legal demands were otherwise fulfilled, correct?

A. No.

Q. Okay. Let me just check. I've got one more -- I'm done with the exhibits. Let me just look right here. Forgive me. I may have asked this. I'm going through the

Complaint. I just have a couple of notes on my Complaint that I filed on this. I just want to ask a couple questions on that and you may have answered it, so forgive me if I'm asking you again. If I -- no, strike that. You've answered -- no, you've answered that. I was just -- you've answered that, so. Does the Biobank have any policies about providing blood samples or blood spots to public or university researchers versus for-profit companies?

A. No.

Q. I've noticed -- and I don't have it on the screen right now, but the State provided me a list of research projects and for example, I see companies like Luminex, Genomics (ph) USA, Astoria Pacific, Advanced Liquid Logic, Asuragen -- A-s-u-r-a-g-e-n, like for example, you guys provided 10,000 samples to them, for example.

A. Uh-huh (affirmative).

Q. These are all for-profit companies I've discovered on that. There's no -- to your knowledge, there's no prohibition or concern about providing samples to a for-profit company?

A. I don't get involved in that information.

Q. All right. Fair enough. All right. So this is going to sound silly. This is going to sound like a silly question. The blood samples are stored at a temperature and humidity controlled area within a facility near Wayne State University known as TechTown, correct?

A. That's correct.

Q. All right.

A. TechTown is on Cass and Burroughs.

Q. And you did -- as part of your responsibilities at the Biobank you've never obtained or otherwise sought a search warrant from a judge to be able to continue to store blood samples, true?

A. True.

Q. All right.

MR. ELLISON: I think that's it, sir. I apologize. It took a little longer than I had thought, but I really sincerely appreciate it. I hope -- I hope this was not an unpleasant experience for you and I appreciate your time today. With that, I'm going to tender the witness to Mr. Kennedy and if he's got any questions, then Mr. Level might have some questions too for you, but otherwise, sir, I appreciate your time today.

THE WITNESS: All right. Thank you, Mr. Ellison.

MR. ELLISON: Thank you.

MR. KENNEDY: Dr. Yancey, I just want to clear -- make a couple things clear for the record.

EXAMINATION

BY MR. KENNEDY:

Q When you get a request from the State of Michigan to pull samples, blood spots, they give you specific numbers to

pull, correct?

A That's correct.

Q They don't just ask to pull random numbers, correct?

A Correct.

Q So in one of the hypotheticals that Mr. Ellison asked with Dr. Shah saying pull ten samples, if you didn't get specific numbers for those samples to pull, you wouldn't pull anything, correct?

A That's correct.

Q All right. Okay. I just wanted to clear that up.

MR. KENNEDY: I have nothing further, unless Mr. Levin does.

MR. LEVIN: I do not.

THE WITNESS: Who is Mr. Levin's representation? I missed that earlier and I want to ask that question before I leave.

MR. KENNEDY: He's from the Attorney General's Office.

THE WITNESS: Okay.

MR. ELLISON: The joke would be, of course, there's no halo behind his head right now, right? So ha, ha, ha. Anyway, I have no further questions at this point right now either. Again, Dr. Yancey, I sincerely appreciate your time today and I appreciate your forthrightness. This concludes the deposition going forward.

THE WITNESS: Thank you.
(At 1:56 p.m., deposition concluded)
-0-0-0-

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
NORTHERN DIVISION

ADAM KANUSZEWSKI, et al,

Plaintiffs,

v

Case No. 18-cv-10472

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES, et al,

HON. THOMAS L. LUDINGTON
MAG. PATRICIA T. MORRIS

Defendants.

/

VIDEO CONFERENCE DEPOSITION OF SARAH LYON-CALLO, PH.D.

Taken by the Plaintiffs on the 17th day of December, 2020,

via Zoom, at 1:00 p.m.

APPEARANCES:

For the Plaintiffs:	MR. PHILIP LEE ELLISON (P74117) Outside Legal Counsel PLC PO Box 107 Hemlock, Michigan 48626 (989) 642-0055
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Also Present:	Sandip Shah, Ph.D. Eric Hendricks Ashley Campbell

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Network Reporting Corporation
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1-800-632-27201

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Via Zoom Video Conference
Thursday, December 17, 2020 - 1:01 p.m.

MR. ELLISON: Good afternoon. I guess I want to know -- I want to be respectful of how I addressed you. Is it just -- do I just call you "Doctor"? Would that be sufficient?

DR. LYON-CALLO: I'm fine if you all me Sarah, but that's really fine.

MR. ELLISON: Okay. All right. I mean no disrespect. As you can kind of tell, we're a little less than formal with the group that we've been hanging out together so long on this particular case. So, anyway, first of all, thank you for being here. I appreciate it. As you may have heard, I need to ask some questions of you here as part of the newborn screening lawsuit, which I'm sure you're aware of. Have you ever done a deposition before?

DR. LYON-CALLO: Yes, I have. I haven't done a deposition over Zoom before, but I've done depositions.

MR. ELLISON: Okay. All right. Well, then I'll skip the usual instructions then going forward, and we can just get right to the -- right to the heart of it here.

REPORTER: Do you solemnly swear or affirm that the testimony you're about to give shall be the whole truth?

DR. LYON-CALLO: I do.

SARAH LYON-CALLO, PH.D.
having been called by the Plaintiffs and sworn:
EXAMINATION

BY MR. ELLISON:

Q I have a couple of questions regarding the newborn screening program and the Michigan Neonatal Biobank. And I just call it -- just for purposes of our discussion here today, when I refer to the "Biobank," I'm referring, of course, to the one that's headed by Dr. Yancey, the organization with its offices and operations in Detroit at the -- at Tech Town.

And then when I refer to the "newborn screening program," part of it, that's the state side, I would call it, of this particular setup. Is that agreeable that we can talk on those terms?

A No. The newborn screening program is a screening program. The Michigan BioTrust is the state program that addresses the residual dried blood spots. The Michigan Neonatal Biobank is an entity that is managing the storage of those spots.

Q Okay.

A So I want to be -- I am very clear and precise in my language when I'm talking about the difference between newborn screening program versus the Michigan BioTrust for Health.

Q Okay. So that's one of the questions I'm going to ask you

about. So I'm going to jump ahead and ask you that. I'm going to set it up in a particular way, and I want you to explain to me, thereafter, what happens. A newborn is born. Blood spots are extracted. Blood samples are extracted in the form of blood spots onto a Guthrie card and are sent to the Michigan State Laboratory for testing.

Once that testing is complete, I'd like you to explain to me, as best you know, what happens to those residual blood spots.

A Sorry. I was having trouble with my mute. I think some of the particular detail regarding specifics around the mechanisms by which cards are handled directly after testing is best handled by Dr. Shah, the director of their laboratory. But I can share -- or I feel comfortable talking about the piece where -- that the dried blood spot card -- the newborn screen card, is -- there's a group at the laboratory that, when they are done with that card for the purposes of the newborn screening program, they process that card. The residual dried blood spots that become part of the --

(Dr. Shah enters deposition)

Q Doctor -- excuse me. You said "they." Who is they?

A The Bureau of Laboratories at the Michigan Department of Health and Human Services.

Q Okay. Thank you.

A Yup. You're welcome. And I see Dr. Shah has joined. I know this is my deposition, and he's like joining in. But he's joining in for his deposition time -- yeah, separate time; right?

Q That's fine. He's entitled -- he's entitled to participate or to observe this -- the deposition as a party -- named party in the case. So, but go ahead.

A Okay. Thank you.

Q I apologize. I mean, I didn't mean to interrupt you. You used the pronoun, and I wanted to make sure I understood. You said, "Once 'they' were done processing the card."

A Yes; yeah; yup. So when the laboratory staff are done with the card from a newborn screening perspective -- I'll let Dr. Shah get into the nitty-gritty of how that card is processed -- but the high level is that the residual dried blood spots go to -- with the exception of a spot reserved for parent/guardians, the residual dried blood spots go to the Michigan Neonatal Biobank where they are managed for the purposes of Michigan BioTrust.

Q Okay. Who is responsible for overseeing the Michigan Neonatal Biobank as it applies to the Michigan -- from any individual you know at the Michigan Department of Health and Human Services?

A I'm sorry. Can you repeat that one more time?

Q Sure. What I want to understand is is that you just said

that the Michigan Neonatal Biobank stores -- and I'm paraphrasing -- stores newborn blood spots that are residual leftovers from the newborn testing program for -- on behalf of our -- under the control of the State of Michigan, I think, DHHS I think is what you said, or some variation thereof.

A Uh-huh (affirmative).

Q I'd like to know who at the Michigan Department of Health and Human Services is responsible for overseeing or otherwise controlling the blood spots at the Neonatal Biobank?

A So the dried blood spots are managed by the Michigan BioTrust. That BioTrust structure has a community values advisory board, a scientific advisory board. There is also an internal infrastructure which Dr. Shah and myself are responsible for. But I think probably the simplest way to answer the question is that Dr. Shah and myself are responsible for the dried blood spots in the Michigan BioTrust program that are at the Michigan Neonatal Biobank for storage and distribution at the direction of the Michigan Department of Health and Human Services.

Q Okay. Good. Fantastic. So I guess the reason why I'm asking would be is that if a -- say in this case a judge was to issue an injunction against both of you in your official capacities, you would have the ability to direct the blood

spots to no longer go to the Biobank if that's what the judge so ordered; would that be correct?

A That is my understanding.

Q Okay. And what -- as part of the complaint -- as part of my complaint and the research I did on this prior to bringing this complaint, I had you listed as the manager of the Michigan Bio- -- or excuse me -- Michigan BioTrust for Health; is that accurate?

A So as the director of the Bureau of Epidemiology and Population Health, I am one of the two folks who is over the Michigan BioTrust for Health, the other one being Dr. Sandip Shah.

Q Okay. What role does Mary Klein play in the Michigan Newborn Screening program and/or the Biobank?

A So none of my -- so Mary Klein is a manager in the division of Lifecourse Epidemiology and Genomics, which is within the Bureau of Epidemiology and Population Health. So Mary Klein is in my supervisory chain. She does not -- I'm not quite certain how to answer part of your question. You asked about if she plays a role at the Michigan Neonatal Biobank? Is that what you asked me?

Q Yeah. I want to understand, you mentioned that both you and Dr. Shah have supervisory control over the BioTrust. According to online disclosure forms that have been made available, that she is the manager of the newborn screening

section of the Michigan Department of Health and Human Services. I want to know what role, if any, does she play over the newborn screening program and/or the BioTrust. And I'll add to that -- or excuse me -- the Neonatal Biobank, and I'll add to that the BioTrust if that assists you.

A So Mary Klein is the director of newborn screening section that addresses follow-up of results from the newborn screening program. In terms of Michigan BioTrust, she has a role in that as we get proposals for use of dried blood spots. She has a role also in communicating -- as do other staff as well -- in communicating with the Michigan Neonatal Biobank. She does not have a role within the Michigan Neonatal Biobank. So she's in no way an employee or something like that of the Michigan Neonatal Biobank.

Q Okay. I've done the deposition of Dr. Antonio Yancey. Do you know who he is?

A (No verbal response)

Q I'm sorry. You've got to answer "yes" or "no."

A Yes, I do. Yes, I do. Sorry. I'm trying -- I have a dog in the background.

Q No problem. If I say "yes" -- yes, if I make a statement like that, I'm not trying to be rude. It's just sometimes we say things like "uh-huh's" and "um's," and we just have got to get clear for the record. So I mean no disrespect by it.

A Yup.

Q The -- one second here. I've got my email on, and it keeps beeping incessantly. There we go, stop that. Okay. I did the deposition of Dr. Yancey, and he indicated that the blood spots were not under the control of the board of directors but actually under the control of members -- or officials with the Michigan Department of Health and Human Services. Would you agree with that statement as I presented it to you?

A Yes. The Michigan Neonatal Biobank does not have control over the use and distribution of the blood spots -- the residual dried blood spots.

Q Okay. Who at the Michigan -- just to confirm -- who at the Michigan Department of Health and Human Services would be the person most in charge of decision-making as to the blood spots held at the Michigan Neonatal Biobank?

A The use of the blood spots under the purposes of the Michigan BioTrust program, Dr. Sandip Shah and I are responsible for the decision-making around that and that includes the use -- or the instruction to the Michigan Neonatal Biobank.

Q Okay. To your knowledge, is the Michigan Neonatal Biobank holding blood samples for any other purpose other than the Michigan BioTrust program?

A I do not know the answer to that question.

Q Well, do you have any knowledge -- do you have additional purposes or additional blood storage for any other programs, to your knowledge?

A I don't have any knowledge to what else the Michigan Neonatal Biobank -- sorry -- what else the Michigan -- what else the entity at Tech Town -- the Biobank at Tech Town, what other activities they may have going.

Q Okay. Can you explain -- and, again, acknowledging that we are lawyers and the person that's going to read this transcript hopefully ultimately will be a lawyer who is a judge. We're not scientists, by any means. Can you explain, as best you can, what the role of the Michigan BioTrust is, vis-a-vis, the Michigan Department of Health and Human Services?

A So the Michigan BioTrust, it is a program that's run by the Michigan Department of Health and Human Services in order to oversee Michigan's storage residual dried blood spots and their use in health research.

Q And I believe you just -- and just to confirm, you testified earlier that that program has oversight of the Michigan Neonatal Biobank; correct?

A For the purposes of the residual dried blood spots, yes.

Q Okay. Is there any other program or entities that have control over the Michigan Neonatal Biobank related to blood spots that you're aware of outside of the BioTrust?

A You're referring to the residual dried blood spots from the Michigan Department of Health and Human Services? Is that what you're referring to?

Q Any blood spots that you are aware of that are there. Is there any other entity or program that has any sort of role as it applies to the Biobank in any way, to your knowledge?

A I think I shared with you earlier that I have no knowledge as to whether or not there are other forms of dried blood spots or other bio specimens that are at the Michigan Neonatal Biobank. The knowledge I have is related to the dried blood spots that are there from the Michigan BioTrust.

Q Why are blood spots transferred or otherwise given to a private nonprofit corporation rather than stored under the direct control of the BioTrust program or the department of health and human services?

A So the purpose of the -- the Michigan Department of Health and Human Services does not have the laboratory capacity for management of a Biobank. The amount of freezer space the software that is required to manage individual specimens over a longer of period of time is something that the Michigan Department of Health and Human Services, under the Michigan BioTrust, has obtained through the Michigan Neonatal Biobank.

Q Okay. Were you involved at all with the creation of the Michigan Neonatal Biobank?

A No. The Michigan Neonatal Biobank, when I came in to the position -- the first position that I had related to newborn screening, when I came into that position in 2012, the Biobank was already instituted.

Q Okay. And just to confirm -- forgive me. I know the answer already, but this is my chance to confirm -- is that you don't serve on the board of directors of the Biobank; correct?

A No, I do not.

Q Any reason why not?

A I have a variety of responsibilities at the department. I also am not a laboratorian. And given Dr. Shah's and I's shared responsibilities for the Michigan BioTrust, I'm very fortunate that he was able to take on that role.

Q How would you describe the nature of the relationship between Michigan Department of Health and Human Services and the Michigan Neonatal Biobank? And I guess let me put it in a clearer parlance than that would be is are they a contract vendor? Are they a partner? Are they another government agency? How is it, in your role as oversight of the dried blood spots that are stored in that facility, do you view the role and the relationship with the Biobank?

A So the Michigan Neonatal Biobank is not a government agency. We have a contract with the Michigan Neonatal Biobank for the purposes of storage and distribution of the dried blood

spots from the Michigan BioTrust. And the Michigan Neonatal Biobank has been a very good partner in terms of, you know, managing those spots, promoting the use of the spots with researchers. So I think they are -- you know, we have a contract with them. They are -- so they have a vendor relationship with us, and they've also been a very good partner in terms of moving this activity along.

Q Does the Department of Health and Human Services provide monetary compensation to the Biobank for these services?

A We provide partial support to the Michigan Neonatal Biobank through a contract with Wayne State University. Their Biobank can -- also has an arrangement to be able to cover some other costs related to a fee structure that is charged to researchers. But, yes, the department does provide direct contract support for the activities there at the Biobank. And I think Dr. Shah would -- sorry. Go ahead.

Q No; no. That's fine. That's fine. And, again, I'm only asking what you know. I'll be asking Dr. Shah a number of questions, as well, given his role as a director on the board of directors of that particular entity when I do his deposition.

A Uh-huh (affirmative).

Q I'm only seeking what you know. Do you happen to know how much, as a percentage, or the dollar amount, that the Michigan Department of Health and Human Services pays

ultimately that reaches -- for the operation or the services provided by the Biobank?

A I'm sorry. I did not come prepared to talk about those numbers today, so I can find that out. There are times where I certainly do hear about the financial support to the Michigan Neonatal Biobank for the functions that are performing a contract but I'm not prepared to speak to those specifics or those numbers today.

Q Fair enough. That's fair enough. And, again, only what -- I'm only asking you what you know here today as well, so if --

A Okay.

Q Well, let me ask this question: I know that as part of the -- I guess -- well, let me make the representation to you that as part each newborn blood draw, the heel prick test that occurs, the hospital charges the newborns a fee for doing that, which is -- again, I don't have the dollar amount that changes year to year, but approximately $130 for that activity. Do you know if all or a portion or none of the monies from those collected fees goes to the Neonatal Biobank?

A So the majority of those fees go to the Michigan Newborn Screening program. A small amount of those fees have covered some of the costs of the contract with the Michigan Neonatal Biobank. The exact percentage of that, I am not

prepared to speak to today.

Q Okay. I mean, can you confirm, though, it's more than zero but less than all of the money goes to --

A Oh, yeah. Yeah, that's an easy statement to agree to; yes.

