

# Pregnancy, Lead, and Mercury: *Protecting our Future*

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**Eric Bind, M.P.P.**

Biomonitoring & Exposure Assessment Program Manager  
NJDOH – Environmental & Chemical Laboratory Services

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**NJ Department of  
Health**

**Public Health &  
Environmental  
Laboratories**

**Environmental and  
Chemical Laboratory  
Services**

I have no financial or  
other conflicts to disclose.

The opinions expressed  
are my own.

**Biomonitoring & Exposure  
Assessment Program**





# Chemicals, Exposure, & Biomonitoring

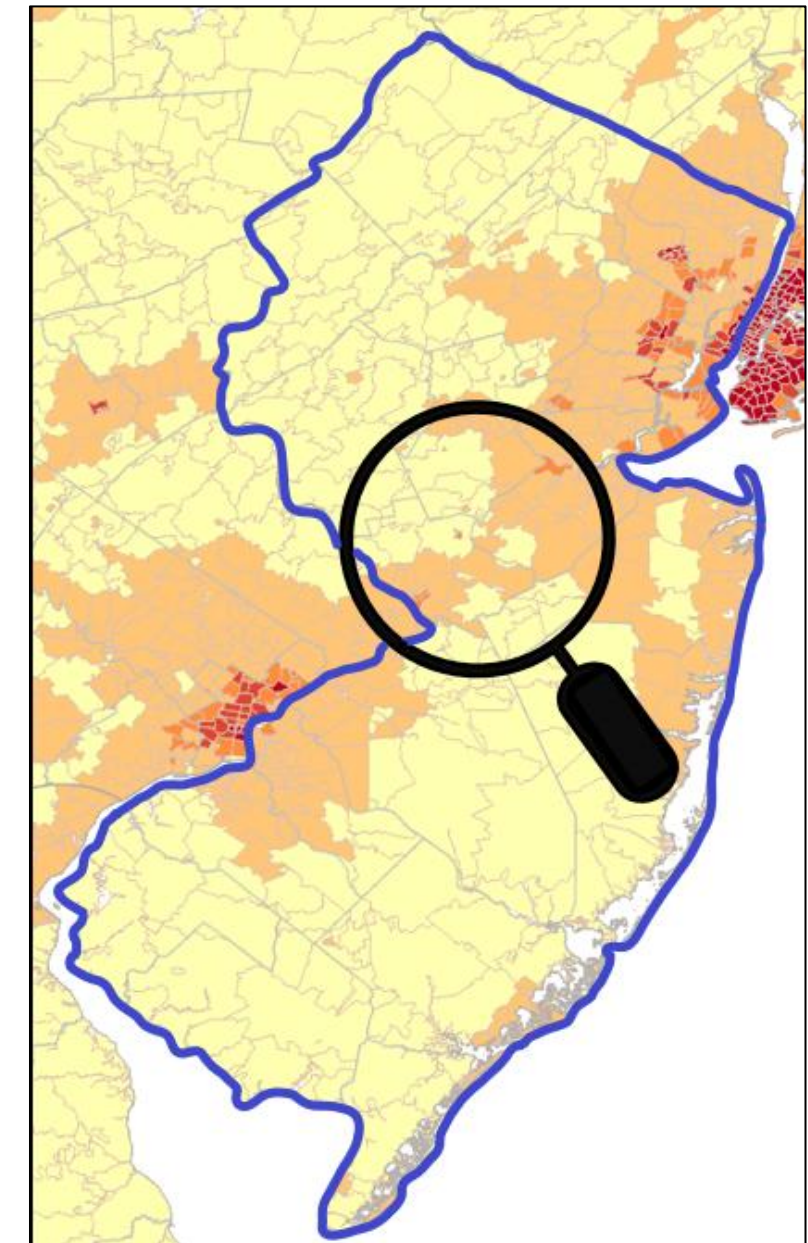




# Why do Biomonitoring in NJ?

## Variety of Risk Factors

- Heart of Northeast transportation corridor
- Industry, manufacturing, refining
- Shared waterways
- Hazardous sites
- External sources
- Diverse Populations



# Background – Health Disparities

## Causes\*

- Limited transportation
- Lack of childcare options
- Housing instability
- Linguistic issues
- Incognizance of services
- Mental distress
- Racial Stigma
- Working hours

## Consequences

- Delayed health care – 1<sup>st</sup> prenatal visit
- Negative health outcomes
- Significant disparity in Black maternal (>2.5X) and infant mortality rates
- Maternal mortality - 60% are women of color - NJ
- Infant mortality - 1.9% for NH Black infants - US
- Many with the greatest need lack access

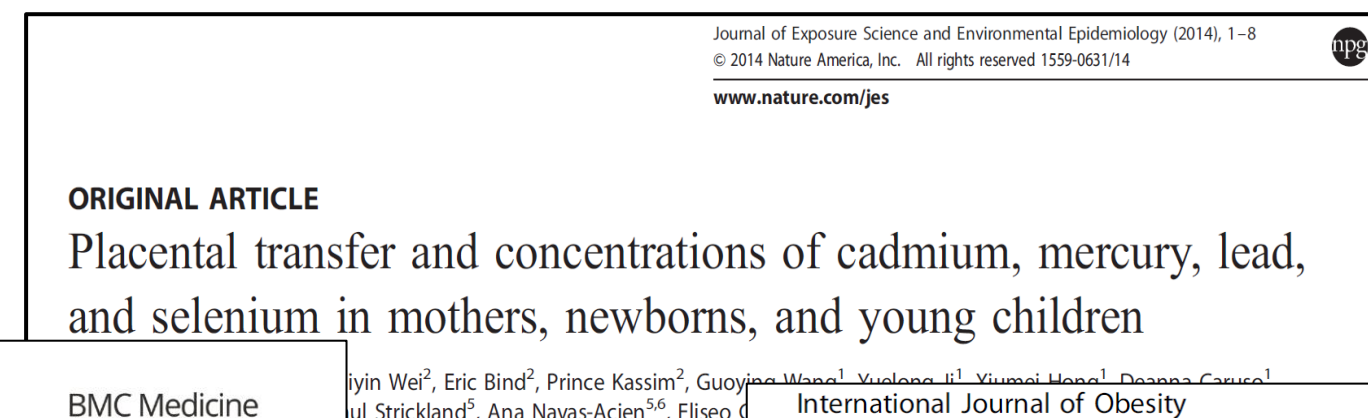
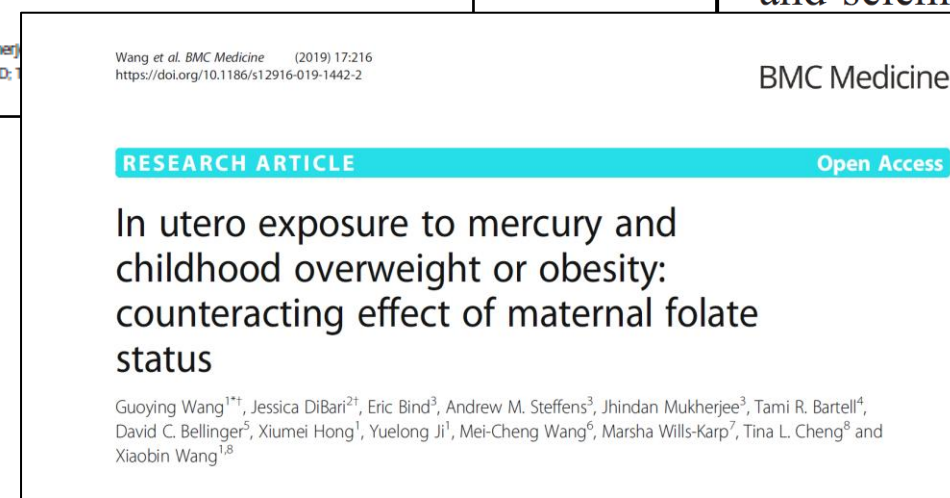
Sources:  
NJ Spotlight  
Daily Mail Online