Q Okay. Very good, very good. Okay. As part of the contractual relationship or the what- -- the nature -- whatever the relationship is between the Department of Health and Human Services and the Michigan Neonatal Biobank, does someone in your role that you serve as -- and, again, I think I just called you the manager of the BioTrust and you identified your relationship with Dr. Shah as part of that oversight authority -- do you have direct control over how the Biobank stores, accesses, uses, and handles the blood spots that are submitted to it under the Michigan BioTrust program?

A Can you repeat that, please?

Q Sure. I guess, making it a little simpler. I just want to know if -- say for today that you -- that Dr. -- I mean, Chris over there -- Chris, the manager of the Biobanks, is doing something that you think is inappropriate for the blood spots. It's not in the best interest of the particular blood spots. Do you have the authority to call over there and tell them to change their processes and procedures?

A Yes. If there was something that was inappropriate going

on, absolutely.

Q And I don't mean this in a legal sense. I'm talking more in either a scientific sense or a project sense. I'm not trying to be inappropriate as in legal or sexual harassment or something of that nature. I'm talking more about the blood spots, the core activities itself. You would have the ability to call or make contact with them and say, "I would like this" -- "you need to start doing it this way," and they would do it that way going forward; is that fair?

A So the department has procedures that the Biobank is following. We have an understanding what their procedures are. They are in a contractual relationship with us, and we are able to, you know, I don't want to say "direct their operations." I don't mean to imply that we're sort of managing their staff in some way. But in terms of what the procedures for storage, maintenance, and distribution of the dried -- residual dried blood spots, the department is able to direct that. In this case, both Dr. Shah and myself have the ability to reach down to the Biobank regarding, you know, any issue or concern that we have. They're very approachable.

Q Okay. Very good, very good. And that's what I was looking for. Thank you. So I don't know how to ask this question so bear with me. I asked a little bit earlier about the nature of the BioTrust program, vis-a-vis, the Department of

Health and Human Services. And I'm trying to understand what exactly its nature is. I mean, it's -- you would agree that it's not a division of the Department of Health and Human Services; correct?

A So the Michigan BioTrust program; you're asking me if it's like an organizational box or a chart? Is that what you're asking?

Q I'm trying to figure out where it fits in the overall organizational scheme. I mean, it's a division; right? It's not a -- you know, the DHHS has got all its various divisions with various different responsibilities. I just -- I don't know how to describe, or how it would be best to describe where the BioTrust fits into the overall scheme of organizational hierarchy at the department itself.

A Sure.

Q Can you articulate that?

A So we refer to the Michigan BioTrust as a program. Program can be administered between different areas within the organizational structure. So there are aspects of the Michigan BioTrust that are related to epidemiologic questions, which is my organizational structure, epidemiology, and there are aspects of the Michigan BioTrust program that are related to laboratory, which is Dr. Shah's, you know, area of responsibility. So it is a program with the Michigan Department of Health and Human Services that

Dr. Shah and I jointly manage.

Q Okay. All right. Very good. Would you, as part of your role as the -- as part of the role involved with the BioTrust, you would agree -- would you agree with me that prior to 2010 parental consent was never obtained for medical research or at least -- or testing on blood spots for infants born before 2010? Would you agree with that? And I'm talking just on the parents.

A Let me just check my -- I'm trying to take some notes here to make sure I have my dates correct.

Q Sure. I believe it's April of 2010, but I know it -- I'm using at least 2010, before that.

(Witness reviews electronic data via video)

A I'm sorry. It's taking me a minute.

Q Take your time.

A So the -- it's smaller, but I can still see it, though. So the -- all right. So there are blood spots that were collected between July 1984 and May 1st, 2010 that may be used for health research under a waiver of informed consent. So we do not have active informed consent for children who were born before May 1st, 2010.

Q And you indicated that you had some form of consent from something. Could you articulate what that is?

A So there is a waiver of informed consent that was granted by the Michigan Department of Health and Human Services

institutional review board.

Q Does that -- as the head of the BioTrust program, do you deem that sufficient to be -- let me strike that. As the head of the BioTrust program, do you deem that decision by the IRB to be sufficient to use blood spots for medical research and medical testing of newborn spots before 2010?

A So the purpose of the waiver of informed consent is for the use of residual dried blood spots for the purposes of research, not for medical testing but for research.

Q Okay. Fair enough.

A So, yes, I consider that appropriate.

Q Okay. Do you have -- I'm sorry.

A So we have -- we have -- the institutional review board is our human subjects review board. It operates under federal regulations around human subjects, protection of human subjects. And that is the board that I rely on for those kinds of assessments, whether it be related to something like this or other research projects that may come about related to public health data or other -- well, public health data is what I work with.

Q Okay. Starting in May of 2010, the department -- and this is my representation to you. I want to see if you agree with me. Starting in 2000 -- May of 2010, the department starting to obtain or attempt to obtain some form of consent from parents before utilizing newborn screening -- or excuse

me -- newborn blood spots that remained after the testing was complete under the program. Were you involved at all in any way with the decision to change the policy starting May of 2010?

A So I was not part of the management structure in the Michigan BioTrust at that point. I was aware, being around the department, of discussions about it, but I was not involved in the decision-making on that.

Q Okay. Do you know who was the decision-maker on that policy change at that time?

A I would have to go back and look at that -- for that information. I don't know. I'd have to go back and look for that.

Q Would it -- okay. I'm sorry. I don't mean to interrupt. Would that be the person that has served in your role as the director of epidemiology at the Department of Health and Human Services?

A That would be my assumption, but I would have to go back and look at that for that information.

Q All right. Very good. Starting -- so from May of 2010 forward, without getting into the finer details about what actual consent was obtained, would you, in your role as the -- with supervisory control over the BioTrust, that the consent that the department obtains from parents is sufficient to conduct medical research on the newborn

screenings residual blood spots?

A Yes. We have created the informed consent process to allow for that -- for a parent to have active consent in the process, yes.

Q Do you --

A So did I answer your question?

Q Yes, you did.

A I'm not sure if I answered your question or a different one.

Q No; no. You did; you did. And, please understand, if I'm not saying something correctly or, you know, I'm not -- again, I'm a lawyer not a science person. I have good friends who are, and sometimes the words aren't quite the same. If you can correct me, I'm not above being corrected. My pride will not get in the way, so -- and besides, I'm married. I'm corrected a lot, so there you go.

So the -- you just mentioned about informed consent -- just now was the phrase you just used. Do you, in your role at the department, make a distinction between consent versus informed consent?

A So we -- when we are doing projects that involve consent, we use a process of informed consent. In the case of Michigan BioTrust, we invested significant time in developing the informed consent brochure for Michigan BioTrust, spent time looking at the informed consent form that goes -- that parents see, try to make those materials as clear as

possible. So for the purposes of public health research, I use the term "informed consent" because that is -- the process is to inform people to what they are consenting to.

Q Do you make a distinction -- setting aside this program just as a public health official, do you make a distinction between getting consent versus informed consent?

A I'm not sure what getting consent means in your question. The process of what we do is about informed consent that you have provided people with information so that they can make, you know, their informed choice and that they have something to reference back to. So it's something that is common in public health and in public health research.

Q Okay. You mentioned that you give information so that persons who make informed consent -- who want to give informed consent are so informed; fair?

A Uh-huh (affirmative).

Q I'm sorry?

A Yes; yes.

Q What information specifically does the BioTrust program provide to parents to give them -- to get them to the point of being informed sufficiently so that they can give their informed consent?

A So the Michigan BioTrust has a brochure entitled, "After Newborn Screening: Your Baby's Blood Spots." That is -- let me pull it up.

(Witness reviews electronic data via video)

That is a small brochure that enables -- that provides information about what the BioTrust is, what are risks if your baby's blood spots are used for research, what steps are taken to protect privacy, that we have a certificate of confidentiality. So we have the -- there are -- there are elements of informed consent that are part of the human subject's process, and those elements are covered in that brochure.

Q Do you believe as the -- in your supervisory role on behalf of the BioTrust, that the information contained in the brochure is a sufficient amount of information for a parent to make informed consent?

A Yes. We work very hard to ensure that we have the elements that are needed in that brochure. So, yes, I do believe that.

Q All right. Is there any other processes, procedures, or communications or documents in any way outside of the brochure that is utilized to give parents information so that they have better or equal informed consent? Essentially is there anything other than the brochure that's available to parents at the time of the birth of their child that the department provides them?

A So the department engages in baby fairs. They provide education to physicians that can be used with expectant

parents. We provide education to nursery staff within hospitals so that there is awareness of what this program is. The informed consent brochure, the "After Newborn Screening: Your Baby's Blood Spots," Michigan BioTrust brochure, is meant to be the document the parents can see at the time that they are signing -- that they are, you know, deciding whether or not they want to have -- whether or not they want to consent to the storage of their baby's blood spots.

But there are other avenues that we use to promote the program and the existence of the program with social media, baby fairs, education to providers.

Q I don't want to put words in your mouth but everything you just described would be a phrase I would usually describe as "marketing materials." Would that be a fair statement to cover what you just said?

A I think it's promotion, education, marketing, you know, we have the baby's blood spot brochure up on our website. You know, with Zoom -- sorry. With the situation that we're all in right now with the epidemic, there aren't baby fairs and things like that. And we've included the brochure and other materials in virtual baby fairs that are going on.

So I think, you know, we put materials out, but part of those materials are the actual informed consent brochure, which also includes the information that you would

be looking at at the time that you are asked if you would like to participate in the Michigan --

Q I'm going to make the representation to you that I represent five parents over -- who are the parents of nine children and all of them will testify under oath that none of them received the brochure from the Department of Health and Human Services or any agent thereof.

What steps, if any, does the department take to make sure that a newborn screening -- or excuse me -- that the brochure -- I believe you call it "Your Blood Spots" I believe you called it -- the brochure is provided to parents before they're asked to sign any sort of consent form?

A So the Michigan Department of Health and Human Services provides education to the nursery staff. We provide the brochure to nursery staff. The card that people are asked to sign is meant to be used in conjunction with the brochure, and that is made very clear in the education. I'm sorry. Just one second.

Q No problem. Take your time.

A I'm trying to enlarge something so I can read it to you.

(Witness review electronic data via video)

And we -- sorry. I shouldn't click and talk at the same time. I apologize.

Q Take your time. That's no problem.

A And the form itself that parents are signing, at the top of

that form it says, "Before signing this form, please read 'Your Baby's Blood Spots'." It gives details on how small drops of blood collected for the newborn screening may be used in research through the Michigan BioTrust for Health. "If you have questions, please call the Michigan Department of Health and Human Services toll free at" phone number.

Q As I understand, you're reading from the consent card itself; correct?

A Correct. So we make sure to reference right at the point that parents are being asked to sign something that this brochure exists. The expectation of the department, the instruction at the department in the provider education materials is that this brochure is provided to parents, you know, so that they are ready when this card comes to them during the baby's stay at the hospital.

Q Do you have any policies -- written policies, directives or laws, administrative rules or anything that directs when a brochure is supposed to be provided to parents?

A In terms of the -- there is not a written statute or rule about the timing of that delivery to my knowledge. I would have to go look to see the specific language that is in the -- the education materials that we provide to staff at hospitals regarding that timing. But the purpose and the point of the training regarding active consent is -- that is important as informed consent and that parents have that

brochure.

Q Do you know -- when you mentioned about training, what sort of training does the department provide to the hospital that you're just referencing right there? What kind of training? Like, when does that occur and how does that occur?

A Sure. So the training occur in a couple different ways. Trainings occur via webinars. Sometimes they occur where staff physically go to a hospital and have a regional in-person training. That's been difficult this year. Obviously we can't do that this year. We also offer training at different conferences that nursery staff may be at. We have a newsletter that goes out to nursery staff and other health providers talking about aspects of the newborn screening program, and we include messages about the Michigan Biotrust in that as well.

Q Is training mandatory?

A We are --

Q That's a "yes" or "no" question. Is it mandatory?

A I would need to go back and look and see if we use the word "mandatory" when we are speaking to the nurseries. It is expected that staff are trained in this. Whether or not we say this is a mandate that you must take every staff member through, I don't know if we use that word. But it is our expectation that staff who are working a nursery, you know, providing that care directly to parents, are trained about

the Michigan BioTrust just as they are trained about the neonatal screening. So, you know, this is -- education about the Michigan BioTrust is being provided alongside education about the neonatal screening.

Q What steps, if any, does the department take to ensure that --

A I'm sorry. You may be on mute.

Q No, I'm not.

A No? Is it me?

Q It might be you. We can hear you.

A Sorry. Can you still hear me?

Q We can still hear you, yes.

A I can't hear you. Can you hear me?

Q Yeah.

A I'm sorry. I can't hear you.

MR. ELLISON: Aaron, do you have her phone number or something that you can --

MR. LEVIN: We can get it, yeah. That won't be an issue.

(Off the record)

MR. ELLISON: All right. So just for the record here, we just took a -- we had a small break because of technical difficulties, but we're back on here now.

Q My question -- I'd like to follow up with the question I just asked about is there any administrative rules,

policies, or directives that mandates that training be provided to the appropriate hospital personnel? Meaning everybody that needs to provide a brochure and provide the information does, in fact, do so?

A Are you -- can you repeat that? I'm sorry.

Q I guess let me put this into context. Okay?

A Uh-huh (affirmative).

Q My son was born in September of 2017 at a hospital in Saginaw, Michigan. The hospital never provided us with a brochure nor provided us with any information until almost 12 hours after his birth. At that point we had, you know, no knowledge or information about the newborn screening program, and the nurse that was there knew very little about the program as well. So the context -- that is my context.

What I'm trying to understand is what steps does the department take to make sure that, for example, the nurse with my son, for example, is sufficiently and properly trained so that they can, A, provide the brochure, and, B, provide sufficient information so that parents like myself and my wife can make informed consent? Can you explain what steps or what guarantees the department provides so that the necessary training is undertaken by these hospital personnel? I think you've been calling them "nursery" employees, but the hospital personnel in some way?

A Sure. So we provide regular educational sessions with

personnel. When -- we also -- we do look at specifics we have about how often our informed consent form is returned blank. We look to see, you know, how often there are -- there, you know, appears to be something about the form that is making clear that there's some sort of lack of clarity or some sort of -- if the form is filled out, you know, in a way that is unclear. We follow back on that as well.

We have one-on-one sessions with hospitals where we have concerns about the percentage of forms that are coming back blank or if we have concerns about, you know, complaints that we have received, something like that, about the newborn screening program, or if there's concerns or complaints about Michigan BioTrust itself.

We would work with the nursery coordinator and then work to get staff refresher training. For example, we've done sessions where we will have -- you know, our staff will provide multiple sessions to ensure that nursery staff has multiple opportunity within a facility to be able to get trained. We also have repeated reminders that, you know, there are new staff training that is available.

Q Let me ask this: Do you track whether these employees are, in fact, been properly trained at an individual employee-by-employee level?

A No. We do not have a record of everyone who is working in a nursery in the state of Michigan. We work with --

Q Okay. Is the hospital required to keep a record like that?

A Not to my knowledge, no.

Q What if a hospital such as -- for example, I'm up in Saginaw. One of our big hospital systems is Covenant Healthcare in Saginaw, Michigan. What if Covenant just said, "You know what? We don't have the time because of COVID right now to deal with any of this stuff. We're not going to do anymore newborn screening blood spot extractions." Can they simply just ignore the department's directive to do so?

A So in this case you're talking about the newborn screening program, not the Michigan BioTrust program?

Q Well, let me be clear. I mean, just to make -- let me lay the foundation then. You would agree that the blood spots that go ultimately to the newborn -- or to the Biobank are the residual leftover spots from the newborn screening program; correct?

A Correct.

Q Okay. And the newborn screening program blood spots come from the blood extractions done by health professionals at the hospital within -- what? -- the first 36 hours typically of the birth of an infant in a Michigan hospital; correct?

A Correct; yup. Apart from home births; correct, yeah.

Q What if a hospital simply just said, "We don't want to participate anymore in your program"? What would happen?

A So in the case of the Michigan Newborn Screening program, a physician who is overseeing the birth of a child must cause the newborn screening to occur. So that would be, you know, the heel stick -- there's other aspects of newborn screening besides just the heel stick that you are referring to.

Q I just want to be clear. I only want to focus on the newborn screening. I know there's other tests that are done, hearing and other types of tests, but this case is only about the newborn screening program and the heel prick test.

A I need to be totally clear with you. Hearing is part of the newborn screening. So what you are referring to is the portion of the newborn screening program that is the dried residual blood spots or the blood spots. So the majority of disorders that are screened for a newborn screening, occur through screening of that blood. But newborn screening also includes screening for hearing and screening for critical congenital heart defects, which are point of care screenings. So that's all part of the newborn screening program.

Q Okay. Fair enough. So my --

A So if someone -- so if -- yeah.

Q I'm sorry. Go ahead.

A So if a hospital stated, "We're too busy with COVID," I think was your example --

Q Correct.

A -- to be able to perform the heel stick portion of the newborn screen, we would be very concerned about that because those babies would be at risk for, you know, more than 55 conditions not being screened for that could cause significant -- could cause loss of life or significant brain damage to that child or other significant irreversible physical harm due to lack of that screen.

So that would be taken extremely seriously by the department, and we would be -- I mean, I would be very surprised if a hospital took that step because of the jeopardy that it would put that child in.

Q What if a parent like myself were to say, "I do not want to participate in the heel prick test at all"? "Do not take my son's blood. Do not do it for a newborn screening test. Do not put it into the neonatal Biobank, no aspect of that portion of the newborn screening program." Is that permissible?

A So the -- so the state law is on the physician to cause a newborn screen to occur. If a parent was refusing to participate in that, that would be against medical advice. That would be up to the hospital to work through with that parent in that -- that parent in that case.

Q So the department would not be against Michigan law, as you understand it, for a parent to direct their medical

professional not to perform any aspect of that test?

MR. LEVIN: I'm going to object just to the extent it calls for a legal conclusion.

MR. ELLISON: Noted.

Q Go ahead, Doctor. You can answer.

A So the law is -- by my epidemiologic training or understanding, the law is directed at the physician, not at the parent.

Q What if a physician decided, "I'm going to follow the directives of the father," which in the example we've been using would be me, and "I'm not going to conduct that test because it would be contrary to his expressed wishes and directives as the parent of that newborn child"? What steps, if anything, or what trouble could the doctor get in based on following the directive of the parent rather than the department, if any?

A So state law is where the directive is coming from to the provider. I am assuming what the provider would have to do is to document all the efforts they made to explain to the parent the purpose of the screen, you know, what difficulty the child -- what risk the child is facing if they do have -- they're unfortunate enough to have one of these newborn period disorders.

Yes, I think there would be a lot of education and discussion, and then the provider, you know, would have to

take it up with their hospital and their legal counsel.

Q So my question is what would that do from the department's standpoint? What would that do for the doctor, anything?

A No. The department doesn't have some sort of sanction against the physician in that case. The department does follow up -- so what that would look like to us is that there was a child who did not receive a newborn screening. We routinely look for babies who have had a missed screen. We contact the parents to try and get the child in for a screen. These are children who -- you know, baby can appear beautiful, happy, you know, healthy, all systems go, and two days later completely crash, seize, their heart stops, they go back into the hospital because they have MCAD. Or, for example, a critical congenital heart point of care screen because some children, again, beautiful, happy, great outcome. Baby leaves, turns blue and, you know, has a major heart defect.

So these programs are put in place because there are children with these rare disorders who have deaths, disability, brain damage, physical damage because they don't have the screen. So we take missed screens very seriously, and we follow up with the parents, try to explain, again, what the program is about, why it's important. We also -- you know, we want to make sure that the child is connected with a pediatrician or the pediatrician is aware that the

child did not have a screen.

That way if the child has some kind of symptom, something going on, the physician may have a higher index of suspicion for certain kinds of conditions and be treating -- be attentive to that symptom in a more urgent way than perhaps they would for a baby who has a newborn screening result that came back completely normal.

Q Okay. The question for you then is part of the informed consent process and when you inform parents of their options in this system, does the department provide them -- provide notice that the parent can completely opt out or otherwise not participate at all in the newborn screening program as it applies to the heel prick test, the newborn screening program, and the Biobank as one big unit?

A So this is where nomenclature and precision is very important.

Q Okay.

A The informed consent is for the Michigan BioTrust.

Q Okay. Pretend I'm a -- again, we'll use the example of me to use it as an example. When I am presented with a copy of the brochure and the consent card, is the option of me opting out of any part of that program, meaning completely opt out of that program, is that presented as an option to me at the time that this informed consent is being -- is attempting to be obtained from a parent like myself?

A Can you please be clearer in your question about what you mean by the "program"?

Q I'm at the hospital. My son has just been born. I, as a parent, do not want to participate in the heel prick test, the newborn screening program, or the Biobank in any way, shape or form. In fact, I don't want you to even conduct the heel prick test because I have an objection to what you guys are doing at the Department of Health and Human Services. Is that option presented and told to me that I have the ability to opt out completely as part of the informed consent process?

MR. LEVIN: I'm going to object to relevance to the extent some of this has been dismissed.

MR. ELLISON: Understood. This is part of a chain, though, obviously, but I understand what you're saying.

Q Go ahead, Doctor.

A So the Michigan BioTrust consent brochure is presented to the parent along with the informed consent form for the Michigan BioTrust program. That is what the consent is about.

Q Okay.

A The consent is not about the medical care in terms of the newborn screening which, in this case, the testing is occurring at the state laboratory. So there is not active

consent obtained on behalf of the State of Michigan to the hearing test, the critical congenital heart defect screen, or the heel stick. Whether or not the hospital has some sort of consent to treat form or something like that, or whether those are covered within the consent to treat form that people sign when they come in to the hospital, I don't have knowledge of that.

Q Looking at the -- I believe earlier you were looking at a consent card in front of you as part of the deposition here today.

A Yup.

Q One of the curiosities that I find on this is that there is no option, at least as to my client's time frame when the card was in effect -- at least the version they got in effect, that would actually preclude the department from not storing the sample at all. Simply -- I guess to shortcut this that the sample should be destroyed directly after the newborn screening testing is completed. Why is that not presented as an option to parents?

(Witness reviews electronic data via video)

A So the card -- sorry. I'm having difficult with my screen.

Q That's okay. Take your time.

A So the card states -- so, for example, you can check: "No. My baby's leftover newborn screening blood spots may not be used for health research. By checking this

box, you understand blood spots will be stored for up to 100 years but not used for research. The blood spots are stored so the state lab can perform quality control tests and improve newborn screening. You may contact MDHHS if you do not want blood spots stored for any reason after newborn screening."

Q Do you know what year that particular version of the card has been utilized in?

A If I can make it big enough.

Q The reason why I say -- while you're looking, the text you just read to me is not the text that's on the BioTrust card for the infant by the initials RFK in this particular case. That would be signed by Ashley Kanuszewski on 4/22/13. Do you know when those -- I guess what I'm trying to understand, what version of the card you're looking at right now. Is there an indication?

A So I am looking at the most recent card. I don't know, from what I have here in front of me, when that card went into effect, but we can find that out.

Q Okay. The reason why -- I also have in front of me a copy -- and this has all been produced pursuant to a subpoena and discovery in this particular case. I'm looking at -- for the same parents, we have child CKK who was born on or about February 10th, 2016 also of Ashley Kanuszewski. That consent card is completely different than the one that

was just simply three years before that. I mean, it's a whole different design completely and none of the text you just read is in that consent card.

A So --

Q Do you have any information as to how or why these consent cards have been changed over the years?

A Sure. So as I mentioned, we work to try and improve how the language is on the card so it can be more understandable. There have also been changes in federal regulations related to informed consent that we needed to incorporate into the card so that the card changes for that reason as well.

Q What federal regulations have gone into effect that require the change in the card, if you know?

A So there are -- and I'm sorry. I don't have complete -- I don't have like a detailed time line to refer to here in terms of when those changes occurred and which kind of changes they were. But there have been changes to OHRP regulations as well as changes to the -- I'm going to get the name wrong -- the Federal Newborn Screening Saves Lives Authorization Act.

And then again, we also -- you know, we've spent time trying to improve the language on the card to make it simpler to understand, clearer. You've referenced a couple times that I am a scientist, and of course the way I speak, you know, we try very hard to make sure that we're not using

scientific terms when we can avoid it, that we're not using, you know, scientific language or that kind of thing in the card so that it is plain language because, you know, that is what makes it an informed consent as opposed to a -- just consent.

Q Would you --

A People need to be able to understand what you've written.

Q Okay. Have you -- I'm on my downward slope here on the last few moments here. So have you, by chance, had the opportunity to read the articles written by my experts in this case, like Dr. Elizabeth Eisenhauer or Dr. Sonia Suter in this case, as part of your preparation today or previously?

A I do not recall reading an article -- can you -- it was Elizabeth Eisenhauer and Susan --

Q Susan -- Sonia Suter -- Professor Sonia Suter --

A Oh, I'm sorry.

Q -- from George Washington University and Dr. Elizabeth Eisenhauer from Oakland University. She's a professor of nursing. They've done studies about the understanding and consent by patients -- well, excuse me. I should be clear. Dr. Eisenhauer has done studies about the knowledge of parents who are providing consent at the time of birth. Have you seen her article at all?

A I don't recall that I have seen her article. It has been

awhile since I've read the materials that came in the original filing.

Q Okay. And also -- I also was just curious if you've read the article written by Professor Sonia Suter. She's a bioethicist. She's actually a law professor writing about informed consent, about Michigan's informed consent system. Did you have a chance to read and have a comment on her article?

A I do not have a comment today on her article. I do not recall reading it. It doesn't mean I haven't. It's been quite a long year in terms of COVID.

Q Fair enough. And I get -- and by the way, I know you guys have been busy, busy, busy with COVID, and as a member of the public, I'm very grateful for the work you guys have been doing. So -- all right. So, finally, just a couple last follow-up questions for you. Harry Hawkins, I believe is someone who worked underneath -- correct me if I'm wrong -- worked underneath you. He's since passed obviously. Did he work underneath you as part of your supervisory chain?

A No. Dr. Hawkins worked in the laboratory in a very --

Q Would that be Dr. Shah?

A Yes.

Q Okay. All right. Can you also confirm that the information that's extracted by the newborn screening program is stored

in the system that we call the "central registry"? You're looking confused.

A Can you ask that again? Sorry. Yeah.

Q The reason why I ask is -- so let me give a little bigger, broader context here so we can communicate effectively. My understanding is if someone like a researcher -- pretend I'm a researcher now rather than -- I've been using me as a parent. Pretend I'm a researcher at a university, and I want to get ahold of everyone, and I saw -- for example, on the video that you guys have on your website, a study was done about mercury levels for pregnant women around Lake Superior, for example.

A Uh-huh (affirmative).

Q And I wanted to get blood samples from everyone who is -- I want to get blood samples from the Biobank that's people from particular zip codes during a particular time frame. That information, as I understand it, is stored in the system called a "central registry." Am I right or am I wrong about that?

A I'm not sure what database you're referring to.

Q Okay. So the term "central registry," that's not ringing anything for you right now?

A The Department of Health and Human Services has registries for -- like we have a cancer registry. There's a -- some aspects of the birth certificate are referred to as a

registry at different points when the birth certificate is being managed. But I'm not quite sure what you mean in relation to newborn screening data.

Q Okay. Let me ask it this way. Let's clear that off the table and ask it this way: Pretend I'm a researcher that wants to do research on mercury levels of pregnant women around Lake Superior State University -- or around Lake Superior up in the Upper Peninsula. I want to find blood samples during a particular time frame with particular zip codes up in the Upper Peninsula. How would I go about getting that information -- or how would I go about getting those blood samples that would be responsive to that categorization or that narrowing of samples that I'm looking for? How will I go about doing that?

A Yup. So you would contact the department. You would provide a protocol as -- you know, with that kind of detail in it in terms of, "I need women who delivered to -- you know, were born to women who lived in these areas during these time periods." We would -- for example, Mary Klein or some of her staff might have a conversation with a researcher trying to understand more about what they are looking for so that we can help them tailor that ask.

Very often researchers -- you know, you may want to know where the mother was living at the time of -- you know, before they became pregnant. We don't have

information on that. So we just talk to the researcher. You know, we can identify children in terms of the zip code that they lived in that's on their birth certificate. That's the zip code that their residence was -- their mother's residence was at time of birth.

So they would have their written protocol. They would also fill out a human subject review form, the IRB application. Their protocol, their IRB application would be reviewed by the human subjects review board. It would also be reviewed by the scientific advisory board that's part of the BioTrust. So there would be three reviewers with different kinds of expertise who would look at that application in a blinded manner -- pardon me. And they would provide information -- they would rate those applications. They'd provide their opinion and their score back to the department.

If the application passes that point, depending on the other kinds of information that might -- that the researcher might be looking for, there may be other steps. So, for example, if you -- you may have to go through a science advisory board that vital records has. That might be another step that your application will go through. But let's pretend it didn't have to go through that one. You have gone through the human subjects review at the -- at MDHHS. You would have gone through scientific advisory

board review at MDHHS. You would have gone through human subjects review at your own institution as a researcher, and at that point the information that you'd be looking for would be prepared. So there would be -- staff would go through and identify the children who we are able to pull under that request -- you know, their records and their session number.

Epidemiologists would gather the data, like I'm assuming you want mother's age or, you know, how many births she's had or something -- thinking about that research question, but, you know, whatever it is that has been agreed upon. Oh, there's one other document that -- there's two other documents that you would go through. You would also have a data use agreement because you were using data for certain purposes. You can't use data -- it's not like we're just giving you data and you have ownership over it. You're getting it for certain purposes. And there would also be a material transfer agreement that covers the residual dried blood spots.

Once all of those -- and the data use agreement would be reviewed by our compliance and privacy office. Once all of that paperwork, protocols, and forms have been reviewed and approved, the accession number for the children that met the inclusion criteria for that study would be sent down to Michigan Biobank -- Neonatal Biobank.

That's the only thing they'd know is that accession number. They would look to find those spots. They would process however number of punches of those spots were needed.

We would provide -- because there is data in this case, we would provide the limited data set with that accession number, and that would be provided to the researcher and then the blood spots would be provided to the researcher with -- sorry. Let me back up. I said something wrong there. We provide the accession number and limited data to the Biobank. They put that together with the dried blood spots for that individual and then they give it a totally different number.

So the Biobank doesn't know who the child is or the mom. The researcher doesn't know who the child is or the mom. If the researcher calls my staff -- they have a study ID attached to that sample and the data that they received. If they called my staff and said, "I'm looking at sample such and such and blah, blah, blah, I want to know more about this person," I don't know who that person is.

So it is -- we have -- you know, one of the reasons why the Michigan Neonatal Biobank is important is that, you know, my staff don't hold the key between the identity of this person that the materials are about and the researcher. Sorry. That was a lot of information. That was (inaudible) a long time there.

Q No; no. You're saying exactly what I need. You're confirming a lot of the details that I understood and come to learn about the program. So I guess my -- I guess the point I was trying to make with all this, it is possible to associate certain identifying criteria to a particular blood sample, meaning zip code, mother's age, you know, what number you were in birth, to a particular blood sample that's being stored at the Biobank, subject to all those details that you just provided just now?

A It is possible to provide a researcher with a very limited set of information about a family. And we spend a lot of time working with researchers to -- for example, we would not give mother's age. We would give age group. So we spend a lot of time limiting the amount of information or thinking through, you know, how little information -- and, quite frankly, how little information can we give to this researcher where they can still accomplish their goal and provided that goal is in, you know, alignment with the community values advisory board, the scientific advisory board, you know, all of those principles and review steps there.

Q Okay.

A So you wouldn't get a blood spot that says, you know, "This is from a 35-year-old mother from," you know, "2004 births at zip code such and such." You know, that would not

happen.

Q Let me ask this then: You mentioned now when a researcher wants to get access to a blood sample, they've got to get approval through, for lack of a better word, your office, IRB, the privacy office, the keying and re-keying of those. After all that, does the department ever go back to the parent and get their consent or back to the individual, if they're over the age of 18, and get their consent to participate in a blood study? Whether or not -- I don't want to differentiate right now, because I will in a moment, between prior -- May of 2010 and after May of 2010?

A The department does not go back to parents whose child is part of a study. We're relying on informed consent or the waiver of informed consent that exists associated with that blood spot. A parent can -- or an adult whose blood spot is in our system, can put in a form to remove their informed consent to remove their samples from this process and/or to have their spots destroyed.

Q I know, but my question, though, is that when studies get -- when the study is -- after checking through all those offices and all those different steps, the department does not go back and ask either the parent, if the child is still a minor, or the person's blood spot itself for consent to participate in that particular study; correct?

A Correct; correct.

Q And before May of 2010, there was no written consent obtained by the parent for medical research for -- say for -- say, for example, a 2004 sample was to be provided from one of these studies, for example, no parental consent was obtained at that point directly; correct?

A Correct.

Q All right. And then the reason -- and the basis for that would have been the waiver of informed consent by the IRB board?

A Correct.

Q After 2010, does the department take any steps, once a child is born, they sign this consent form, does the department in any way go back after a certain amount of time and say, "Hey, your sample is subject to medical research activities. Do you wish to continue to provide us with consent?" Do you ever go back and re-up or renew consent at any point?

A No, we do not.

Q Any reason why not?

A There's two thoughts in response to that question. We have obtained informed consent for use of a sample of materials, that is someone's, you know, intention at that time. So we make use of that informed consent going forward. We do not have a record of where that person has gone, you know, where -- where that person is now. We do not have a mechanism for reaching back out to that individual. That

would be a very large undertaking to reach back to 100,000 people a year, for example, let's say.

Q Okay. Let me ask this question, too, is that obviously when a child is born, they are not in a capacity to make a decision like that as a one or two-day old child. You would agree with that; fair?

A Sometimes I wonder about my own daughter, but, yes, I agree.

Q True, true. Okay. You would, at no point, though, when a person becomes the age of majority, which in Michigan is the age of 18, that the department doesn't go back and confirm that they -- the actual person themselves wishes to continue to be part of a potential research study or studies going forward?

A Correct. We do not do that.

Q Any reason why not?

A We have not had resources to be able to do that. Again, the -- that would be, you know, 100,000 people a year that we are reaching back out to for re-consent, I think.