# Built on Collaborative Research

- Boston Birth Cohort (BBC) – continuously funded > 20 years
- Mothers/babies enrolled at birth – followed for up to 21 years
- ~9000 dyads
- >140 publications covering outcomes related to exposure



# What the Research Says



- Mothers transfer lead and mercury to infants; infant mercury levels can be twice as high
- Prenatal exposure results in negative birth, early childhood, and lifelong outcomes
- Exposure tied to heart, respiratory, metabolic, neurodevelopmental, and other disorders at levels lower than current health limits (5  $\mu\text{g/L}$  Hg; 3.5  $\mu\text{g/dL}$  Pb)





# Lead (Pb)

Toxic metal found in older buildings, pre-1980s paint, small plane exhaust, foreign goods, etc.

Exposure:

- Breathing or swallowing dirt or dust
- Drinking contaminated water
- Eating food or non-food items with lead

Culture-related increased risks:

- Lead-containing pottery
- Cosmetics
- “Earth”
- Ayurvedic medicine





# Exposure Questionnaires - Continued

## Learn About Lead in Remedies

Protect Your Family from Lead Poisoning



Many remedies have lead in them that can hurt your child. You cannot tell by looking at or tasting a remedy if it has lead in it.

### What are Remedies?

- Remedies are known as traditional, alternative, natural, or herbal medicine that are used across the world for many reasons.
- Remedies can have herbs, minerals, metals, or animal products in them.
- Lead and other metals are sometimes put into remedies on purpose or can get into remedies during grinding, coloring, from the packaging, or if the ingredients are grown in soil with lead in it.

### Can Lead in Remedies Hurt My Child?

Lead in remedies or from other sources can hurt your child or unborn baby's growth and development. It can also make it hard for your child to learn and pay attention

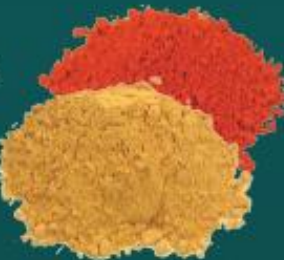


### How Do I Know if My Child has Lead Poisoning?

Most children with lead poisoning do not look or act sick. The only way to know if your child has lead poisoning is to get a blood test for lead. If you think your child has been given one of these remedies, ask your child's doctor to test your child for lead, or reach out to your local Childhood Lead Poisoning Prevention Program (CLPPP) for more information.

### Common Remedies that Contain Lead

- **Greta and Azarcon** (also known as Alarcon, Coral, Luiga, Maria Luisa, or Rueda) are fine powders used in Latino cultures for upset stomach and other illnesses. The powders are often yellow, orange, and/or red and have been found to contain up to 90% lead.
- **Kohl and Surma** are black powders used in South Asian and Middle Eastern cultures mainly as a cosmetic, but also on the navel of a newborn child as a medicine to treat skin infections.
- **Sindoor** is an orange-red powder typically used by the Asian Indian community.
- **Pay-loo-ah** is a red powder used in Southeast Asian countries to treat children with rash or high fever.



### More Remedies that Contain Lead

Remedy:	Used for:
<b>Latin America</b> Albayalde, Albayaidle	"Empacho" (vomiting, colic, apathy, lethargy)
Azarcon, Alarcon, Coral, Greta, Luiga, Maria Luisa, Rueda	Stomach ache
Litarigiro	Antiperspirant and deodorant
Anzroot	Vomiting, diarrhea
Bint al Zahab, Bint, Bend Dahab	Diarrhea, colic, constipation, general newborn use
<b>Middle East</b> Bokhoor	Calming fumes
Cebagin Santrinj, Farouk	Teething powder
Esfand	General health, protect against evil eye
Jawani Badeyan	Stomach ache, nausea, digestion
Kajal, Kwalli, Kohl, Al-Kahl, Saoott, Surma, Tiro, Tozali	Cosmetic; astringent for eye injury, umbilical stump, teething powder; protect against evil eye
Lozeena	Food coloring
<b>Asia</b> Ba Bow Sen	Hyperactivity, nightmares in children
Daw tway	Digestion
Hai Ge Fen	Digestive & stomach problems
Pay-loo-ah	Rash, high fever
Po Ying Tan	Minor illness in children

continued on next page

Remedy:	Used for:
Bala goli/fita	Stomach ache, dissolved in "gripe water"
Balguti Kesariya	Rickets, cough/cold, worms, teething, digestion
Deshi Dewa	Fertility
Gashard, Kandau, Bali Gali	Digestion, stomach ache
Ghutti	Indigestion, vomiting, teething, flatulence
Kum Kum	Ceremonial powder
Kushta	Disease of the heart, brain, liver, stomach
Pushpadhanwa	Fertility
Sindoor	Applied to forehead and hairline
Vibuthi ash/Bhasma, Pooja powder	Ceremonial powder



For more information, visit [go.cdph.ca.gov/LeadFreeKids](http://go.cdph.ca.gov/LeadFreeKids)



This is new! Tell us what you think.





# Mercury (Hg) as 4 Different Chemicals

## Methylmercury (MeHg)

- Extremely toxic
- Commonly found in fish/seafood
- Builds up in body



## Inorganic mercury (InHg)

- Toxic
- Found in ayurvedic medicine
- Skin lightening products



## Ethylmercury (EtHg)

- Toxic
- Used as a preservative (thimerosal)
- Rarely detected



## Elemental mercury

- Toxic
- Found in thermometers, CFLs, dental amalgams, gold- smithing, religion
- Liquid, volatile





# Effects on the Body - Mothers

## Lead

- Abdominal Pain
  - Fatigue
  - Difficulty sleeping
  - Constipation
  - Anemia
- 
- Joint pain
  - Mood disorders
  - Memory loss
  - Reduced bone calcium
  - Sterility
- Increased risk of preeclampsia
  - Increased risk of high blood pressure
  - Embolisms

## Mercury

- Nausea and vomiting
- Anxiety/Depression
- Memory loss
- Insomnia
- Muscle weakness
- Skin rashes
- Impaired motor skills/paralysis
- Hair loss
- Organ damage (kidney, lung...)
- Mood disorders
- Endocrine disruption
- Immunological disruption
- Sterility
- Coma





# Effects on Developing Fetuses: Lead

01

## Neurological

Decreased brain function  
Decreased nervous system function

02

## Developmental

Decreased kidney function  
Decreased muscle growth  
Decreased bone growth  
Preterm Birth  
Miscarriage