Q But if you were to use a sample that the person today -- say just today -- you had a researcher today, and the person was -- the sample being used of somebody who is now 30 years old, you would not be reaching out to that 30-year-old person to say, "We want to use your sample now even though your parent, who is not you, gave some form of consent back 30 years prior on the day you were born"? You don't do

anything like that; correct?
A No, we do not. We do not.
Q All right. Last question I have is -- all right. I guess I'm going to skip over that. I'm going to skip over that part. I want to follow up with -- we didn't start in the beginning, so we jumped right off. If you could actually give your name for the record, as we jumped right into starting into this before. If you give your name for the record?
A I was wondering, yes.
Q Yeah.
A So my name is Dr. Sarah Lyon-Callo. I'm the director of the Bureau of Epidemiology and Population Health. Currently I am also working out of class as the director of the Bureau of Infectious Disease Prevention. I have a --
Q That wouldn't have something to do with the COVID, would it?
A Just a little. Dr. Shah and I are pretty much all COVID seven days a week. I have a Ph.D. and a master's degree in epidemiology. I have been working with the department officially as a civil servant since 2001. Prior to that I worked with the department as a contractor from fall of 1998. And I was the director of the Division of Lifecourse Epidemiology and Genomics with the newborn screening follow-up program beginning in 2012. I think that's everything you need from me, but happy to answer anything

else.
Q I think so.
MR. ELLISON: At a minimum here, I appreciate your time today and working with the communications between scientist and lawyer, which is always -- not always apples to apples in communication. I appreciate your time. And on a personal note, I do appreciate all the hard work you guys have been doing down with COVID because I know you guys have been on -- very much involved. And part of the reason we've delayed these depositions as long as we have, is we want to keep you guys working on that.
THE WITNESS: Yeah.
MR. ELLISON: As we often thank our veterans, I'm also going to thank our scientists, so we appreciate your work helping us all out, the rest of us over here who are hiding in our holes. So we appreciate it.
THE WITNESS: Well, thank you, Mr. Ellison. I really -- thank you very much for saying that. Thank you,.
MR. ELLISON: Well, I was going to say nobody thanks a lawyer, I can tell you that, but I'm going to thank a scientist for sure.
THE WITNESS: I have to admit I have seen -- yeah.
MR. ELLISON: Anyway, thank you for your time today. I'm going to turn it back over. These two other gentleman might have some questions for you, but I'm done

for today. So thank you for your time.
THE WITNESS: Okay. Thank you.
MR. LEVIN: Jeremy, do you have anything? Do you want to go first?
MR. KENNEDY: I do have some, yes. Good afternoon, Doctor. My name is Jeremy Kennedy. I'm the attorney for the -- actually at this point Dr. Antonio Yancey.
MR. ELLISON: Jeremy, I'm going to step away out of screen. I can still hear you, but I'm just going to step off the camera but keep going.
MR. KENNEDY: Okay. Thank you.
EXAMINATION
BY MR. KENNEDY:
Q Doctor, you distinguished, I think rightfully so, between the BioTrust and the Biobank; correct?
A Correct.
(Mr. Hendricks exited deposition)
Q The Biobank, does that do anything other than store the dried blood spot cards, to your knowledge?
A So the Biobank stores, maintains, you know, records about how many spots are on the stores so they sort of curate them in addition to keeping them nice and cold. And they also, upon the direction of the Michigan Department of Health and Human Services, distribute spots. So they'll assign the

study-specific number to a spot and provide that and then distribute that spot out to the researcher at the director -- direction of Michigan Department of Health and Human Services. The Michigan Neonatal Biobank will also promote the existence of this resource to researchers as well.
Q They do not, however, approve research projects, to your knowledge?
A No, they do not.
Q And they do not select the dried blood spots that are sent to researchers; correct?
A Correct.
Q The only -- the Michigan Department of Health and Human Services directs them to provide certain dried blood spot cards to researchers and that is all the information they get; correct?
A I'm sorry. Can you repeat that?
Q When there is a -- when they are -- when they do provide dried blood spot cards to researchers, they -- the information the Biobank gets is simply, as I understand it, "Pull these particular blood spot cards and send them to this entity"; correct?
A So the Biobank will be instructed to find the cards with certain accession numbers -- ascension -- accession numbers. It will be directed how any punches of the card out of a

dried blood spot need to be provided -- these little 13 millimeter punches. And in some cases they may also be given a limited set of variables, information that needs to be sent with that dried blood spot.

Q Okay. When they get a -- when they get a dried blood spot card from Health and Human Services for storage purposes, the card is de-identified; correct?

A Correct.

Q It just has an accession number that allows DHS to locate the card to say, "These are the cards we need if it comes up in the future"?

A Correct. Yeah, the name, date of birth, all that is ripped off the card before it is sent down to the Michigan Neonatal Biobank.

Q Okay. And the BioTrust program, can you just explain briefly what that does, the difference between the two?

A So the Michigan BioTrust -- let me just make sure.

(Witness reviews data via video)

The Michigan BioTrust is a program that receives the use of the residual dried blood spots in health research. The BioTrust itself includes outreach community engagement activity policy development around guiding principles about what's an appropriate use of the spots. The BioTrust also has coordination and approvals of research proposals -- or disapprovals of research proposals requesting use of the

dried blood spots. The Biobank is solely responsible for storage and maintenance of the spots and then distribution at the direction of the Michigan Department of Health and Human Services.

Q And, Doctor, you're familiar with the underlying policies behind the storage of the dried blood spot cards after their initial screening; would that be fair?

A Yes.

Q Okay. Why does the State of Michigan Department of Health and Human Services store these dried blood spot cards after they do the initial newborn screening for the disease -- various diseases?

A So the BioTrust for Health was put into place because there was recognition that there was this population-based set of residual sample that could be a very valuable resource for research into questions of public interest and questions for public good. So, I think, in the earlier questioning there was a comment about -- or a hypothetical about looking at mercury exposure to mothers in certain areas of the state and what sort of mercury exposure those babies may have had. It's a very important resource for understanding exposures and conditions that babies were in during one of the most sensitive periods of development in terms of gestation.

Q So would it be fair to say that, generally speaking, the purposes of storing the dried blood spot cards is you are

looking for ways to protect the public health? Would that be accurate, broadly speaking?

A Yes, that would be accurate.

Q And part of the reason you store these cards, again, in broad terms, is to at least in part develop tests for additional screenings of newborns if there are additional conditions, diseases that can be detected in the initial screening? You can discover those as well?

A Yes. This resources is something that can be used to identify -- to aid in the development of new tests for new disorders. Or I should put it -- it's not a new disorder. It's disorders. Let me be clear. It's an important resource for being able to -- for researchers to be able to develop new tests that would enable the detection of severe disorders of the newborn period through the newborn screening process or other medical processes at time of birth.

Q And in your opinion, Doctor, is that an important thing for the state to be able to do to develop these new tests for existing conditions?

A Yes, very important.

Q And why is that?

A So there are more than 54 conditions that we screen for in newborn -- in the newborn screening program. The program saves children's lives. This program also prevents disease

and disability in children. You know, I remember when we had the 50th anniversary for the newborn screening, being moved by meeting a young man who had galactosemia, and he -- if he had not been identified as having galactosemia, he would have been, you know, considered failure to thrive. He would not be as physically robust or mentally robust as he was. And, you know, he came and spoke about what is he doing now.

I've also had the fortune to work with a gentleman who was diagnosed in newborn screening with PKU, which is a disorder where his body is unable to process a particular (inaudible). What happens to people with PKU is that because they are unable to appropriately process that aminoacid, which is one of the basic building blocks of proteins in all of our bodies, they build up toxins and they lose mental capacity and other kinds of capacities. So before -- this is one of the first conditions we were able to screen for in newborn screening. And before there was a test for that and the ability for people to avoid eating this particular aminoacid, children would, again, be born healthy, beautiful, bright, you know, a wonderful moment, and then begin to deteriorate and eventually end up with significant loss of cognitive function, being unable to function, you know, independently in society.

This particular gentleman who I was able to work

with has now just graduated from medical school. So, you know, when I see those moments about how valuable this program has been, it certainly drives us all forward to see what else we can do to prevent disease, disability, and mortality among children.

We just recently went through a -- we've added a number of conditions just recently around lysosomal storage disorders and a couple of other disorders, one that's called X-linked adrenoleukodystrophy. And there's frequently mothers or families -- you know, one of the things I love about my job is I get to meet so many very dedicated parents.

THE WITNESS: As you are, Mr. Ellison, as well.

A And, you know, this was a mother who had lost her son to X-linked adrenoleukodystrophy. And we've just recently been able to begin screening for that. You know, we have lysosomal storage disorders where we have families who -- you know, they've lost their first child to this disorder. And their next child, they're able to know that the child may have this disease because their earlier child, as families will say, has been sacrificed.

So newborn screening enables families to know about disorders that may run in their families and prevent that, you know, loss of life -- very painful loss of life.

You know, we have treatments like for sickle cell

disease where children are able to take low dose antibiotic prophylaxis in their first year of life. It used to be that one-third of babies born with sickle cell disease were dead before their first birthday. And because of newborn screening, the -- you know, we don't see children dying due to sickle cell -- due to infections in sickle cell disease in their first year of life. I'm sorry. I could go on for quite for awhile. I'm very passionate about protecting children.

Q No. That's a wonderful answer, and my commentary -- it sounds like it's very rewarding work. And I don't think -- from what it sounded like, it sounds like you literally -- this testing saves thousands of lives quite literally?

A Yeah. We could calculate the number for you. I don't have that off the top of my head right now.

Q That won't be necessary.

A Okay.

Q And there are, as I understand, a number of polices in place to protect the privacy of the individuals whose DBS cards, the dried blood spot cards, are sent to the Biobank and possibly used for research later; is that correct?

A Yes.

Q Are there any -- in addition to the accession number, any other policies DHS has put in place to protect the privacy of these individuals?

A So the review process that we have, in terms of human subjects, in terms of scientific advisory board, the data use agreement process, are all designed to protect privacy in terms of if a researcher is going to use these dried blood spots. Is that what you're asking me --

Q Yes.

A -- or are you referring to something about the Biobank itself?

Q No. I'm referring to any polices DHS has, not Biobank policies.

A Thank you.

Q And there are policies in place where a parent or a subject, you know, once they reach the age of majority, can request that the dried blood spot cards be destroyed; correct?

A Correct.

Q And does that request go to DHS directly?

A Yes. It goes to the Michigan Department of Health and Human Services. There is a form. There's need for identification, you know, driver's license, birth certificate, so that we're assuring that the person who is requesting destruction has the ability to do so and that we've got the right material as well.

Q Okay. And once the information is received and the request to destroy a card is confirmed by DHS, can you walk me through the -- how the cards are destroyed? What the

process is to have the card destroyed?

A Do you mean in terms of the -- after the approval has been done? The actual process of destruction?

Q Yeah. After they get (inaudible) the request --

A Okay. That --

Q -- you look at everything, confirm that everything is proper, and that the card should be destroyed, what happens at that point?

A So the follow-up -- the epidemiology side of the Michigan BioTrust folks who work with me usually handle the paperwork and making -- you know, making sure that everything is in there and that the request has gone up to compliance and legal for review. At the point that it is approved, we then send off to the laboratory for destruction. So I think that answer is probably better heard from Dr. Shah than me.

Q Okay. To your knowledge -- and if this is something that's best asked for Dr. Shah, that's fine -- after the card is destroyed, does DHS keep any of the information that would have been contained on the card?

A The Michigan Department of Health and Human Services will still retain the information on the child and what their newborn screening result was. So it is the dried blood spot card that is destroyed.

MR. KENNEDY: Okay. Thank you, Doctor. I have nothing further.

MR. LEVIN: I have just a couple of questions for you, and then --

EXAMINATION

BY MR. LEVIN:

Q Yeah. So we've talked a lot about -- or at the start of your deposition, talked a lot about use and control of these residual dried blood spots, but who owns these residual dried blood spots?

A So the Michigan Department of Health and Human Services has qualified ownership over the dried blood spots. Sorry. Let me grab my notes because I do better with my notes.

(Witness reviews data via video)

Yeah, so the Michigan Department of Health and Human Services is who has qualified ownership of the dried blood spots while they are in storage. The department may, you know, release part or all of residual dried blood spot to the individual and that may be -- like an individual may request their -- or their family may request their dried blood spots for use in research studies or other uses of -- or destruction.

So the individual retains control over that, but the department has the qualified ownership of it. The Michigan Neonatal Biobank does not have ownership over those spots, qualified or otherwise.

Q So is that why a parent or an individual after they turn 18,

can request destruction of those blood spots?

A Yes.

Q And then relatedly, can a parent or an individual after they turn 18, request the return of those residual dried blood spots?

A Yes, they can.

Q So we talked a lot -- or you talked a lot also about the educational materials and information provided to -- I'm going to say hospitals and medical professionals. Who is responsible ultimately for providing that information to new parents?

A The medical professional treating that -- that -- the medical professional that is attending that birth I guess is the way I would put that -- treating that baby and mother.

MR. LEVIN: That is all I have. Thank you.

THE WITNESS: Thank you.

MR. ELLISON: I've got just a couple follow-ups here, and then I think you're all done for today. And I appreciate your time.

EXAMINATION

BY MR. ELLISON:

Q You mentioned just a minute ago about return of blood spots. Is it possible rather than getting blood spots destroyed, that you can get blood spots returned to the parents or to the person if they're over the age of 18?

A Yes, they can. The -- say, for example, there has been an instance in my memory where an individual or parent -- I can't remember which -- wanted the dried blood spots used in a research study, you know, not associated with the department or the Michigan BioTrust, a separate study, and, you know, requested that the spots be sent to that -- returned to the parent or adult -- I can't remember which -- but went to that researcher.

Q If I was a parent and wanted my child's blood spots returned to me -- just returned to me, not for another study, just I don't want you guys to hang on -- I don't want the Biobank to hang on to them anymore, would the department return those blood spots to me as their parent?

A If you've gone through the process of, you know, identifying that, you know, who you are, that you are, you know, related to that spot, yes, the department can return those to you.

Q Is that information ever given to a parent that they have the option to have the return of their child's blood spots, to your knowledge?

A I would have to read through the brochure. I don't think it is covered in the brochure that you can have them returned to you. This is something that -- you know, the information about destruction is covered in there. At the point where people are asking about destruction, that is, people want them returned, other times people will be aware that the

resource exists and (inaudible) for a different purpose and will reach out about that as well.

Q Have you ever heard of a -- have you ever heard of a use of the blood spots beyond -- well, I guess let me ask it this way: Rather than doing a medical study that blood spots have been used for crime victim identification?

A So that is not part of the Michigan BioTrust for Health. That is a use of the blood spots that predates Michigan BioTrust for Health. It's part of the newborn screening program. So, yes. I'm sorry. That was a long way to say "yes."

Q Okay. So if a law enforcement individual wanted to get access for a blood spot for, let's say, DNA testing -- right? -- the department has got some sort of process or standards in place by which they'd give that blood spot to a law enforcement officer?

A Correct. There is a process -- there is a legal process that they would have to go through. It's not just that someone calls up and says that they're a policeman, they want the blood spot. There is a legal process that they would have to go through. You have to meet a standard that this is for crime victims so this -- it can be released for that purpose.

Q Okay. Do you guys have any written policies or directives on this? This is something that I've not seen as existing,

at least to date. I mean, is there some sort of policy somewhere or something that references this?

A I do not have those things up in front of me. I did not review or prep for this kind of question right here. So, yes, but I can't describe them to you.

Q You didn't prepare for this portion of the deposition?

A No.

Q If you would, could you get -- when you get done -- and this doesn't have to be done in the next ten minutes after we're done here. But just in the next couple of days, can you get a copy of that over to Mr. Levin? Because I'm going to request that as part of discovery request in this case. Okay?

The last thing I wanted to ask is is that the -- do you know, as a general custom or practice, when hospitals typically ask for consent for retention and use of medical -- the remaining medical -- or excuse me. Let me start over again. Sometimes I get tongue-tied when I'm talking here. Are you aware of the usual customary time frame of when the hospitals ask for consent from parents to use the residual blood spots for medical research? Like when is that consent sought?

A Are you asking when hospitals usually obtain Michigan BioTrust consent?

Q No, not Bio- --

A Or are you asking --

Q When the --

A Because they don't have residual dried blood spots.

Q Okay. Let me rephrase the question and make sure we're clear. For example, I'll just use me as the example. My son was born at 3:30 in the afternoon. The following morning at 6:00 a.m. after a whole night of no sleep and birth of a child, they presented me, an exhausted dad, and a sleeping mother, with a consent card for signature. Is it the usual practice of hospitals, based on your knowledge, that hospitals ask for consent after the birth of the child but before they discharge from the hospital?

A So I'm not sure what consent you would be talking about in terms of the hospital practice.

Q Well, let me -- the consent card that's in front of you that checked the box "yes" or "no." The one that we've been talking about.

A Uh-huh (affirmative).

Q That was presented to me after 12 hours of no -- more than 12 hours of no sleep and my wife -- after my wife just gave birth to our son; right? And this is my representation. Obviously you weren't there. I acknowledge that. As well as I will also represent that to my clients, each one of them were at different hospitals, were presented with their cards almost about 12 hours following the birth of their

child. Do you know if that's the usual customary practice or the standard practice required by the department when seeking consent for putting these blood spots -- or deciding what to do with these blood spots for medical research purposes?

(Mr. Hendricks joins deposition)

(Ms. Campbell leaves deposition)

A Okay. So now I understand what your question is is you're asking about what a usual practice -- am I aware if there's a usual training of the presentation of the informed consent brochure and presentation of the card. Okay. So I wasn't sure if you were talking about like some sort of residual tissues or something that the hospital deals with in a different way. But I'm hearing that you're asking about Michigan BioTrust.

So the neonatal blood sample, there is a period of time after the baby is born. There is sort of a window after the baby is born that it's important to draw that sample. And, you know, if you draw the sample too early -- so a lot of what is being detected for in newborn screening are different metabolites that the baby has generated in their blood and they have to find this window of time where there's enough time that the baby will have generated those metabolites that can be screened for but not too much time that the information is no longer useful in terms of being

able to identify newborn screening disorders in a timely manner to protect that child.

So that's why this 12 hours. So 12 to 24 hours is the period of time that you want to have that blood drawn for that baby. Length of stay for a healthy -- a lucky, healthy baby in the hospital is around 24 to 48 hours, so there's a lot that is being managed and packed in in terms of that child's care during that time. So 12 to 24 hours is when they want that sample drawn.

In terms of -- you know, I am not a neonatal nurse, but in terms of how they're functioning, they're going to want to handle everything about that newborn screening card, including the Michigan BioTrust consent, which is in the newborn screening card, even though it's not part of the newborn screening program, and they're going to want to, you know, manage all of that information, those asks, at the same time.

Q Well, let me ask you --

A So I think it's not surprising to me that it's around that 12-hour time for the parents that you know.