03

## Behavioral

Learning disabilities  
Lower IQ  
Antisocial behavior  
Aggressive behavior  
Decreased attention span  
Lower educational attainment  
Lower career attainment



# Effects on Developing Fetuses: Mercury

01

## Neurological

- Decreased brain growth
- Decreased nervous system growth
- Neurological disorders
- Decreased coordination

02

## Developmental

- Decreased bone growth
- Kidney failure
- Blindness
- Deafness
- Microcephaly
- Preterm Birth
- Miscarriage

03

## Behavioral

- Learning disabilities
- Lower IQ
- Behavioral disorders
- Decreased attention span
- Lower educational attainment
- Lower career attainment



# Translating the Research

## University Hospital Standard-of-Care

- Mercury and lead screening at mother's 1st prenatal visit
  - Educational materials to all patients
  - Prescription for vitamins with calcium, iron, folate, Vitamin C and Vitamin D
- Screening for all mothers and babies at delivery
  - Regular blood draw for mothers; cord blood for babies
  - Specimens sent to NJDOH for analysis by ICP-MS/Hg speciation
- Resources for patients





# Patient Resources

### HOW CAN LEAD AFFECT MY BABY?

Lead is harmful to brain development. It can also cause permanent problems like:

- Lower brain, kidney, and nervous system function
- Reading and learning disabilities
- Increased antisocial & aggressive behavior
- Reduced attention span and lower IQ
- Decreased muscle and bone growth; reduced coordination
- Preterm (early) birth
- Loss of pregnancy if lead levels are very high

### CHECK FOR LEAD:

- Get tested!
- Lead is checked using a blood test.
- If you have high lead levels while pregnant, your baby will need to be tested at birth.
- If your home was built before 1978, ask your local health department (LHD) to check your home and water for lead. Find your LHD: [bit.ly/my-LHD](http://bit.ly/my-LHD)

### HELPFUL TIPS:

- Take off your shoes before going into your home to help keep out dust or soil.
- Wash hands, toys, and play areas regularly, especially low areas where kids can reach.
- Buy and use products for your home and for self-care from the USA.
- When renovating your home, block off and clean the work area. Consider moving to lead-safe housing until the project is finished.

### LEARN MORE:

Call:  
New Jersey Poison Control Center  
1-800-222-1222

Visit Online:

- NJDOH Environmental Health: [bit.ly/enviro-lead](http://bit.ly/enviro-lead)
- NJDOH Biomonitoring Program: [bit.ly/biomon-prg](http://bit.ly/biomon-prg)
- Partnership for Maternal & Child Health of Northern NJ: [bit.ly/lead-prev](http://bit.ly/lead-prev)
- Centers for Disease Control & Prevention: [bit.ly/cdc-lead-prev](http://bit.ly/cdc-lead-prev)

Speak to your health care provider if you have any concerns.




### LEAD EXPOSURE & PREGNANCY: HOW TO PROTECT YOU & YOUR BABY

### HOW CAN MERCURY AFFECT MY BABY?

Mercury is harmful to brain development. It can also cause permanent problems like:

- Low brain, bone, and nervous system growth
- Reading and learning disabilities; lower IQ
- Increased chance of behavioral and neurological (brain, nerve, and spinal cord) disorders
- Decreased attention span and coordination
- Kidney failure, blindness, and deafness
- Preterm (early) birth
- Loss of pregnancy if mercury levels are very high

### CHECK FOR MERCURY:

- Get tested!
- Mercury is checked using a blood test.
- If you have high mercury levels while pregnant, your baby will also need to be tested at birth.

### HELPFUL TIPS:

- While you are pregnant, eating fish is very important. Fish have vitamins, minerals, and healthy fats that are good for your baby's development.
- To minimize mercury exposure, eat one serving of the following fish 2x each week:
  - anchovies
  - sardines
  - salmon
  - cod
  - shrimp
  - tilapia
  - pollock
- 1 serving = 8 oz, or about the size of the palm of your hand

### LEARN MORE:

Call:  
New Jersey Poison Control Center  
1-800-222-1222

Visit Online:

- NJDOH Biomonitoring Program: [bit.ly/biomon-prg](http://bit.ly/biomon-prg)
- NJDOH Mercury Exposure: [bit.ly/merc-exp](http://bit.ly/merc-exp)
- NJ Department of Environmental Protection: [bit.ly/dep-fish-eat-smart](http://bit.ly/dep-fish-eat-smart)
- Centers for Disease Control & Prevention: [bit.ly/cdc-merc-facts](http://bit.ly/cdc-merc-facts)

Speak to your health care provider if you have any concerns.




### MERCURY EXPOSURE & PREGNANCY: HOW TO PROTECT YOU & YOUR BABY

### WHAT IS LEAD?

Lead is a toxic metal that may be found in:

- plumbing in older homes
- paint from before the 1980s
- house dust
- old toys
- soil or dirt
- imported foods (like spices)
- products from other countries (like cosmetics or clay pots)

### LEAD & PREGNANCY

If a pregnant woman is exposed to lead, the lead passes from the mother to the baby through the umbilical cord.



Even though lead may pass to the baby through breastmilk, **breastfeeding is usually the best option for your baby.** If you have high lead levels, ask your health care provider if breastfeeding is safe.



### ENVIRONMENT

- Do not touch or eat peeling paint.
- Vacuum often to avoid breathing dust or dirt with lead.
- If someone is exposed to lead at work, they should change their clothes or shoes before going home.



### WATER

- Change your water filter regularly.
- Use cold water for drinking and cooking. Hot water is more likely to have lead.
- Run the faucet for 15 seconds to one minute if you have not turned it on in a few hours.



### HOW TO PROTECT AGAINST LEAD:

#### ITEMS AT HOME

- Do not use greta and azarcon in home remedies. They have lead in them.
- Avoid using ceramic pottery like clay pots, plates, or jars, from outside the USA.
- Avoid ayurvedic medicine as some may have lead.
- Beauty products from other countries like makeup, kohl, or hair dyes, might have lead.



#### WHAT YOU EAT

- Avoid eating items that are not food, like earth, clay and paint chips.
- Avoid certain spices or candies that might contain lead.
- Eat a healthy, well-balanced diet that has vitamins C and D, iron, calcium, and folate. Eat small fish, meat, cereals, beans, green leafy vegetables, and oranges.



### WHAT IS MERCURY?

Mercury is a toxic metal also known as quicksilver. It is usually found in:

- smoke from coal plants
- oceans, rivers, and lakes
- fish (especially large fish)
- skin lightening creams, hair, or makeup products
- mercury thermometers
- compact fluorescent lightbulbs

### MERCURY & PREGNANCY

If a pregnant woman is exposed to mercury, the mercury passes from the mother to the baby through the umbilical cord.



Even though mercury may pass to the baby through breastmilk, **breastfeeding is usually the best option for your baby.** If you have high mercury levels, ask your health care provider if breastfeeding is safe.



### Mercury can get into the body by:

- Using skin lightening creams, hair, or makeup products with mercury.
- Exposing skin to spilled mercury.
- Breathing in mercury vapors.
- Eating fish that are usually high in mercury, like shark, eel, raw fish, the green gland or bile of crabs and lobsters.
- Do not eat anything caught in Newark Bay.