Q But let me ask this, though. If a parent -- if you truly wanted a parent to understand the risks and benefits of this program, meaning whether it's -- and I would actually say both, but we're here specifically about the neonatal Biobank storage and use of medical researchable blood, wouldn't it

make sense to require that hospitals need to give these two or three weeks out before the parents show up at the birth rather than in the aftermath of right after the birth occurred?

A So about one-third of the births in the state are not preregistered at hospitals prior to delivery. That said, we encourage hospitals to provide information in baby packets. We work with OB/GYN's and other groups to promote awareness of, like, what to expect. So we promote the information about newborn screening but also about the Michigan BioTrust to health care providers so that they can provide that to patients.

Q But there's no rule requiring that, though; correct?

A No.

MR. ELLISON: Thank you very much. Again, appreciate your time today.

MR. LEVIN: I have just one follow-up briefly.

EXAMINATION

BY MR. LEVINE:

Q So if somebody submits a consent form -- strike that. I'm going to rephrase. If a parent signs a form providing informed consent to the BioTrust program in storage and research and medical projects, can they change their mind later?

A Yes.

MR. LEVIN: Thank you.

MR. ELLISON: Jeremy, I guess you get last shot. Have you got anything else you want to ask?

MR. KENNEDY: I have nothing further, no.

MR. ELLISON: Before this poor lady's cell phone battery goes dead here? All right. Doctor, thank you so much today for your time. You've been a good sport working through all of this craziness with the Zoom platform here. So we're all set with you.

(Deposition concluded at 3:06 p.m.)

-0-0-0-

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
NORTHERN DIVISION

ADAM KANUSZEWSKI, et al,

Plaintiffs,

v

Case No. 18-cv-10472

MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES, et al,

HON. THOMAS L. LUDINGTON
MAG. PATRICIA T. MORRIS

Defendants.

/

VIDEO CONFERENCE DEPOSITION OF SANDIP SHAH, Ph.D.

Taken by the Plaintiffs on the 17th day of December, 2020,

via Zoom, at 2:00 p.m.

APPEARANCES:

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Also Present:	Eric Hendricks

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1-800-632-2720

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Via Zoom Video Conference
Thursday, December 17, 2020 - 3:16 p.m.
REPORTER: Do you solemnly swear or affirm that the testimony you're about to give shall be the whole truth?
DR. SHAH: I do.

SANDIP SHAH, Ph.D.

having been called by the Plaintiffs and sworn:

EXAMINATION

BY MR. ELLISON:

Q Good afternoon, sir. If you could state your name -- we're going to do it right this time. State your name for the record and your current position with the department.

A Yes. Sandip is my first name, S-a-n-d-i-p. Last name is Shah, S-h-a-h. I'm the state public health laboratory director, Board Certified director for Lansing as well as regional laboratory system, and I manage Kent County laboratory for State of Michigan.

Q So you've been doing some COVID tests, I'm guessing, the last few months?

A Oh, my goodness. It has been 24/7, 365 almost. I haven't had a day of vacation yet, not even a weekend, so --

Q It sounds like you might get some next year, but you're not doing a vacation anytime soon. But --

A I hope if I last that long.

Q There you go. There you go. So just to confirm, you just

said you're --

MR. ELLISON: Sorry. Pam is waving at us.

REPORTER: Phil, your -- could you turn your volume up a little bit, and, Doctor, could you turn yours down a little bit?

MR. ELLISON: Oh, sure.

THE WITNESS: Absolutely.

MR. ELLISON: Yeah, how about we do that? I'll move my mic. Is that better?

REPORTER: That's better. Thank you. Sorry for interrupting.

MR. ELLISON: No problem.

THE WITNESS: No problem.

MR. ELLISON: I was going to say I'm normally not accused of being too quiet in a situation, so that's new.

Q So, anyway, I'm just going to jump in and ask you some questions here. Obviously you sat just through the deposition of Dr. Callo-Lyon. Is it --

A Sarah Lyon-Callo.

Q Lyon-Callo? I got it back- -- I knew that it didn't sound right. Lyon-Callo. I'm going to have just some follow-up questions with you on this, and then we'll turn it over to the other guys here. Have you ever done a deposition before?

A No, this is the first one.

Q You did get a chance to see what went on the last time around. And that's pretty much -- I'm going to ask some questions for awhile. If my questions don't make sense, don't hesitate, and say, "That doesn't make sense. Restate it." You know, you're not going to hurt my feelings at all with this.

And I think we only had one thing last time around. Occasionally the lawyer might object to the question. Unless Mr. Levin directs you not to answer the question, you still answer all questions, and later on the judge decides whether the question that was objected to was improper in some form or fashion. Okay?

A Okay.

Q Anyway, all right. And you are here, also, as I would note, here in your official capacity, which is basically you're the -- I've sued you as the agent of the department that way. So your questions are not on your behalf but on behalf of essentially your agency as a department -- as part of the department; fair enough?

A Uh-huh; sure.

Q Okay. Now, occasionally -- I was just going to say I'm glad you did that because occasionally I may say, "Is that a 'yes,' or is that a 'no'?" That's just because we're human. I can see you and know what reaction it is, but Pam on here has got to write it down in verbal form in some fashion. So

with that being said, let's get underway.

What -- and I know we've talked a little bit before with Sarah about the BioTrust. Can you explain, from your perspective, what is the BioTrust within the Department of the HHS?

A Absolutely. The BioTrust is a program that's run by the Department of Health and Human Services, and this is to oversee Michigan's storage spots, the dried blood spots and their potential use in health research for overall good. The BioTrust encompasses also outreach and community engagement policy, development as well as coordination and approval of research from that blood spot. So that's the BioTrust.

Q Okay. Now that's separate from the newborn screening program, I guess -- I don't want to say "theoretically," but, I mean, there's kind of an invisible line, if you will, between those two programs; is that fair?

A Yes. The newborn screening program is the testing program, and this is for potential research coming out of those spots that we save.

Q And we've talked today obviously about the Michigan Neonatal Biobank, and I'm just going to call it "Biobank" for short, as we've been doing throughout today. What role do you have in relation to the Biobank?

A I sit on the board of Michigan Neonatal Biobank, or Biobank, as you say.

Q Yup.

A As a stakeholder. The Biobank is a storage repository for dried blood spots. It's distinct from State of Michigan, different entity. It's a 501(c), whatever they call a nonprofit agency and the stakeholders run it. By stakeholders we are one, and obviously other university, like the University of Michigan, Michigan State University, Wayne State University, they all participate in this, and they're all part of running the neonatal Biobank for dispensing the blood spots to potential researchers.

Q Okay. And why -- I guess let me ask this question: Why -- let me go back, maybe a half step back. Were you involved with the formation of the Biobank back in -- and I'm just spitballing here -- around 2010?

A No.

Q Okay. How did you get on to this -- and I'm going to call it the "board," and I treat it as a board of directors, but on this board or you call it "stakeholders." How did you get assigned to that particular responsibility?

A This was in 2012, December, when I took over as the state public health laboratory director. Before that I was in infectious diseases, so I was not part of the chain of command for newborn screening program.

Q Well, did the person who held your current position before you serve in that role on the Biobank board?

A Yes, I believe so; yes.

Q And what role does -- what activities or what responsibilities does the board have in relation to the Biobank as an entity?

A So the board oversees the storage program, so to say. They look at how the blood spots are stored, in what manner, how secure everything is. The promotions that the blood bank usually do with other researchers, other centers that are potential clients, all that is reviewed by the board probably two or three times a year and we look at the finances of the Biobank, if everything is okay, and we discuss potential problems, if there are any, as a group, as a board.

Q Okay. And, I mean, just to shortcut this, you would agree that the Biobank is storing, managing, cataloging, and assuming control but not ownership of the blood spots in infants that have been sent there by the department following the completion of the newborn screening testing?

A That is correct. They are a repository only, and an institution that will dispense this blood spots as required, when ordered to do so.

Q Is there any particular reason that you know of why the state has utilized a private, nonprofit entity as a storage facility that -- I mean, from my -- this is my

perspective -- would be outside of the normal controls of government to store these blood spots?

A Yes, of course. As a state entity, if I had to do this, I couldn't. I don't have the resources. I don't have room. I don't have space. I don't have personnel and the expertise that this private organization has and that's why we utilize them. If I had to do it it would be much more expensive, no funding for it.

Q Okay. But the department -- as we heard from Sarah, the department actually does contribute money towards this particular -- towards the operation of the Biobank. I mean, would you agree with that in your role at -- and I'm asking you today as -- on your behalf of your role today in your deposition today if you agree with that position.

A Yes, of course. And it's only a partial funding. We -- other entities like University of Michigan, other stakeholders, let me put it that way, they also contribute.

Q Okay. How is -- I mean, looking at the board of directors, we have the DeVos (sic) group, which is a -- we'll call it a private organization. You have three universities, and you have this -- just for a shortcut -- the State -- right? -- our representatives of the Health and Human Services. Is there any reason why you don't have somebody who takes my view of the world, which is that this has got medical privacy and medical and constitutional issues, to serve as a

stakeholder on that board?

A I would rephrase that question again for my proper understanding.

Q I guess what -- I'm under- -- what I see is -- and, again, this is my representation, my viewpoint as I'm trying to articulate to you. You've got three universities who are all potential beneficiaries of the blood spots they need for their research work that's being done by employees and researchers at their universities. The DeVos Group has got medical research interest in there. The state obviously wants someone to, as you just mentioned, make it more cost effective to store these suckers.

Is there any particular reason why stakeholders -- like there's no parents or specifically parents or someone like myself who you guys have come to -- have to come to learn that I've got some objections to this particular program, why there aren't others on that board outside of kind of basically the ones who benefit from having access to blood spots?

A All the stakeholders, they have contributed something in order to be on the board, to be honest with you. I think what you're calling "DeVos" is probably Van Andel Institute. Is that what -- well --

Q Yeah, Van Andel.

A Okay. There is no DeVos that I know of, I can tell you

that.

Q I'm sorry. I get those western -- I'm from the eastern side of the state. The Van Andels and DeVoses, I get them backward sometimes on those things, but, yeah.

A So the reason Van Andel Institute is used is they are the ones who are providing the software for cataloging all these blood spots. If we had to buy that software, we would close the program. This software is available for free for us to use from Van Andel, and that's why they're part of it.

Q Why do they supply -- do you know why they supply the cost or the software itself?

A In good faith to promote research for human good.

Q Would you agree -- and I didn't ask Dr. Lyon-Callo this, but would you agree that the testing results from the newborn screening -- we've seen numbers along the lines of one in every 500 children or one in every 400 children gets flagged as a potential health concern based on that. Is that consistent with what you understand the numbers are? I know very obviously, depending on what group you look at, but is that a fair representation of the statistics of what you're finding through the screening program?

A Yes, I would agree to that. Normally if I had to put a good average in front of you it will be about 275 kids that come down with life threatening problems out of 100,000 babies born in Michigan. This is on a yearly basis. Sometimes --

from testing sometimes we have more babies, but then we confirm the testing by doing confirmatory tests and we either eliminate those babies, or we include some. But on the average, about 275 babies identified out of 100,000.

Q Out of 100,000?

A That could be the right statistics, yes.

Q Okay. You -- again, I'm going to just keep this short-circuited here. Would you agree with Sarah's assessment that before 2010, that -- excuse me -- before 2010, that consent for medical research purposes was not obtained from parents for blood spots being held today at the Biobank that are qualified -- that are owned in a qualified manner by the department?

A Correct. It was not obtained. This was a new program. BioTrust was just coming up, just evolving, so it hadn't been thought about yearly.

Q Now, I know we've mentioned you're a doctor. You have a Ph.D.

A Yes.

Q You're in the same club with my wife; right? Another Ph.D., you know, that way. I guess, do you have -- I mean, as part of your -- part of your education, do you have medical training?

A I have medical training. I am the -- my Ph.D. -- my doctorate degree is in veterinary medicine, and I have a

master's degree in human microbiology.

Q Okay. So, I mean, I guess -- I mean, I'm not trying to poke fingers or anything here, but would you categorize yourself here as a public health -- I hate to --

A Laboratorian.

Q -- expert, but, I mean, you're a person that is learned in the ways of public health. Would you agree with that?

A Yes, I would. I am a public laboratorian.

Q Okay. I heard that phrase earlier, and I've never heard that phrase before that way and that was a new one on me, but -- would you feel that in -- someone of your position and with your education would be able to comment about the necessary consent that is required for medical research purposes such as the one being undertaken through blood samples from the Biobank?

A Yes.

Q Okay. All right. So my question would be to you -- would be is, do you believe, based on the practice of what is informed consent, that a sufficient amount of informed consent was obtained from the parents of newborns prior to 2010 to authorize their use in medical research studies, but, you know, for the blood spots that are being stored in the Biobank?

MR. LEVIN: I will object just to the extent it calls for a legal conclusion.

Q Go ahead, Doctor.

A Yeah. I would leave it to my legal experts to provide an opinion on that. If it had to personally say something, I would say, "Well, it didn't exist back then." As soon as we realized we had to do something, we instituted it, and that is past, I guess, May of 2010.

Q Okay. Are you aware -- I mean, there was a case that -- there was a challenge to Texas's newborn screening program about the retention of blood spots, and it resulted in -- and, again, I'm just making my representation to you here, is that it resulted in Texas deciding to destroy almost 5 million blood spots. Are you aware of that circumstance?

A At one time I did happen to read a little bit about it. Yes, I'm aware of it. I don't have the details as to why they had to destroy so many spots.

Q Okay.

A That's a big loss to the human research in this nation.

Q So -- and, again, I'm not asking you to draw on a legal conclusion here. I'm simply asking in your role as someone who is in a public health profession --

MR. ELLISON: And, Aaron, I will acknowledge your objection about calling for a legal conclusion.

Q The IRB's can decide in lieu of parents or the persons themselves to provide consent for medical research of blood spots taken at birth, in your opinion?

A IRB is a board, and my conclusion will be yes.

Q Okay. Is there any -- in your mind, is there any limits, again, as a public health -- on the public health -- excuse me -- public health perspective as opposed to legal -- as to when -- as to how much consent needs to be obtained when consent is not obtained from the very person -- you know, their human material -- when they, themselves, haven't given that consent? I mean, is there any principles, or is there any standards that guide, as a customary practice in your particular field of expertise, that would say -- you know, obviously you've said so far an IRB approving something is acceptable. What would be unacceptable? What would be on the other side of that line?

A Unacceptable would be if we were doing research by identifying the individuals. That would be wrong. If we would be -- doing research that is outside of human good, that would be objectionable, and I won't agree to that. In this case, there is no harm done. There is only benefit. The research only provides good data for improvement of newborn screening programs or development of new tests, development of new equipment, maybe more advance and so on. There's no harm done.

Q Okay. I asked this of Sarah, and I did it somewhat inartfully before, and I'm probably going to do it inartfully again right now. But what I was asking her was

is that for some reason if the judge said, "I'm ordering you" -- you know, "Dr. Shah, to do the following things as it applies to the retention of newborn blood," would you be the right person to be that person where that would be directed at? Meaning you're in charge, have enough sufficient authority to direct the Biobank and the BioTrust about new -- about the retention utilization of newborn blood samples being stored at the Biobank?

A I would be one of the persons, not the only.

Q Okay. Would Sarah be the other one, Dr. Lyon-Callo?

A Dr. Lyon-Callo would be the other one.

Q Anybody else in your opinion?

A Sure. We would definitely consult with the chief medical executive of DHHS and the director of DHHS.

Q That's Dr. Joneigh Khaldun?

A Yeah, Dr. Joneigh Khaldun and Robert Gordon is the director.

Q Is the director? Okay. We've all come to learn Dr. J -- right? -- from the press conferences, obviously, the last ten months of COVID world. Let me ask this: Obviously knowing Robert Gordon is the director of the agency, and if he directed you to do something relative to the program, you would be subject to his directive ultimately -- correct? -- as it applies to the BioTrust?

A Yes. It would be a directive that we would study as a group and make sure that it is the right directive.

Q Okay. So --
A Mr. Gordon is not a scientist.
Q So, I guess -- let me ask -- let me put it this way: The bucks would stop with him as the head of the department?
A No, it would not. It would be one of the opinions because he's not a scientist. So we will evaluate the order based upon science.
Q Okay. Let me ask it this way because I want to make sure that I have named the right people in this lawsuit, is what I'm trying to make sure I understand. Is there anybody else -- I mean, I know you -- what I tend to find -- and I'm just going to be frank with you and speak candidly, as I already have been -- nobody seems to be the ultimate decision-maker in this department because you guys all work together largely as a team. Okay? And that's just my observation, and I don't fault anybody for that, but as a lawyer somebody has got to be the decision-maker; right? Someone -- the buck has to stop with somebody, and usually in the legal profession. Who, in your opinion, would be the person that would be the decision-maker for the way the BioTrust operates as it applies to newborn screening blood sample residuals?
A Are you looking for a dictator? We're not. I'm sorry. It's kind of funny, but, yeah.
Q It's a weird question, I know, because -- you know, there's

inherently a disconnect, obviously, between the way scientists approached issues as opposed to lawyers approaching issues, obviously, and the law approaches issues. I guess I just want to make sure -- is Dr. J somebody I'm going to need to add to this lawsuit? Is she someone that's got supervisory authority that should be part of this? Is there -- is it just -- or is it just Director Gordon? Obviously you two, you and Lyon-Callo both have direct supervisory control over the program. Is there anybody else that I need to be focused on about the way the BioTrust operates going forward, in your opinion, in your role within the department?
A To answer that question today, I would say no, because the others have not been involved at all. They're all new people, and so Sarah and I -- Sarah, meaning Dr. Lyon-Callo, and I, we are the chief entities here.
Q All right. Very good, and I appreciate that. I appreciate you sticking with me as I flub my way inartfully through that. So a couple other questions I have, once -- let's set up the time frame here. The hospital has a child that's born at it; medical personnel conduct the heel prick test, distract that blood, put it on a Guthrie card or a DBS card I've seen them called, too. It's shipped over to a state laboratory, which you're in charge -- that's your division you're in charge of. The testing is done. Okay?