### How to protect against mercury:

- Do not eat seafood that is often high in mercury.
- Avoid breathing in vapors or handling items that have mercury including skin lightening creams, mercury thermometers, and broken compact fluorescent light (CFL) bulbs.
- Eat a healthy, well-balanced diet that has vitamins C and D, iron, calcium, and folate. Small fish, meat, cereals, beans, green leafy vegetables, and oranges are great sources.
- Avoid using costume jewelry from outside the USA. It may have a pendant that contains mercury.
- Do not touch liquid mercury or allow it to sit in carpeting or other outdoor spaces.
- If you are exposed to mercury at work, change clothes before going home. Wash those clothes separately.



## General prenatal resources

- Centering/educational material
- NJDOH and UH support use of doulas
- Local community organizations
- Lead and Healthy Homes program

## Post-diagnosis resources

- Medical treatment
- Diagnostic questionnaire
- Poison Center expertise
- Local DOH – inspections, case management, remediation
- State Child Lead and CEOHS



# Lead Follow Up Guidelines

## CDC Guidelines (Endorsed by ACOG) for Maternal Lead

- < 3.5 µg/dL no follow-up needed
- 3.5-5 µg/dL education and monitoring
- 5-14 µg/dL resample within 1 month, cord blood at birth
- 15-24 µg/dL resample within 1 month, every 2-3, cord blood
- 25-44 µg/dL resample within 1-4 weeks, monthly, cord blood
- >45 µg/dL resample within 24h, frequent, consult specialist, cord

## CDC Guidelines (Endorsed by AAP) for Child Lead

Blood Lead Level (µg/dL)	Time to Confirmation Testing**
≥3.5–9	Within 3 months
10–19	Within 1 month
20–44	Within 2 weeks
≥45	Within 48 hours

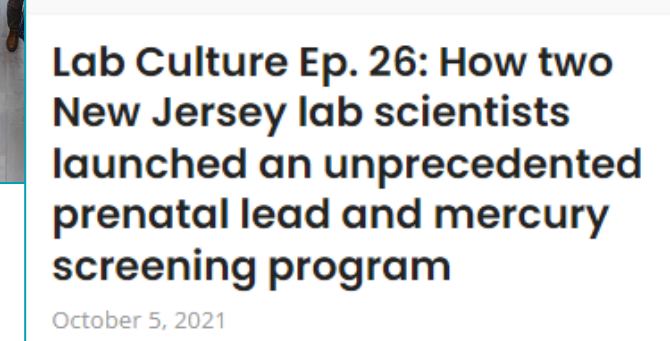
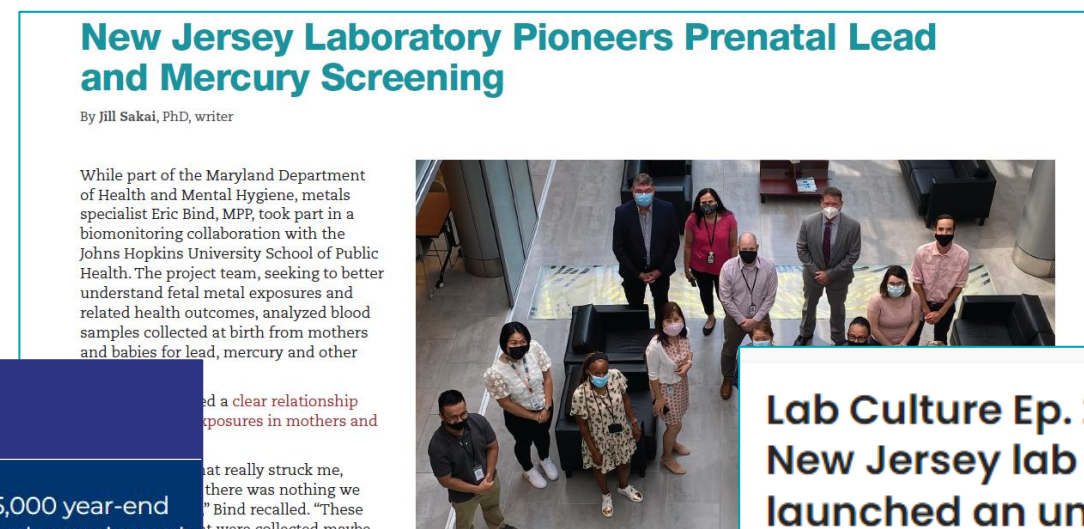
Venous blood lead levels (µg/dL)	Early follow up testing (2–4 tests after initial test above specific venous BLLs)	Later follow up testing after BLL declining
≥3.5–9	3 months*	6–9 months
10–19	1–3 months*	3–6 months
20–44	2 weeks–1 month	1–3 months
≥45	As soon as possible	As soon as possible



# How it's Going

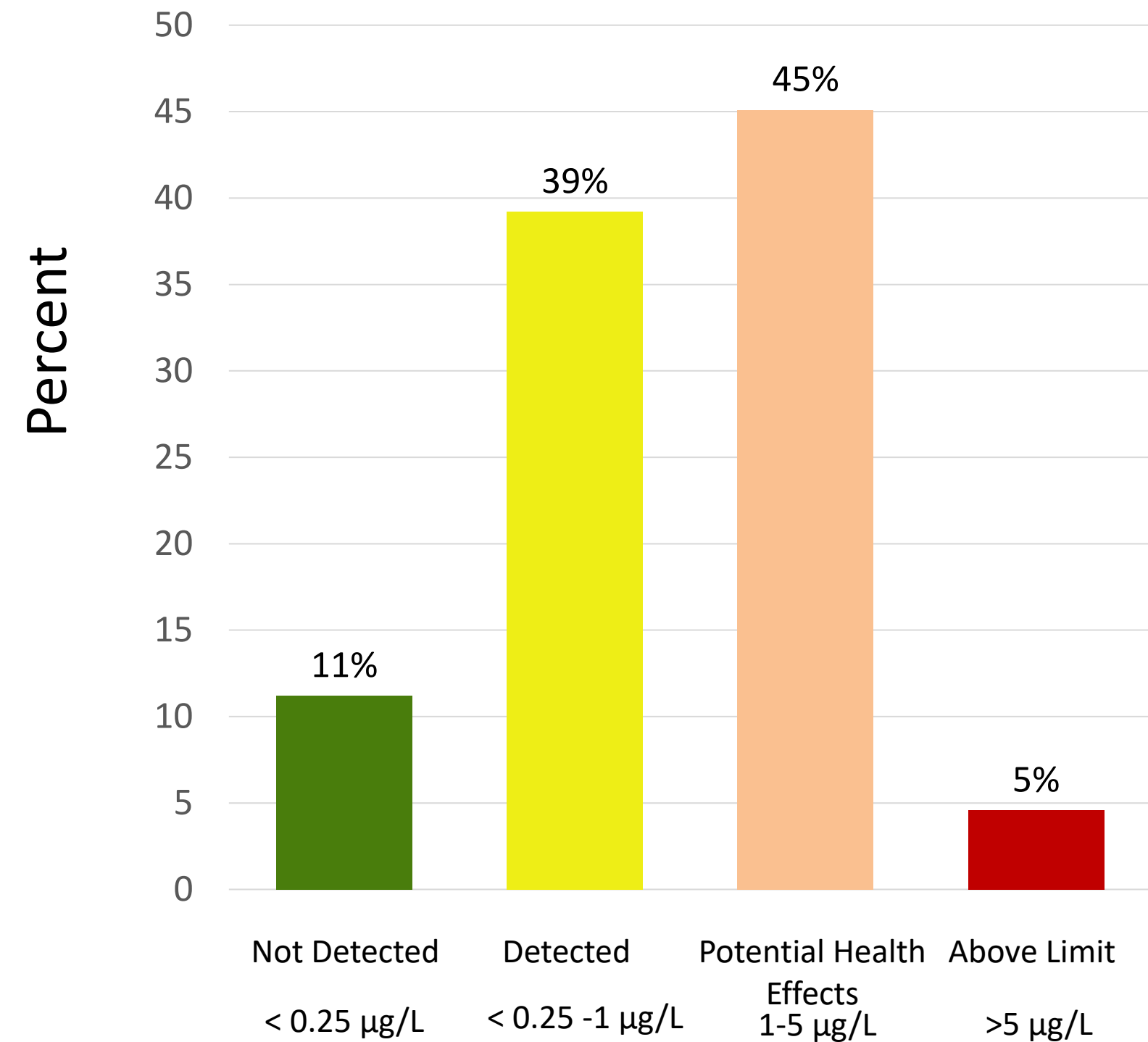
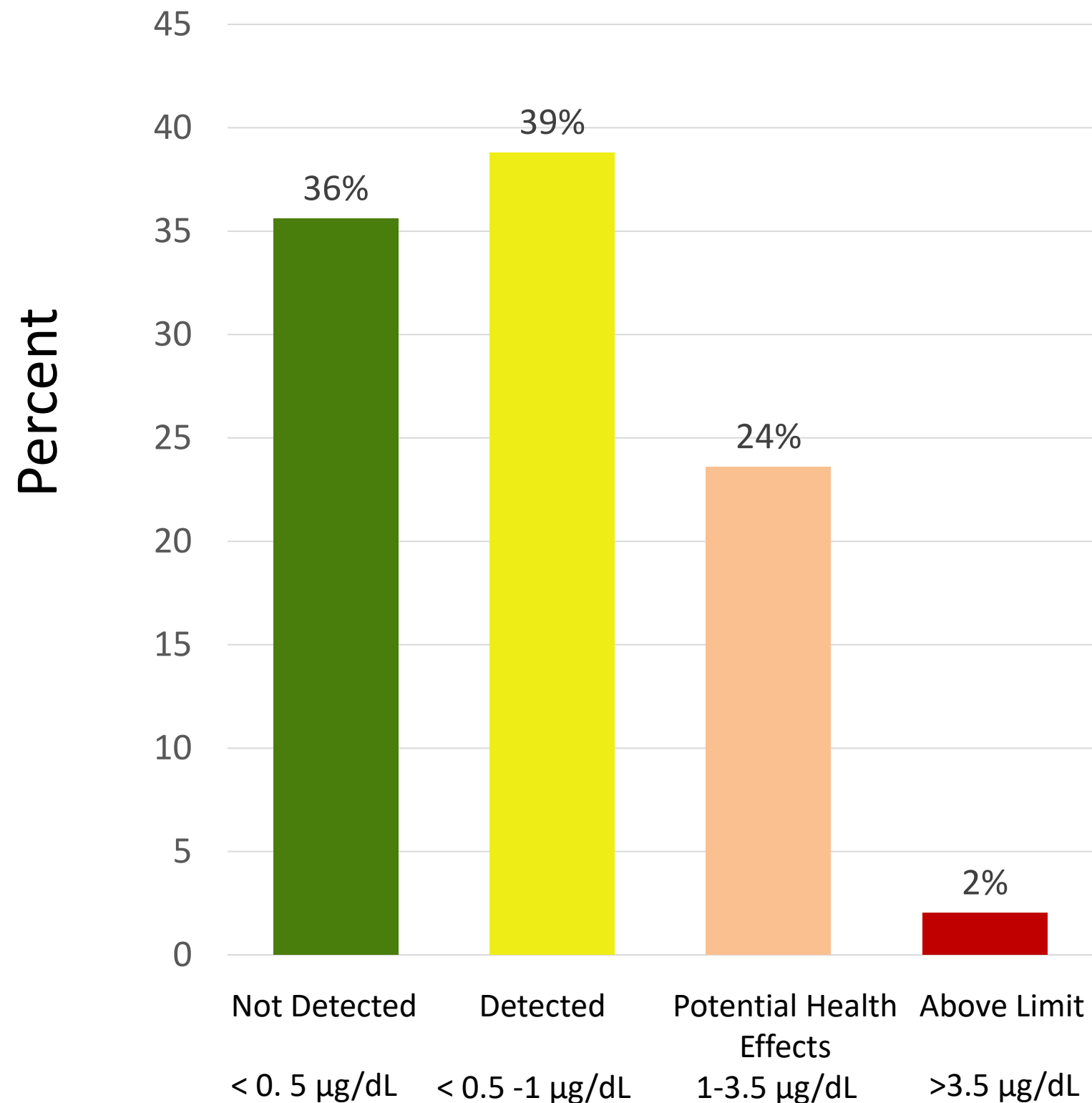
Program started June 2019

- > 27K tests including follow ups
- > *1650 elevated results*
- Thousands of families have received educational materials
- Medical and environmental interventions implemented
- Pursuing 3<sup>rd</sup> party payer options – program expanding