Now, up to that point right now I've been trying to fight about that, and we -- that's now not part of the case right now based on some court rulings. And then from that point forward is when the BioTrust program kind of kicks in and takes over. It takes those residuals, ships them over to the Biobank, and then, of course, we'd have the research issues and things of that nature. Is that -- I know it's an overly simplistic view, but is that a fair, high-level overview of start to finish of the chain of different entities that we've talked about today and Dr. Lyon-Callo has talked about as well?
A Yes.
Q Okay. I want to know then, after the newborn screening program is complete and the testing -- or excuse me -- and the storage and the medical research part begins -- right? -- you know, at that point going forward, all the way through the Biobank and research -- is there anything that's being done at that particular point that makes a child specifically at risk if those activities do not occur on a child-by-child basis?
A No. Unless there were abnormal results, then it would trigger some actions on our part.
Q And to be fair, what I understand is if there's abnormal results, that's still part of the newborn screening program as opposed to the BioTrust; is that right, or am I wrong

about that?
A That is correct.
Q Okay. All right. So my question, to make sure we're on clear, so from the BioTrust point forward, that's the time frame I'm talking about. There's nothing specifically by -- if they did not store that blood sample, a child's life would not be necessarily in eminent danger in any way; fair?
A That would be fair, but if we had to repeat the test, we would lose that ability to do it. If we had to run a quality assurance, we would lose that ability as a laboratory.
Q But you could agree with me that if you guys needed a blood sample, you could call the parents and ask them to provide a second blood sample; true?
A It is not same as the original blood spot because the metabolites change. That's why we have that window between 12 and 24 hours to draw the blood because it represents a specific status. It changes if it's delayed.
Q Have you -- I'm going to switch gears here a little bit, and have you seen the brochure -- and it's called, "Your Child: Your Blood Spots," or, "Your Child's Blood Spots" brochure that was referenced? I just call it the "brochure." I don't know what the title is offhand.
(Witness shares document via video)
Yup, that one right there; yup. Thank you. If a parent did

not receive a copy of that brochure prior to signing the consent form, would you, as a public health official, a public health -- a person learned in the ways of public health -- believe that the parent had received sufficient informed consent when signing the consent form?

MR. ELLISON: And, Aaron, I will acknowledge, because I'm guessing you're going to want to jump in with a legal -- I'm not asking a legal here, so I'll acknowledge that objection right now. Save you the call.

MR. LEVIN: Thank you. Thank you.

MR. ELLISON: Yup.

Q But, Doctor, what do you say about that, as a public health official, about if a person did not get that brochure?

A I have to agree that if the brochure was not given, that would be a wrong practice, and if we knew about it, I would let Sarah know, Dr. Lyon-Callo, and her group will try to reeducate the hospital or wherever this took place. This brochure and the consent form and everything has to be given when the blood is taken from the child. Simple as that.

Q Okay. Well, let me -- and I appreciate your answer, but it's not quite what I asked. My question, though, was is that would you, as a public health official, conclude, based on your experience and education and understanding of public health issues and testing and IRB's, and, you know, everything else, that if a parent did not receive the

brochure that they did not get sufficient -- they were not sufficiently informed about the Biobank and the BioTrust program to be -- to have -- to be able to give informed consent? Would you agree with that?

MR. LEVIN: Same objection, but proceed.

A It would concern me. If somebody had to point out that they did not get this, it would concern me, yes, absolutely.

Q Would you say that would just simply be attempted consent or attempted informed consent but not actual informed consent? I'm trying to box -- I'm not joking. I'm not -- I'm trying to box you in. There's no -- I'm not -- you know, I don't make any qualms about it. I'm trying to box you in right now to say, you know, if -- you know, basically if a parent was just given the card and no context with the brochure, does that, based on your experience, fail to provide enough information so that the parent could not have given informed consent?

A Simple answer is, yes. But if I was a parent, I would legitimately ask, "What is this? Explain this to me." You and I have both seen hospital bills; right? Don't we question that? Same thing here.

Q Same question I asked Sarah. Do you know what is the customary or normal practice of when a hospital presents the brochure and the consent card to a parent to seek their consent for -- and, again, just because the case is the way

it is, the BioTrust and the Biobank portion of this particular program from start to finish?

A I would say most of the times everything goes well. It's occasionally that we hear something in Sarah's group -- I mean, Dr. Lyon-Callo's group. They try to correct it every time. And human beings are involved here, so mistakes can occur under pressure. That's what we're dealing with here.

Q When would you expect the hospital to have provided that information where the parent would be in the best position to make an informed decision about this -- about whether or not they want their newborn's blood sample to be part of the BioTrust and the Biobank portion of this system?

A To me it should happen right before the blood spots are taken. It could happen when the mother was admitted hopefully, but different departments of the hospital deal with these scenarios. I can't expect the admitting person to actually handle these kinds of things. It's really almost impossible. So that's why, yup.

Q Well, wouldn't it be more ideal, though, to say -- and I guess Ms. Sarah testified that one-third of birth are -- I don't want to say "unplanned," but just spur of the moment sort of things, weren't planned. That means two-thirds. That means you said there's 100,000 births a year. That means 66,000 births a year are well-planned out ahead of time. Wouldn't it make more sense that if a person -- if

the goal of the department was to make people fully and fairly, as best possibly, informed about the newborn screening program, the BioTrust program, the Biobank program, that the best time would have been a few weeks before showing up rather than mom is in labor or right after when mom has just given birth 12 hours before?

A In order to do that, how do we know who is pregnant, who is going to go to which hospital or even going to hospital? There are some who don't go to hospital. They've called somebody home. I've seen that. This is difficult to ascertain. How do you do that?

Q Well, that's one of the benefits of being a lawyer, I don't necessarily have to give the good answer for this. I get to ask the questions; right? So let me ask this then: Let me ask you -- and I don't mean to be intruding on your personal life, but do you have children?

A Yes, sir. I've got -- I've got two grandchildren, too.

Q Two grandchildren? Well, congratulations.

A Thank you.

Q You've bought your way into heaven now with those grandchildren. All right? So -- that's what I tell my dad. The father that's giving gifts to my son is not the same father I grew up with. I can tell you that, so -- but, anyway. You know, interests change in time, you know.

A Yes.

Q So anyway. You know, when your wife gave birth to your children, and, you know, it's a -- you would agree it's a stressful, trying, difficult process having a woman giving birth to a child. I mean, I think we can agree to that, couldn't we?

A Yeah. And I like to smile. You're young when you have a child born. Okay? You have different hormones. I'll be tired but not when I was young.

Q So my son was born two weeks early and this is my story to put this in context. My son was born two weeks early. I literally that day was having the window guys replace the windows -- all the windows in our house that day. So half the windows were gone, decided today was the day to show up two weeks beforehand. And we go to the hospital, and he's born at 3:30 in the afternoon. We had some medical issues where he had to be admitted to the neonatal unit and the nurse presents to me, after being at the hospital all night at 6:00 o'clock in the morning, the card. Not the brochure, just the card. Okay?

Would that, in your -- looking at that as an example, would that -- and again, understanding that we don't necessarily -- can't control all facets of nature. I'll be the first to -- as the father of a young child, I can say we can't control all facets. I don't doubt that. But wouldn't that -- at that time frame -- what? -- 15 hours

after the birth of my son and with the NICU issues, that that would not have been the best time to ask me or my wife to make an informed decision? Would you agree with that?

A So out of 100,000 parents I'm hearing this from you. So you have one parent who's bringing this to me out of all of those.

Q Uh-huh (affirmative).

A That's scenario number one.

Q Yup.

A Number two, you may not read it at that time, but you have a right to read it like 48 hours, 72 hours, 96 hours after that, and then again decide whether you want to participate or not.

Q Right.

A You don't have to decide right away if you're so busy; correct?

Q That's not what the nurse told me, but I don't want to get into that right now. I won't get into that part of it right now. Let me ask this question: Let's go back -- let's jump backwards a little bit; right? You know, we went to the hospital in the afternoon to give birth to my -- you know, for my wife to give -- not me, my wife to give birth to my son. Why wasn't this presented -- why wouldn't it have been presented to me as a matter of good -- if the purpose and the goal was to be informed consent, why wasn't it presented

to us when we first got to the hospital and said, "Hey, you're going to be in labor for awhile. Here's something that we have to make a decision on, and we want you to think about it before your child arrives."

Wouldn't that have been a better time? Even if it's not weeks in advance, at least it would give us a better chance of being more properly informed about the options that we had available to us to make that the best informed decision. Wouldn't that be a better time from the department's perspective if the goal is to get -- really, truly get informed consent?

A Good argument and department would not have objection to that. This is hospital practice as to when they are able to do this. As I mentioned, when the patient is admitted, this would have been given at the same time, but are they able to do that? What other difficulty does the hospitals have? That that would be question for them.

(Mr. Hendricks exits deposition)

Q Right. Well, let me ask this: What steps does the department take that assist or otherwise direct the hospital on how to effectuate seeking informed consent from parents?

A Training. Departmental wide training to all the working places including hospitals.

Q Okay. What does training consist of? What does that mean?

A That's a good question for Sarah Lyon-Callo. It's her

department. I usually don't interfere in the training programs. It's done by the newborn screening area in epidemiology.

Q Okay. But, I mean, would you agree or have any knowledge -- I mean, this is my chance to ask you some questions. But would you have any knowledge as to whether the department maintains and logs who got what training at what hospital?

A Oh, I'm certain about it, yeah. This would be Mary Klein who works for Dr. Sarah Lyon-Callo. She would have that information.

Q Okay. All right. That's good to know.

A Yeah.

Q All right. I asked Dr. -- I'm going to get it right one of these times. Dr. Lyon-Callo, I asked her about has she reviewed the articles that we -- from our experts in this case from Dr. Elizabeth Eisenhauer and Dr. -- or I shouldn't say "doctor," Professor Sonia Suter in this case? Have you had a chance to review those at all?

A I have not.

Q Okay. All right. So you're not -- I mean, because you haven't reviewed them, you are not prepared to comment on their conclusions or their assertions in any way; would that be fair?

A That would be fair, yeah, I'm not.

Q Fair enough, fair enough. All right. Harry Hawkins. I

know Harry passed away shortly after we started this case, and I never got a chance to meet him because he was the one that signed the letter after we did a destruction of sample request. What was his job title -- well, let me ask you this: Was he under your supervisory chain at the department?

A Yes, he was.

Q Okay. What was his position with the department?

A He was the section manager of newborn screening program.

Q Now, where does that put him relative to Mary Klein?

A Mary Klein is in a different bureau, epidemiology bureau.

Q All right. So what did Harry do? What was his job responsibilities as it applies to -- and I'm just going to -- I'm going to call it the "whole" program. I don't know where he fits in. From heel prick to Biobank, where does he fit into this whole process?

A So as a section manager of newborn screening testing program, he oversaw all the testing that is done in the laboratory, all 55 different tests that we do at the lab. He had a staff of probably about 20, 25 people under him.

Q Who's is his replacement?

A Her name is Dr. Mary Seeterlin.

Q Okay. I've seen that name, yup. All right. Just to round out this: Harry Hawkins, in that position, did not have anything to do -- I mean, relatively speaking, -- with the

BioTrust or the Biobank; correct?

A No. But he was part of the group discussions when needed.

Q But meaning he wasn't -- he wasn't in charge or had responsibilities, the day-to-day responsibilities, in the BioTrust portion or the Biobank portion of this particular overall program. Would that be fair?

A Partially. He did see the sample move -- sample, being the blood spots, move to Biobank on a daily basis.

Q Okay.

A Or weekly basis, however it worked out.

Q So I think I get you. I mean, you don't necessarily draw a nice, straight line on all of these?

A No.

Q Him and his team are prepping these things to go to the Biobank; fair?

A Uh-huh; yes.

Q All right. Forgive me, I'm going to jump back to where we kind of got off a bit here. After May of 2010, the newborn screening program then started requiring -- well, strike that. Let me try again. Starting in May of 2010 and going forward, the BioTrust required a form of -- some sort of written consent form that we've talked about with Dr. Lyon-Callo and going forward, were you involved at all with the -- with that change in policy?

A I was not the laboratory director at the time, so I did not.

Q Okay. And whatever position you held at that time, were you -- let me ask this: Were you working with the department at that time in 2010?

A Yes, I was. I was in infectious diseases at the time.

Q Okay. Did you have anything to do with that policy change at all? I mean, any contribution or any discussion as part of that in your role at that time?

A No, I did not. I was in a totally different area, infectious diseases, so --

Q See, I know that means something to you like "being somewhere else." To the rest of us, we -- I mean, you guys were just in a big, brick building to the rest of us on the outside; right, so --

A Absolutely.

Q All right. That takes care of that one. To finish up another line of thought I had earlier, I had asked you about if a brochure had not been presented to a parent about whether that was sufficient informed consent. Let me ask the next logical step after that would be do you believe, as a public health official, that if a parent had been given the brochure and the consent card, that that would provide enough information to successfully provide -- or to successfully allow the department to obtain informed consent from the parents for residual blood spots being used for medical research?

MR. LEVIN: I'm going to just, again, object to the extent it calls for a legal conclusion, but proceed.

MR. ELLISON: Yup, understood.

A In my opinion, yes, there is a ton of information with these two pages. It's a very descriptive brochure, and, you know, we always improve it almost every year to put as much information as possible. So if it was read carefully, which should be done by every parent, there would be sufficient information. And there are numbers and contact information here they can contact us any time, and we're always prepared to answer any questions or concerns.

Q Okay. Do you have any concerns about -- as a public health official, have any concerns about the fact that informed consent is not obtained from parents before starting this whole process, before the sample is taken, for newborn screening, Biobank, Biotrust, and all of these things? Does that cause you any pause or any concern in your role with the department or in your role as a public health official?

MR. LEVIN: I'm going to just, in part, make an objection to the extent the question involves some things that are dismissed and not relevant. But, again, proceed.

MR. ELLISON: Understood.

A So my answer would be the BioTrust program comes later on; right?

Q Right.

A And consent is for that program. Obtaining specimen from a child, that is something that's mandated by the legislature. That's why we do it.

Q Okay. Is there any reason why -- well, let me, again -- I appreciate you allowing me to be contextual here today with our discussion.

A Okay.

Q Understand -- I mean, Mr. Levin has been pointing out today that this case has two parts. And one case was -- part of it was dismissed, which was the newborn screening challenge part of this, not on the merit but on some legal technicalities that you don't need to worry about, and we're here about the newborn or the BioTrust and the Biobank portion of this case.

From my aspect, and let me just say this to you -- and this is my representation -- is that if I was really concerned about the State getting access to my child's medical and genetic data, the best and safest way to ensure that would be is to prevent the test -- any testing, the extraction of the blood ever, in the first instance. Okay? And I'm not trying to impede on the case -- part of the case that we're not on here.

But I guess what I'd want to understand is would you agree with me that if my interest, as a parent, was to make sure that my child's medical, private data which can be

extracted from blood samples -- all sorts of information can be extracted from that -- that the best way to do that would be to prevent the Sate from even starting the newborn screening process to begin with? Would you agree with that position?

And I guess then, before you answer, let me take it one step further because we heard -- let me look at my notes for a second. Yeah, Dr. Lyon-Callo testified that even if the blood sample is destroyed, all of the medical data extracted from that sample is still retained nonetheless. Wouldn't it make the most sense as a parent if I had the really, truly interest that I didn't want the State to have that kind of information, that I'd cut it off at the beginning rather than later on in the process when the data is still going to be retained anyways? And I know I'm giving you tough questions today, and I appreciate --

A No; no. Believe me, this is not tough. I can tell you in two words what you just said is a flawed thinking.

Q Okay. Why is that?

A Because this testing is for the benefit of your child. It is a public health testing. This is not to extract any DNA information or anything else. The State does not have any of that information. You know, frankly, did anybody ask, I would not allow them to even come nearby me. No, I'm not going to allow -- I'm a state public health laboratory

director. I have a specific program to run. I don't allow those spots to go anywhere else for any other testing.

All I have is newborn testing that those 55 parameters that we check for, and that's it. Then it goes into storage. Yes, BioTrust comes in later on, but we have boards that monitor the research activity. We only allow activities which pertain to public health for benefit of all, for public good, for getting better testing in the future, for discovering more and so on.

Q Okay. Let me ask --

A I'm a public health advocate, so --

Q I get it. I get it.

A Yeah.

Q And I'm a privacy advocate, so I --

A There you go.

Q But let me say this: Isn't it true, though, that as a parent I could have every one of those 55 tests done privately in a private lab?

A You probably could, and you could do it at Mayo lab, and it would cost you probably a couple of thousand bucks. If you're ready to pay for that, you should -- when you reach the hospital, you should make it clear to them. And if they allow you, go ahead.

Q Okay.

A Would they come and get your spots within 20, 24 hours, I'm

not sure how that whole thing would work. This has been tried elsewhere in other countries, and it hasn't worked.

Q But that would be -- but you would agree that if the State's interest -- you know, the interest of the public health was to get that information to make sure that the child did not have one of those 55, you know, tested for diseases, it could be done without the intervention of the State, and by extension, would prevent private medical data being stored in the database and prevent those blood spots from being used by -- potentially used by researchers in the future? Wouldn't that be an alternative that would solve the concern that testing needs to be done, but at the same time protect the privacy of the infant?

MR. KENNEDY: Objection. It's an improper hypothetical.

MR. LEVIN: And I'm going to object to the extent it calls for a legal conclusion.