# Lead vs. Mercury in Mothers

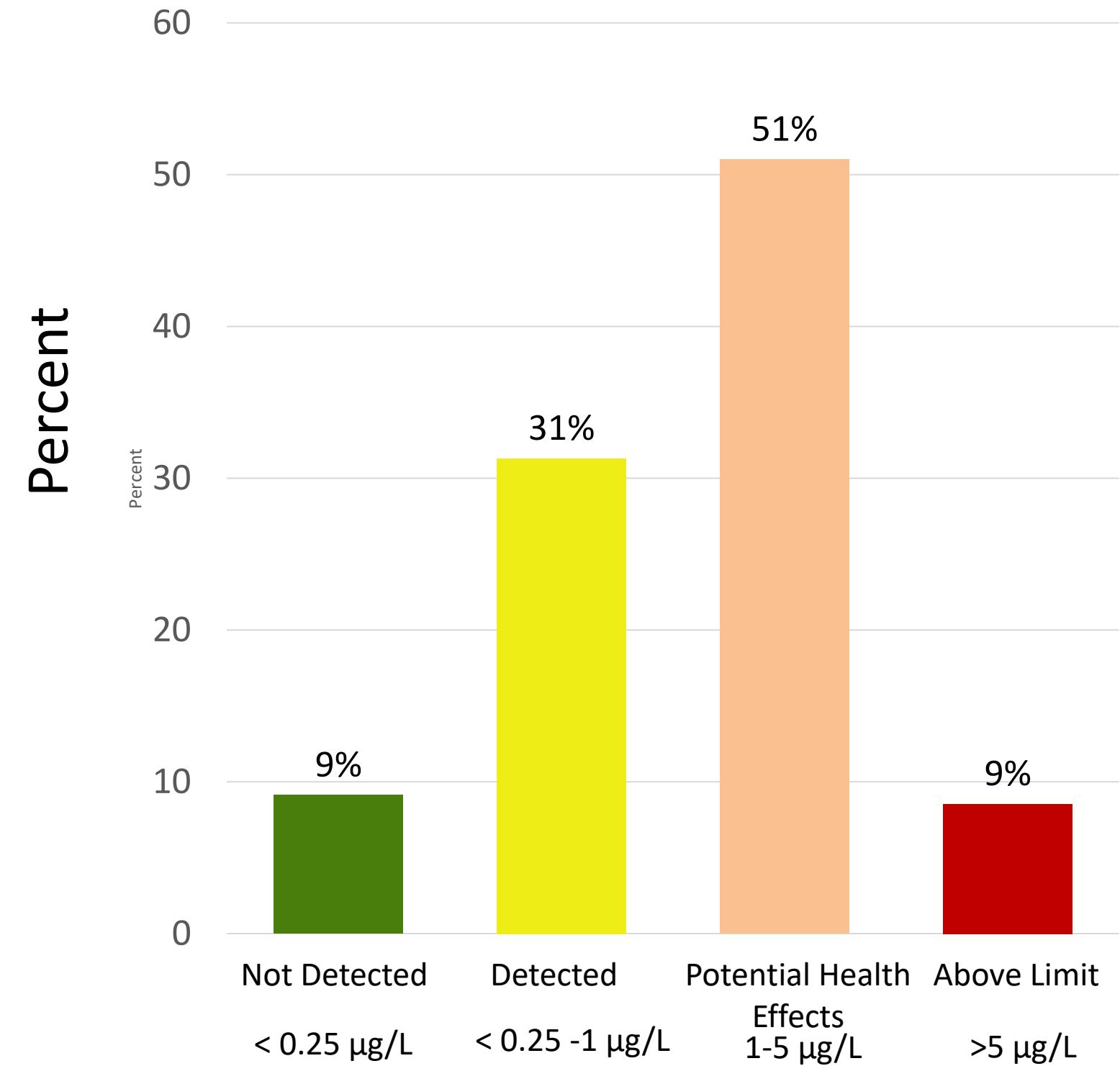
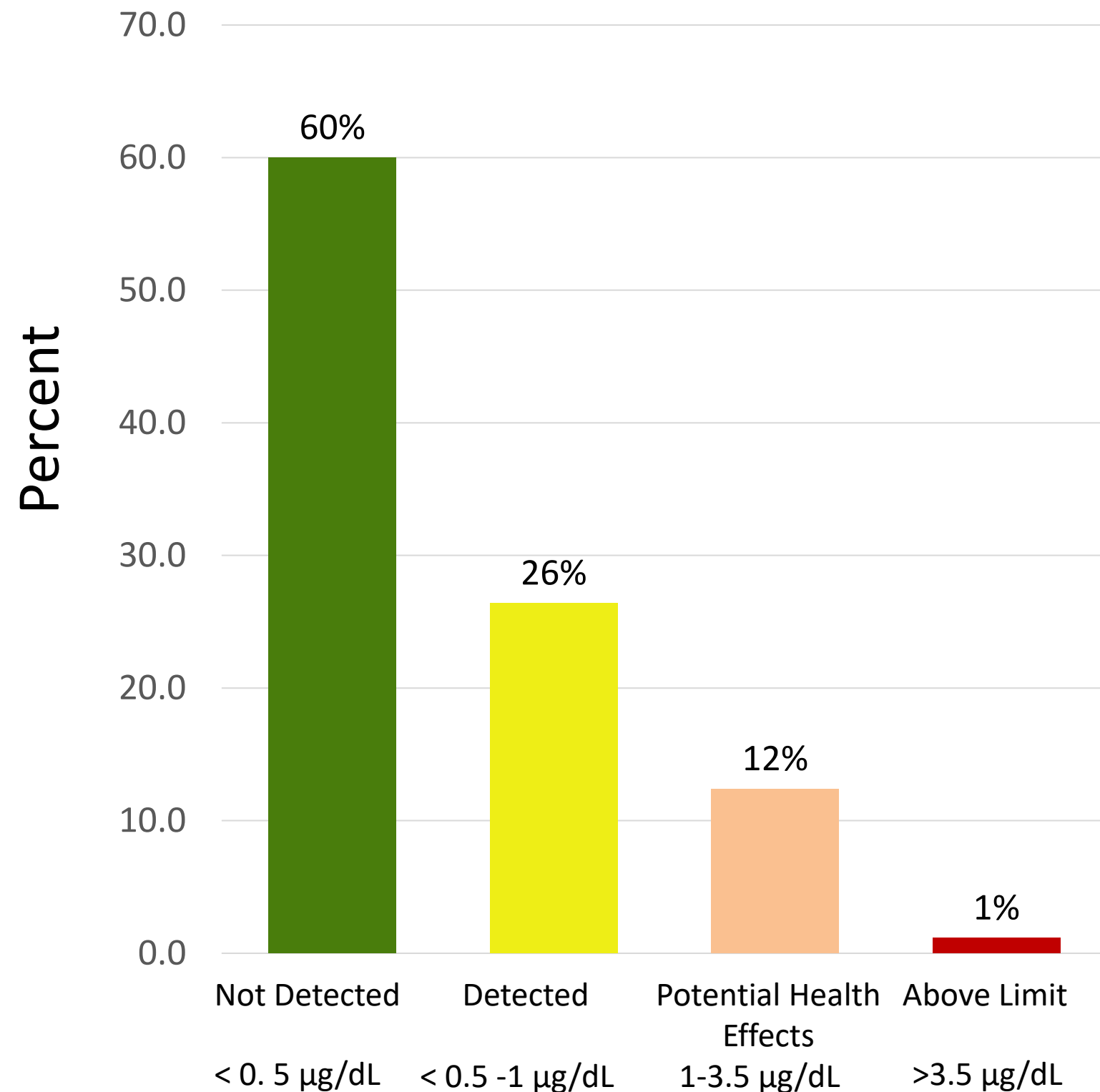
University Hospital, Newark NJ (2019-2023)  $n=6688$