MR. ELLISON: It must be a good question, because they're objecting like crazy; right? And I'm just -- I was -- we're laughing. We're joking here.

Q But go ahead, Doctor. What say you to that? I mean, what do you say to that response to that argument right there in your role as a public health officer?

A So, again, I would say that's flawed thinking. So here what you're proposing is the State has it's testing data, which

it has to keep by the accrediting agency. We are accredited under the College of American Pathology nationwide. We have to keep our testing data in order for any audit in the future.

Now, if you want to do this private lab testing, go ahead and do it. Do you think a private lab is going to retain this data? Yes, they will, and they'll retain it precisely for the same reason for future audits by their accreditation agencies. All laboratories have to undergo this. They have to retain data. We cannot get rid of it.

Q Do you have any knowledge about law enforcement accessing blood samples for law enforcement purposes?

A I do have knowledge only for identifying the person and that's it, and it is very well spelled out here in the certification of confidentiality. It's very well-written.

(Witness reviews document via video)

Q Right. Where does it say in there -- could you read that? Go ahead and read that into the record, that statement right there in that -- I'm glad you have that brochure in front of you. Could you read that?

A Oh, sure. Can I get a reading glass, please?

Q Oh, sure.

A Can I get it from here and --

Q Yes; yes; yes; yes. Absolutely.

A Sorry. I'm showing my age here.

(Off the record)

Q All right. Go ahead. Could you read that section of the brochure, please?

A Yes. So for law enforcement it says:

"The BioTrust can use this certificate to legally refuse to disclose information that may identify you in any federal, state or local, civil, criminal, administrative, legislative or other proceedings. For example, if there is a court subpoena, the BioTrust can use the certificate to resist any demands for information that would identify you except as explained below."

The below part is:

"The certificate cannot be used to demand for information from personnel of the US federal or state government agencies sponsoring the project and that will be used for auditing or program evaluation of agency funded the projects or information that must be disclosed in order to meet the requirements of the Federal Food and Drug Administration. It does not prevent you or a member of your family from voluntarily releasing information about yourself or your involvement in this research. If an insurer, medical care provider or other person obtains your written consent to receive such information, then the BioTrust

will not use the certificate to withhold that information."

Q Okay. So having read that, are you aware of any instance in which the BioTrust or the Biobank supplied a blood sample as a result of a subpoena being issued for access to be delivered -- for delivery and access to a blood sample?

A The only incidence I knew was one time when the police asked for identification of a person, and that was it.

Q Uh-huh (affirmative).

A And no other incidents that I can remember.

Q So in that one instance right there, they didn't use the certificate of confident- -- what is it? -- certificate of --

A Confidentiality.

Q -- of confidentiality then, did they?

A I'm not sure what they did. You know, this was a few years ago.

Q But they did -- but you can say they complied with the subpoena and provided the sample; correct?

A Because it was for identification purposes only, nothing else.

Q Was there -- where in that statement right there, it says, "Except" -- "Will use the confiden-" -- "the certificate of confidentiality except for to identify crime victims"? There is no exception for that in there, is there?

A Let's see. Let me look at it again. It does say -- in the first paragraph it said, "The BioTrust can use the certificate to resist any demands for information that would identify you except as explained below." And in below lines, they are saying, you know, that you can provide this without using the certificate if it is just for identification purpose.

Q I don't know if I read it that way, but that's a legal fight that the lawyers will have later on on that. I appreciate that, so --

A I'm not a lawyer. I'm just a poorly paid, hard-working, poor scientist. What can I say?

Q Well, I was going to say we're glad you're there because otherwise the rest of us wouldn't be able to go to work to be able to -- we'd be all stuck hiding from COVID. So we're glad you're there.

So the only other question I had was -- because this wraps up for me -- looking at my notes, I think I've got everything checked here I wanted to ask you. Let me check one more thing real quick. Forgive me, I know the answer to this, but this is my chance to ask the question. As part of your responsibilities working as part of the BioTrust, you don't ever obtain a warrant from a judge or a magistrate before taking these samples into -- I'm going to use the word "custody," but possession, custody, whatever

you want to say, as part of the BioTrust; correct?
A Correct.
Q All right. And, again, -- I know, again, Mr. Levin has pointed out there is different parts to this case, but because I want to talk from the start to finish on this, in the beginning before the sample is taken, you, as part of your responsibilities with the BioTrust and the Biobank, you don't get a warrant at the front end of this thing from a judge or a magistrate to seize those samples for BioTrust and Biobank purposes; correct?
A Correct from my side, but, again, this is a legal question.
Q You don't have a team of lawyers running down to the courthouse every time someone is born; correct?
A Right; correct.
MR. ELLISON: Doctor, it has been a pleasure talking to you today. I thank you for your time. And as I noted before we started, I also thank you for your service in the fight against COVID. And sorry to keep you away. I needed you for a few hours here to solve this case here, so thank you for your time. I'm going to hand you over to Jeremy and Aaron, and they're going to ask you some questions.
THE WITNESS: Thank you, Mr. Ellison.
MR. ELLISON: Yeah, thank you.
MR. LEVIN: Jeremy, I know I jumped in last time,

but I will let you go first.
MR. KENNEDY: Okay. Good afternoon, Dr. Shah. Again, my name is --
MR. ELLISON: Jeremy, let me interrupt you. I'm going to do the same thing. I'm going to be off screen for a minute or two but keep going.
MR. KENNEDY: No problem. I believe I mentioned this before in Dr. Lyon-Callo's deposition, I am the attorney for Dr. Antonio Yancey and the Michigan Neonatal Biobank. Just have a few questions for you.
EXAMINATION
BY MR. KENNEDY:
Q You are the -- sorry -- is it director of laboratories for the Department of Health and Human Services?
A Yes.
Q Okay. And what exactly does that entail? What are your responsibilities in that position?
A As a laboratory director I oversee all the public health-related testing in our laboratory, state laboratory as well as county laboratories as a regional laboratory system. We are responsible for 7 million different tests every year; clinical tests, biological tests, biological terrorism, chemical terrorism, any toxin tests, all of that included in here. Or any hospitals that have problems with their pathology testing, they would connect with us, and we

would do the testing for them. We are a part of CDC.
Q So all of the testing that's done by DHS here, the one who ultimately oversees it; is that accurate?
A That is accurate.
Q How long have you worked with the newborn screening program?
A Eight years now.
Q Okay. And do you recall -- Dr. Lyon-Callo testified earlier, I believe, that there have been a number of new diseases or conditions that have been able to -- you've developed tests to screen for in the -- recently; is that correct?
A Yes. On the average, about two tests are added every year. We depend on the federal government to tell us which ones are approved to be tested, and we certainly follow up.
Q So in the eight years that you've been there, would it be fair to say that roughly 15, 16 new conditions have had tests developed for them?
A I would say -- let me start with (inaudible) which had four foundations. I'm just thinking loudly here. I would say good eight or nine tests have been added ever since I took off. Sometimes we try to add a test, and we are unable to because the -- somehow the validation didn't work or the process didn't work somehow, something broke down. We also took away two tests that we were running already and -- because they expired and the importance sort of ran away.

So that also happens. But I would say about eight to nine tests have added since I took over.
Q When you screen for the genetic conditions with the newborns, currently you can detect approximately 55 conditions; is that accurate?
A Now, genetic is just one portion.
Q Okay.
A The testing we do, it depends upon three different things. Either it's a metabolic error that we detected, it could be an enzyme detection, not a genetic, or it could be endocrine detection. That means one of the hormones is imbalanced in the body. So that's a different type of testing and genetic, of course, is the third type of testing.
Q So these are all the different types of conditions that you detect in the blood screening?
A Yes; yes.
Q You heard Mr. Ellison state -- it was kind of an off-the-cuff remark that he's a privacy advocate, and you're a public health advocate. One of the questions we were looking at is what -- you have policies in place to protect the privacy of the individuals whose blood samples you've taken; correct?
A Correct.
Q Can you describe all of the privacy -- "all" may be -- hold on a second. Can you tell us what types of policies are in

place to protect the privacy of these individuals?

A So as a state laboratory, clinical laboratory, we are all Board Certified laboratory workers. So we maintain full HIPAA policy in place. Number two, when we send samples out -- samples meaning the dried blood spot to, say, Biobank, the only thing that goes out with the blood spot is an accession number and no other information goes out. That's all in -- in our -- our system. Then Biobank decides, based upon BioTrust activities, what is to be sent out to a researcher. They enter another code to the specimen. They don't send out our accession number that went to them. They assign their own code that goes out to the researcher.

So this is two deep for the researcher to find out anything about anybody's item. And that -- that has been working very well so far. There has been no breach.

Q Now, do you store or do you keep a record of the genetic information of any of the individuals whose blood spots you take other than a record of the testing results for the blood screen and what those were?

A So when you say "genetic information," that's a broad term.

Q Okay.

A We don't test for genetic profile of an individual, no. These are fixed 55 tests. That's the only information we have, and they are all into our LIMS meaning the laboratory

information system and it's all highly secure. It's not even on the web. It's very local, right here on our servers and completely sealed.

Q Is there any way that information could be hacked by an outside source, to your knowledge?

A This would be a speculation.

Q Okay.

A What happens in the future, I can't really tell, but there are big companies out there that are protecting that information. Like in our system is a world-renowned system, and they use that and everything that we have is behind the firewall and everything is backed up every night. So if something was hacked today, for example -- nothing has happened so far. We have been very secure. But if anything happens today, next day we will have our operation under different server with the same information.

Q Okay. You indicated you're not connected to the internet with this information; correct?

A Yes, we are not.

Q So it would take a very -- it would seem to be anyway, it would take a very dedicated effort to get that kind of information. Would that be fair?

A Oh, absolutely because something has to go wrong with the entire state system in order for something to happen.

Q Now, one of the questions I asked Dr. Lyon-Callo was about

the information that you have from these individuals when the DBS cards are actually destroyed. What information does DHS keep after a card is destroyed?

A So you can visualize that when the cards are received by us, they are logged into the computer system. It's all demographic information that is provided to us by the hospitals. It goes into our laboratory information system. This data stays with the results of the test. The physical cards that we have, if we were asked to destroy, we would immediately archive those and destroy those. But information still stays with us and we are to keep it, and no laboratory in the United States can get rid of it. You take a private lab or us or anybody.

Q And that's because of all the regulations you'd have to comply with?

A Absolutely, yes.

Q State and federal regulations; right?

A Absolutely, yes.

Q And private labs have the same, or at a minimum, very similar requirements they have to comply with as well; correct?

A Exactly the same requirement. We are governed by the same federal act with is called Clinical Laboratory Improvement Act of 1988, and that's what governs us.

Q One second. Doctor, you're on the Biobank's board; correct?

A I am, yes.

Q The Biobank board, does it have any role in approving any research project where the dried blood spot -- where someone's dried blood spot cards may be used?

A No.

Q And the Biobank has no role in determining what dried blood spot cards are sent to a particular researcher; is that correct?

A No. They are given instructions as to what cards to be sent where.

MR. KENNEDY: Thank you. I have nothing further for you.

THE WITNESS: Thank you.

MR. LEVIN: I have a couple questions.

EXAMINATION

BY MR. LEVINE:

Q So in talking about the board of the Michigan Neonatal Biobank, there was a question about -- at the beginning of the deposition -- if there's a role for parents on that board. Do parents have a role -- strike that. I'm going to rephrase this. That was not a good question. Is there a community value advisory board?

A There is, and --

Q What is that?

A To give you the description of that. Let's see.

(Witness reviews document via video)
I have a complete description:
"The community values advisory board," -- CVAB, as we call it -- "they provide guidance on ethical issues including what types of research are or are not acceptable uses of the dried blood spots. The community values advisory board also provides advice on educational methods and materials for engaging and informing the public about BioTrust."
Q So if a parent were concerned about privacy interests, would that board be the place to bring that concern?
A Yes, sir.
Q Not the board of the Biobank?
A Not the Biobank. The Biobank doesn't decide anything.
Q Is there ever a need to go back to older, residual dried blood spots and retest them or perform some additional test on them for the benefit of the child?
A Yes, there is. Now, it depends upon how old the spot is because the -- the integrity of the spot, it changes with time. The older the spot, chances are that there's substantial amount of degradation for doing further testing.
I must also qualify that older spots were not really stored in the ideal conditions. Ideal condition is the spot, as soon as testing is done, should be preserved in the freezer with lowest humidity, minus 20 degrees Celsius

at all times. And that was not the case with older spots because we did not have the facility.
Q Thank you. I'm just looking a few things over. Are you aware of any efforts to educate OB/GYN's regarding the BioTrust consent process?
A That would be a good question for Mary Klein. It is her section that does it. I know that they do this, but in order to get a very correct answer, it would be a question for her.
Q But at a minimum you know it occurs?
A It occurs, yes.
MR. LEVIN: I think that is all I have. Thank you.
THE WITNESS: Sure. Thank you.
MR. ELLISON: We have two follow-ups, and then we're all done.
THE WITNESS: All right.
MR. ELLISON: We going to send you, unfortunately, on your way.
EXAMINATION
BY MR. ELLISON:
Q I just was looking just now about who is on this community values advisory board. Do you know who is on the board at all?
A That, again, is a tough question for me to answer because I

don't have anything in front of me that can give me that information.
Q Well, let me ask -- don't -- I just want to know if you know it. Don't -- just offhand, do you know right now?
A Okay. Yeah. No, I don't have an answer who those people are or how they are created. But people like you, you can easily be on the CVAB board and influence, yes.
Q Okay. In your role with the BioTrust, have they ever made a recommendation to you about -- or raised a concern with you in the role for the operation of the BioTrust and the Biobank, about informed consent?
A No. But I do participate in the I guess updating of these documents and discussion about how can we make things better. I do participate in those discussions, but generally I leave it to the epidemiology.
Q I mean, but as you sit here today, you can't identify a change in government policy or department policy based on informed consent based on what this CVAB board recommended; is that fair?
A It is fair, and all this that we have developed is based on CVAB recommendation, too. They are part of it. That's how this is developed.
Q Last question I have for you then or -- I always say "last question." There's always three. But the medical results you said are retained if the newborn residual -- you know,

the part of the Guthrie card is still -- is retained. Who has access to that data? I think you said it's stored in LIMS?
A Yeah, laboratory information system.
Q Yup. Okay.
A And the selective few would have access to it only when needed. We are reg- -- department regulated agency, so --
Q Is it possible -- it is available if someone -- now, this is somewhat of a trick question so bear with me. Is it possible if someone wanted to request their medical data from that system that it could be printed out and given to that person?
A That's not so easy to do. In order for you to request, you would go to your provider first, your hospital, and ask them for the data. We don't work with community. We don't work with any individual patients. If hospital requests us, then we will ask the individual to give us everything in writing and identify themselves.
Q Right. Well, I requested the data and got it for my son. Okay?
A Yes; yes.
Q So I guess the point is is when you talk about it being a secure system, you can print the results on paper and mail it out to somebody?
A We could, yes. It's part of the mandate from CDC and the

federal government that we be able to provide this service.

Q Is that right? I accessed it through some obscure medical law that's in Michigan that I found I was able to use. So the point is, though -- I guess the point I'm trying to get at is is that it's not locked away forever. It can be extracted out, as needed, whether it's a hospital, as you suggested, or an individual like me who finds some obscure health law? It's not, once it goes into the vault, it can never come back out? I mean, it can be extracted as needed or requested by the operator of the system with the right authorizations or right credentials in first that have been --

A Under right conditions, yes. If we have a vault where nothing can come out, then the vault is called destruction.

Q Well, then it's a hole; right. So there you go.

MR. ELLISON: Doctor, thank you so much today. You've been a wonderful, wonderful witness today. You have been a joy. It's really been an enjoyment to talk to you today.

THE WITNESS: Thank you so much. Very nice meeting you all.

(Deposition concluded at 4:37 p.m.)

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Genetic Information Privacy

Genetic Information Privacy

When exploring medical privacy issues, it's very useful to have an overview of the laws that affect control and privacy of medical information. We encourage you to read our legal overview.

GINA, HIPAA, and genetic information privacy

Genetics is the new frontier of medicine and genomic data is the raw material of some of the most advanced medical research now underway. Genetic testing is the current paradigm for diagnosis and treatment of many diseases. It's likely that within 10 years genetic tests for disease markers—such as presymptomatic testing for the risk of developing adult-onset cancers, Alzheimer's, or chronic diseases—and possibly even whole-genome sequencing will be as routine as urinalysis is now. And the greater availability of population-wide genetic information is happening alongside its digitization in

a given individual's electronic health record (EHR).

Genetic data can be obtained from cells we routinely shed, is easily shared, and is in high demand for cutting-edge medical research. Genetic data might be used to develop cures for cancer, paranoid schizophrenia, common tooth decay, and far more—multifarious areas of research that can seem irresistibly compelling. So what can protect the privacy of genetic data in such a world?

Not much, actually. Some laws limit how the information can be used, but none truly protects privacy. And that may not even be possible, because genetic information is unique to every individual. It cannot be de-identified; even if separated from obvious identifiers like name and Social Security number, it is still forever linked to only one person in the world. The de-identification "checklist safe harbor" from the Health insurance Portability and Accountability Act (HIPAA) doesn't include genetic information.

Genetic nondiscrimination laws

The federal laws that deal with genetic information are GINA (the Genetic Information Nondiscrimination Act of 2008) and, more recently, HIPAA. GINA is essentially an anti-discrimination law that has nothing to do with privacy. It prevents group health and Medicare supplemental plans—but not life, disability, or long-term care plans—from using genetic information to discriminate against you when it comes to insurance.

Title II of GINA prohibits the use of genetic information to discriminate in employment decisions, such as hiring, firing, and promoting. It also restricts employers from asking for or buying genetic information. GINA does not apply, however, unless the employer has more than 15 employees. An Executive Order that accompanies GINA prohibits federal government agencies from obtaining genetic information from employees or job applicants and from using it in hiring and promotion decisions.