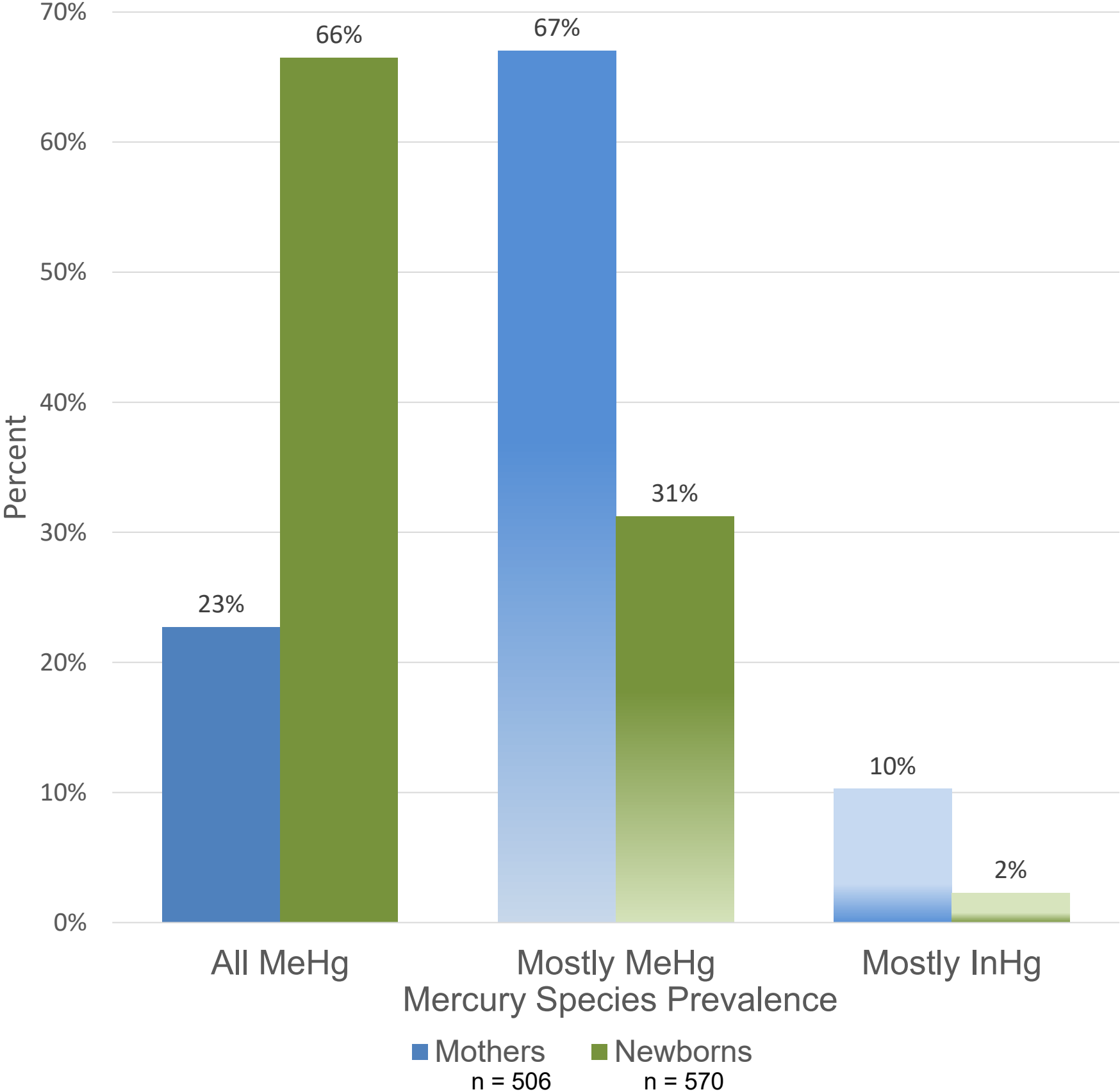
# Lead vs. Mercury in Newborns

University Hospital, Newark NJ (2019-2023)  $n=6090$



# Mercury Species in Mothers and Babies

Data from Patients with Elevated Mercury Levels (2019-2024)





# Case Study 1

## *The case for prenatal screening*

- 1<sup>st</sup> prenatal visit at 10 weeks gestation
- Source: large fish – educated and switched to smaller fish

Mom					Baby	
	10 w	22 w	27 w	31 w	40 w	40 w
Hg (µg/L)	44.7	13.8	7.8	5.56	3.41	7.37
% MeHg	95%					100%

- Baby born with up to 90% less mercury due to intervention



Data courtesy of University Hospital



# Case Study 2

## *The case for newborn screening*

- Foreign-born mother – language/transportation concerns
- No prenatal care – first test at delivery

	Mom	Baby
Lead (ug/dL)	49.5	65.1
Mercury (ug/L)	0.345	1.10

- Hospital – medical care; NJ Poison – consultation, police – transportation, LDOH – case management and inspection
- Baby hospitalized and chelated same day
- Baby's lead came down to  $< 3.5 \mu\text{g/dL}$  and baby is healthy
- Eating “earth”



Data courtesy of University Hospital





# Case Study 3

## *The lead challenge*

Second Pregnancy – 27 Months Apart

Mom						Baby
<b>Baby 1</b>	05/28	07/02	08/27	09/24	10/14	10/14
Pb (µg/dL)	33.1	43.7	28.2	22.8	<b>43.9</b>	<b>46.8</b>
<b>Baby 2</b>			09/23	12/15	01/12	01/12
Pb (µg/dL)			14.6	21.5	21.3	21.4

- Lead is released from bone with calcium as part of remodeling
- Baby 2 born with <1/2 levels as Baby 1
- Different than mercury where you can see >90% reduction



Data courtesy of University Hospital



# Case Study 4

*The case for third trimester screening*

Second Pregnancy – 12 Months Apart

Mom			Baby
Baby 1	Visit 1	Delivery	Delivery
Pb (µg/dL)	1.50	1.38	< 1

Baby 2	Visit 1	Delivery	Delivery
Pb (µg/dL)	0.57	36.3	34.1

- Baby 2 flown to NYC for emergency heart surgery
- Family moved 3 times during second pregnancy
- Plates broke during move, new plates had high levels of lead



Data courtesy of University Hospital





# Risk Factors and Outcomes

Preliminary data analysis on elevated mothers<sub>(n=79)</sub> and reference mothers<sub>(n=102)</sub>

Mothers	Elevated	Reference	p-value
Age (years)	30.8 (5.68)	24.2 (5.35)	<0.0001
Immigrant	74.7%	20.2%	<0.0001

Preliminary data analysis on elevated babies<sub>(n=78)</sub> and reference babies<sub>(n=79)</sub>

Babies	Elevated	Reference	p-value
Newborn screen hit	30.8%	5.06%	<0.0001
ICU admission	35.4%	20.5%	0.037



Data courtesy of University Hospital



# Early Interventions Program (EIP)

- Newborn was referred to Early Intervention and exhibited delays in adaptive behavior, communication, motor skills, and cognition at the 4-month evaluation.
- Improvements were observed across these areas by the 16-month assessment following Early Intervention.

	Date: 02/16/23 Chronological Age: 4 months	Date: 02/07/24 Chronological Age: 16 months
Developmental Domain	Domain Score (Average =100)	
Adaptive	75	90
Personal / Social	85	100
Communication	73	65
Motor	70	113
Cognitive	73	87





# EIP – Low Level Mercury (5-7.5 µg/L)

- 7 patients received initial and annual evaluation
- ***80% of these patients showed cognitive improvement***
- 43% showed improvement in communication
- 43% showed improvement in personal-social behavior
- No significant improvement seen in gross and fine motor



# What it Means



Prenatal screening is an efficient tool

- *Identifies emergency cases that would otherwise go undiagnosed*
- Education is key to reducing exposure

Health concern from mercury in NJ – echoing other studies across U.S.