The federal Equal Employment Opportunity Commission (EEOC) investigates and enforces GINA claims. One EEOC lawsuit filed in 2013 alleged that a company violated GINA by requesting and requiring job applicants to indicate whether or not they had a family medical history for a variety of diseases and disorders as part of its post-offer, pre-employment medical examination; it

was settled for $50,000. A week later the EEOC filed a similar lawsuit against the Founders Pavillion nursing and rehab center in Corning, NY. As of late July 2013, the EEOC "is sifting through about 170 claims filed by workers, applicants and former employees who say companies unlawfully asked for genetic information or used it to discriminate."

In 2013, the HIPAA Omnibus Rule amended HIPAA regulations to include genetic information in the definition of Protected Health Information (PHI). It also prevents use of the data in underwriting for all other types of health insurance plans, but still not for life, disability, or long-term care insurance. Excluding long-term care insurance guarantees that anyone with a tested genetic predisposition to Alzheimer's, for example, will be uninsurable. According to the definition, genetic information includes your genetic tests and a family member's, your or a family member's fetus or embryo, and evidence of a disease in a family member. It does not include your age or gender.

California's broader genetic anti-discrimination law, known as CalGINA, not only prohibits genetic discrimination in employment (GINA's scope), but also in housing, provision of emergency services, education, mortgage lending and elections. CalGINA amends the Unruh Civil Rights Act to add genetic information to the list of Californians' civil rights that entitle them "to full and equal accommodations, advantages, facilities, privileges, or services in all business establishments of every kind whatsoever." The Government Code contains the employment and other membership provisions of the FEHA. Other sections can be found on the California Department of Fair Employment and Housing website.

One problem with GINA that the Omnibus Rule perpetuates—and CalGINA does not address either—is that GINA is based on a genetics framework that is more than 20 years old. GINA only prohibits discrimination based on genetic information about someone who has not yet been diagnosed[1] with a disease; that is, the disease is not yet "manifest." Today there are many tests for genetic markers that may—or may not—be precursors of a disease and also may mean that you could benefit from preventive treatment. If the presence of genetic markers is considered a "manifestation" of a disease, then neither GINA nor HIPAA applies to the information.

Protecting genetic information privacy

With genetic data—or any personal health information (PHI)—it's important to remember that HIPAA only applies to an organization if it is either a "covered entity" or the business associate (BA) of one. Many non-covered entities collect genetic information, such as online genetic testing companies like 23andMe and genealogy websites like Ancestry.com. At the moment, such businesses are only self-regulated, although the federal Food and Drug Administration (FDA) recently told 23andMe that its over-the-counter saliva collection kit and Personal Genome Service (PGS) was being marketed in violation of the Federal Food, Drug and Cosmetic Act. As the FDA put it: "if the BRCA-related risk assessment for breast or ovarian cancer reports a false positive, it could lead a patient to undergo prophylactic surgery, chemoprevention, intensive screening, or other morbidity-inducing actions, while a false negative could result in a failure to recognize an actual risk that may exist."

Obviously, existing laws that deal with genetic information fall short in many ways. One corrective approach to the limits of GINA and HIPAA—and not only where genetic information is concerned—would be to apply protections to the data itself, rather than making them dependent on who has the data. This dispenses with the patchwork created by "covered entities."

Some major unaddressed issues concerning genetic information privacy

As accessing and recording genetic information progresses, it raises some serious issues.

Employment and eligibility

A recurring issue in medical privacy is lawful uses of information based on overly broad compelled authorizations, such as in states where individuals must sign a release for substantially all of their health records as a condition of employment or when applying for life insurance or government benefits.[2] In the context of widespread use of EHRs—interoperable, comprehensive, lifetime individual health records that vastly increase the amount of data that can be disclosed—these kinds of releases create significant privacy risks for all health information, including genetic information.

Newborn screening

Newborn screening is another problem that arises with EHRs and genetic data. Tests done at birth vary from state to state, but all states must screen for at least 21 disorders by law, and some states test for 30 or more.[3] Currently, tests

are limited to conditions for which childhood medical intervention is possible and may be beneficial.

What if that practice changes to include—or mandate—tests for adult-onset disorders that cannot be treated in childhood—or for which there is no known treatment, such as ALS, Huntington's disease, or Alzheimer's? The privacy implications of starting a lifetime EHR that includes information about genetic diseases are enormous, and become even greater if the record comes to include evidence of a genetic propensity toward future, as yet incurable, diseases (not to mention the emotional impact on those designated at birth to succumb to a tragic and incurable disease). A great deal of thoughtful analysis and decisionmaking is required to protect this data—and the individuals connected to it—from exposure, while at the same time not excluding this data from important research.

Law enforcement

There is the growing practice, at all levels of law enforcement, of collecting genetic data from suspects when they are arrested and storing the information in a database for later reference. The Supreme Court held in *Maryland v. King* that such DNA collection, while subject to the Fourth Amendment ("using a buccal swab on the inner tissues of a person's cheek in order to obtain DNA samples is a search"), does not require a warrant: when there is already probable cause for a valid arrest for a serious offense, collecting a DNA sample is analogous to taking fingerprints or a photo. (See EFF's blog posts on *Maryland v. King*.)

The Ninth Circuit Court of Appeals, *en banc*, recently upheld a controversial California law that requires people who are arrested for a felony to provide DNA samples that will be stored in a criminal database accessible to local, state, national, and international law enforcement agencies. The requirement is not limited to serious or violent offenses. The plaintiff in the case, *Haskell v. Harris*, was arrested for protesting the Iraq war, but was never charged or convicted. The Court compared the California law to the Maryland law upheld by the Supreme Court and found no difference and no Fourth Amendment violation.

The United States has the world's largest database of DNA profiles. As of November 2013, the FBI's National DNA Index (NDIS) contains over 12 million profiles, and it is still growing. These are primarily from criminals and criminal suspects, but the database also includes parolees, probationers, and people who were simply arrested.[4] It is bound to grow as more states expand the categories

of people compelled to give DNA samples for law enforcement.[5] Law enforcement is also known to collect DNA surreptitiously from suspects' cigarette butts and coffee cups.

Responding to the difficulty in making an exact DNA match from crime scene evidence, in 2008 California became the first state to authorize "familial" or "kinship" matches, which are by design less precise.

Another area of concern in law enforcement DNA collection is the current trend for predictive modeling or behavioral genomics. It raises questions about the potential use of DNA databases to reveal the genetic tendencies of individuals toward certain types of criminal behavior, like violence. Could this lead to practices like preventive detention or protective custody of individuals believed to have a genetic disposition toward crime or anti-social behavior?

Consent for Disclosure

Finally, there is a complex ethical issue around the consent for disclosure of genetic information or biospecimens that contain DNA, for research purposes and otherwise. We're used to thinking of consent as individual, which makes sense when the health information is mainly about that person. Genetic information is different: analysis of an individual's DNA is highly informative about his or her offspring, siblings, and parents. The Supreme Court of Iceland, for instance, found in 2003 that a woman had a right to opt out of her father's genetic information being retained in Iceland's national DNA database. Genetic information also bears on demographic categorization, as many genetic predispositions toward specific diseases or conditions are strongly associated with specific ethnic or racial groups.[6] Is individual consent appropriate when DNA analysis can reveal significant information about other people—as we now see for familial DNA searches?

Resources

For a critique of existing genetic information non-discrimination laws, see "Are Genetic Discrimination Laws Up to the Task?," an interview with Mark Rothstein in Medscape Today. Rothstein holds the Herbert F. Boehl Chair of Law and Medicine and is the Founding Director of theInstitute for Bioethics, Health Policy and Law at the University of Louisville School of Medicine.

1. See the National Coalition for Health Professional Education in Genetic (NCHPEG) GINA information website for what GINA does and does not cover. NCHPEG was established in

1996 by the American Medical Association, the American Nurses Association, and the National Human Genome Research Institute to educate health professionals about human genetics.

2. Circumstances that require individuals to authorize the release of their medical records is a complex subject, with many variations. Keep in mind that under current HIPAA regulations, medical information includes genetic information.
- Employment: In California, CalGINA adds "genetic information" to the Fair Housing and Employment Act (FEHA) as a prohibited basis for discrimination in employment.
- Life insurance: The federal GINA does not protect against discrimination in life insurance underwriting based on genetic information. (See the National Human Genome Research Institute's GINA Fact Sheet, especially the section "What's not included?") Life insurers require you to release your medical records when you apply. CalGINA does, however, prevent discriminatory use of genetic information in denying life insurance coverage and setting premiums.
-Government benefits: Existing laws already prohibit discrimination against individuals by programs or activities administered or funded by the State of California or a state agency. CalGINA amends Gov't Code § 11135 to prohibit such discrimination based on genetic information.

3. The National Newborn Screening and Global Resource Center (NNSGRC) provides links to each state's screening requirements, along with other information and resources concerning newborn screening.

4. See state-by-state numerical tally of DNA profiles by the type of offender.

5. See EFF's amicus brief in *Haskell v. Harris*, concerning warrantless collection of a DNA sample from an arrestee at the time of booking.

6. See the American Indian and Alaska Native Resource Center's article on the Havasupai Tribe and the lawsuit settlement aftermath. The lawsuit arose from university researchers' use of DNA samples intended for diabetes research for unconsented follow-on research in areas as unrelated as "schizophrenia, migration, and inbreeding, all of which are taboo topics for the Havasupai."

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INSIGHT

GENEALOGY

The challenges of maintaining genetic privacy

Two studies suggest that a determined adversary may be able to obtain genetic information without permission from some genealogy databases.

SHAI CARMI

Related research article Edge MD, Coop G. 2020. Attacks on genetic privacy via uploads to genealogical databases. *eLife* **9**: e51810. DOI: 10.7554/eLife.51810

The direct-to-consumer genetic testing industry has grown rapidly in the past few years, to the extent that the companies offering such tests now hold a large proportion of all the human genetic data ever generated (***Regalado, 2019***). A common reason why someone might undergo genetic testing is to discover relatives, either within the database of the company that performed the test, or via one of a number of third-party services that allow users to upload genomes generated by other labs. Two new studies demonstrate that it may be possible for a user to obtain genomic data without permission from some databases (***Edge and Coop, 2020***; ***Ney et al., 2020***).

In general, when a user uploads their genome to a third-party service, the service searches its database for genomes that have segments that are identical or nearly identical to segments of the user's genome. The number of such identical-by-state (IBS) segments, and the length of these segments, both increase with the closeness of the relationship between the user and the person (or persons) in the database. The minimum length of a segment is typically around a few millions of base pairs.

To see how a user could access data they should not be able to access, suppose that Alice uploads her genome and finds that she is related to Bob. If the testing service gives Alice details about the IBS segments she shares with Bob (such as the location of these segments in the genome), then Alice will have obtained a certain amount of genomic information about Bob. Now, two independent groups – Michael Edge and Graham Coop of the University of California, Davis writing in eLife (***Edge and Coop, 2020***), and Peter Ney, Luis Ceze, and Tadayoshi Kohno of the University of Washington in work to be presented at the NDSS symposium in San Diego in February (***Ney et al., 2020***) – report how services that give users certain details about IBS segments could be subject to attacks that allow an 'adversary' to obtain potentially significant amounts of genomic information that they should not have permission to access (***Edge and Coop, 2020***; ***Ney et al., 2020***).

The key insight is that an adversary does not have to upload their own genome, and that they can instead upload multiple genomes, including genomes that are in the public domain. This approach is called 'IBS tiling'. For each IBS segment that is reported, the adversary gains a small amount of genetic information about a 'target' genome in the database. However, by uploading a large number of genomes, it is possible to obtain large amounts of genetic information (***Figure 1A***). Using simulations, Edge and Coop showed that with about 900 public

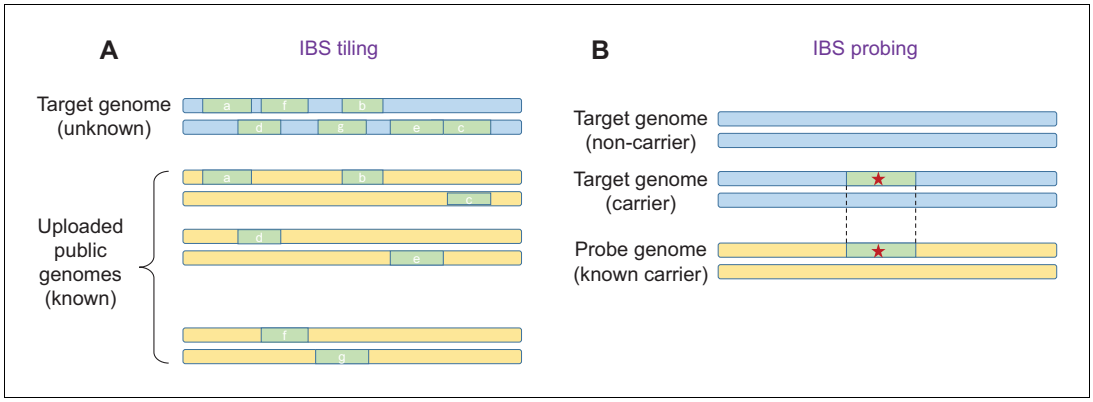

Figure 1. IBS tiling and IBS probing. (**A**) In IBS tiling a user (called the 'adversary') uploads multiple public genomes (shown in yellow) to a DNA matching service in order to determine the sequence of a target genome (pale blue) that is already present in the service's database. In the figure, uploading the first genome yields three IBS segments (a,b,c; pale green), uploading the second genome yields two (d,e), and uploading the third genome also yields two (f,g). IBS tiling only works if the matching service reports matching IBS segments and their locations between the public genomes and the target genome (see text). The amount of information obtained by the adversary increases with the number of public genomes uploaded to the service. (**B**) In IBS probing, the adversary uploads a 'probe' genome that belongs to a person who is known to carry an important mutation (such as a mutation that causes a disease; red star). If the target genome contains the same mutation, the DNA matching service will (under certain conditions) report a matching IBS segment, and the adversary will know that the target also has this mutation in their genome. In general, IBS probing is expected to work for mutations that are relatively young (that is, less than about 500–1000 years old).

genomes from the 1000 Genomes Project, IBS tiling is expected to reveal about 60% of the genome of a European target. A related approach developed by Edge and Coop, named 'IBS probing', allows the adversary to learn if the target's genome contains a specific disease allele (***Larkin, 2017***; ***Figure 1B***).

The risk of IBS tiling and IBS probing is limited in services that only report IBS segments to users who are closely related. Thus, as genomes from public databases will only rarely be close relatives of the target, this will limit the effective number of genomes available for tiling. However, IBS tiling could yield significant amounts of information on targets from founder populations in which the rate of genomic sharing is high, such as Ashkenazi Jews or Finns (***Carmi et al., 2014***; ***Martin et al., 2018***). Direct-to-consumer genetic testing companies and third-party services could eliminate this risk by not showing users where IBS segments are located within the genome.

The most popular third-party service, GEDmatch, has over a million users, and was recently acquired by the forensics genomics company Verogen (***Husbands, 2019***). GEDmatch puts very few restrictions on users and is vulnerable to IBS tiling. GEDmatch is routinely used by police forces to investigate crime (***Erlich et al., 2018***; ***Kennett, 2019***), though (as of recently) they can only search the genomes of users who have opted in to give law-enforcement agencies access to their genetic information.

When comparing genomes, GEDmatch uses a simple algorithm, reporting a region of the genome as an IBS segment so long as the user and the target do not have conflicting homozygous genotypes: that is, if the user genome is, say, AA at a given site, GEDmatch will return an IBS segment if the target is AA or AB at that site, but not if the target is BB (subject to the segments being longer than a certain minimum length, as described above). GEDmatch also provides users with an image, indicating, for each site in the genome, whether the genotypes of the user and the target fully match, partly match, or do not match.

Ney et al. recently demonstrated that it is possible to extract nearly the entire genome of an individual from GEDmatch by uploading an artificial nearly-all-heterozygote genome and examining the resulting IBS segments (which was also shown by Edge and Coop), or by uploading an all-homozygote genome and examining the resulting images. However, these techniques depend crucially on the specifics of the genome comparison methods used by GEDmatch, and could become obsolete if these methods change, or if users are prohibited from uploading artificial or manipulated genomes.

The use of digital signatures could also prevent adversaries from uploading genomes they have downloaded from public resources or have generated computationally (***Erlich et al., 2018***). This would involve direct-to-consumer genetic testing labs digitally signing their genome files before users can download them, and third-party services only returning information about IBS segments to a user if the genome uploaded by the user has a digital signature from an approved lab.

The practical consequences of an adversary getting access to your genetic information are debatable. For example, some researchers question the potential usefulness of methods that predict the risk of disease based on polygenic scores (***Wald and Old, 2019***), especially for non-European populations (***Martin et al., 2019***). However, others argue for a clinical utility of polygenic risk scores (***Lambert et al., 2019***). Likewise, there are contrasting views on the usefulness of information about mutations in protein-coding regions. For example, some argue that most coding mutations carried by an individual are difficult to interpret, even by physicians (***Hoffman-Andrews, 2017***). However, databases such as ClinVar allow users to interpret the pathogenicity of many mutations, and some mutations can be strong risk factors for diseases such as Alzheimer's or breast cancer, which may affect insurance decisions.

However, one needs to remember that DNA is immutable, and thus, any loss of privacy cannot be reversed. Moreover, any loss of privacy can go beyond the individual and extend to their relatives. Further, if an entire large US-based database was compromised, an adversary would be able to identify most US individuals, even those not in the database (***Erlich et al., 2018***). Therefore, I urge all stakeholders to pay attention to the work of these two groups and attempt to keep genetic information secure.

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