Proactive approach to limit exposure, address disparities, and *improve health outcomes*

High need – high ROI



# What About...

## Communities in NJ?

- Communities are likely not aware of risks
- Communities are likely being exposed
- May experience negative health outcomes
- Families are not being treated or changing behavior



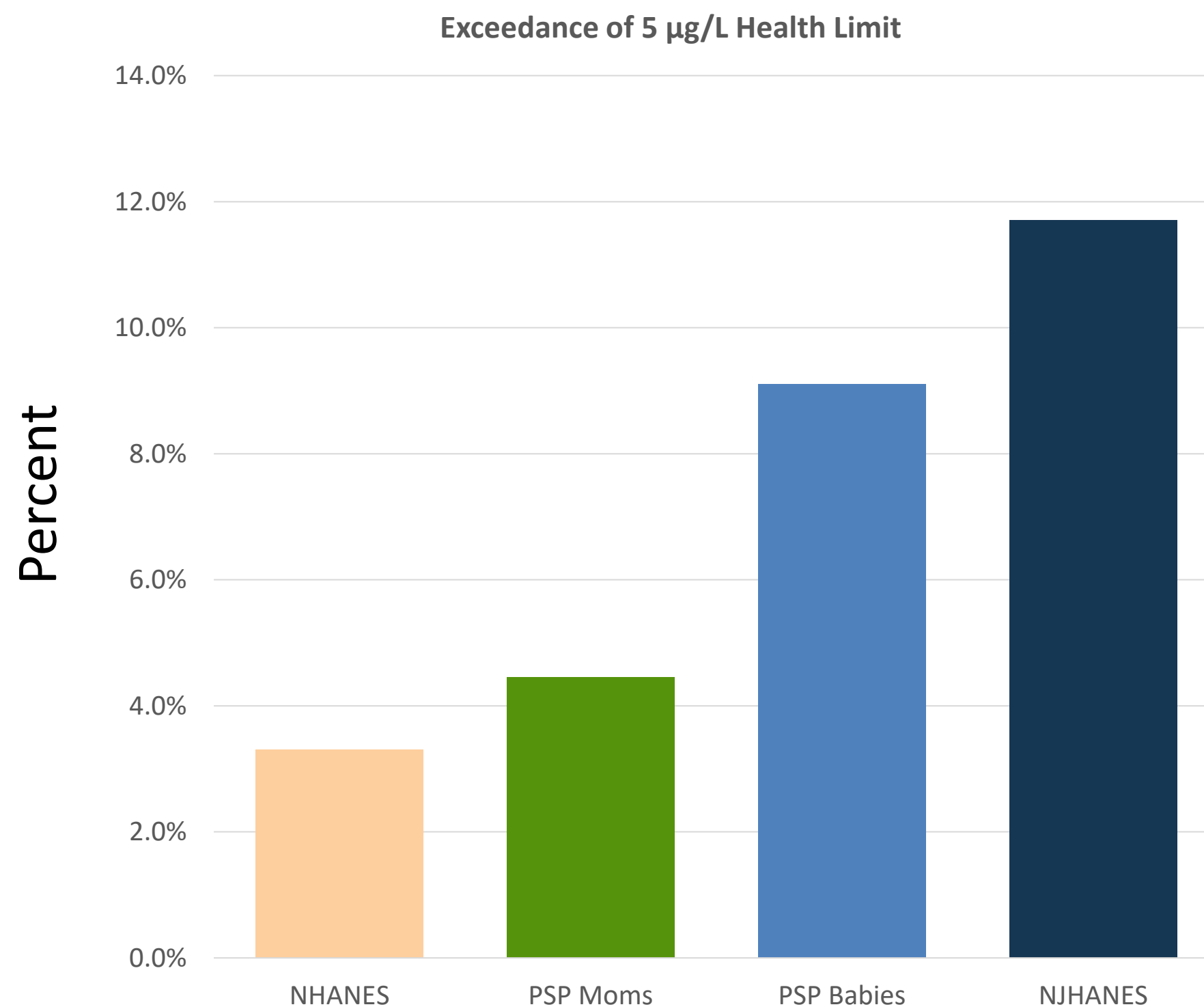
	Newark, NJ	New Jersey	United States
Population	311,000	9.3 million	342 million
Composition	45% Black 36% Hispanic 8% White (NH) 2% Asian 9% Other/two plus	12% Black 22% Hispanic 51% White (NH) 10% Asian 5% Other/two plus	13% Black 19% Hispanic 58% White (NH) 7% Asian 3% Other/two plus
Poverty	24% poverty	9.7% poverty	12.5% poverty
Foreign-born	37%	24% Cities as high as 60%	16% Cities as high as 74%

# Mercury in NJ



**Fig. 1** Four-year-old girl with excessive muscular hypotension especially of the pectoral and pelvic girdles due to chronic inorganic mercury intoxication (acrodynia)

From Benz & Seung-Hee , Eur Journal of Pediatrics, 2011



(PSP - Pre-/perinatal Screening and Intervention Program for Lead and Mercury)



# Current Screenings

## Child Lead

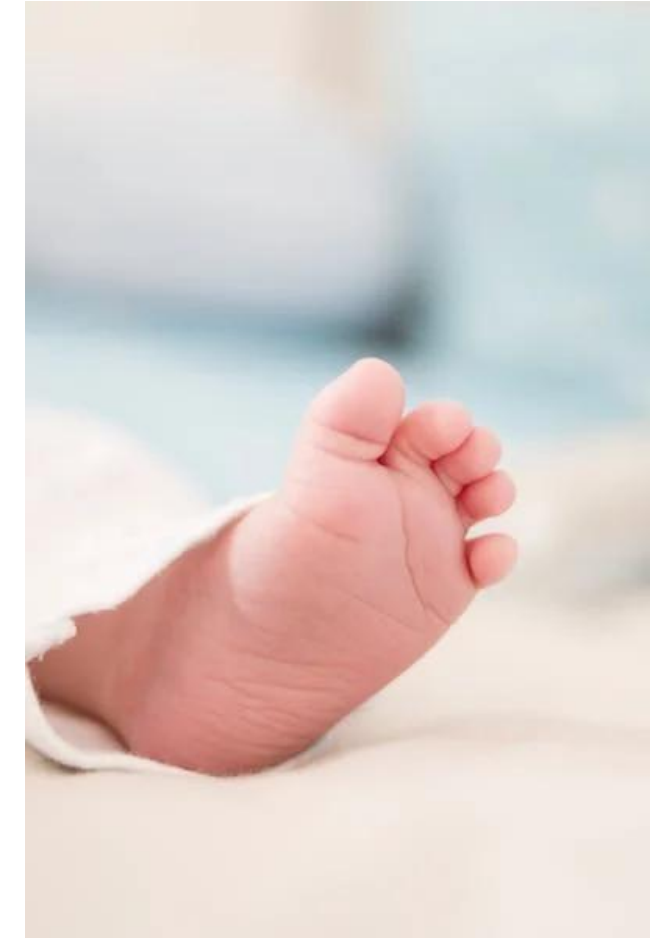
- NJ endorses 1- and 2-year Pb screens and at school enrollment
- Recommended as universal nationally, but varies by state
- No routine screening for mercury

## Prenatal Screening

- Standard screens for STDs, iron, etc.
- Risk-based metals; prenatal intervention is rare

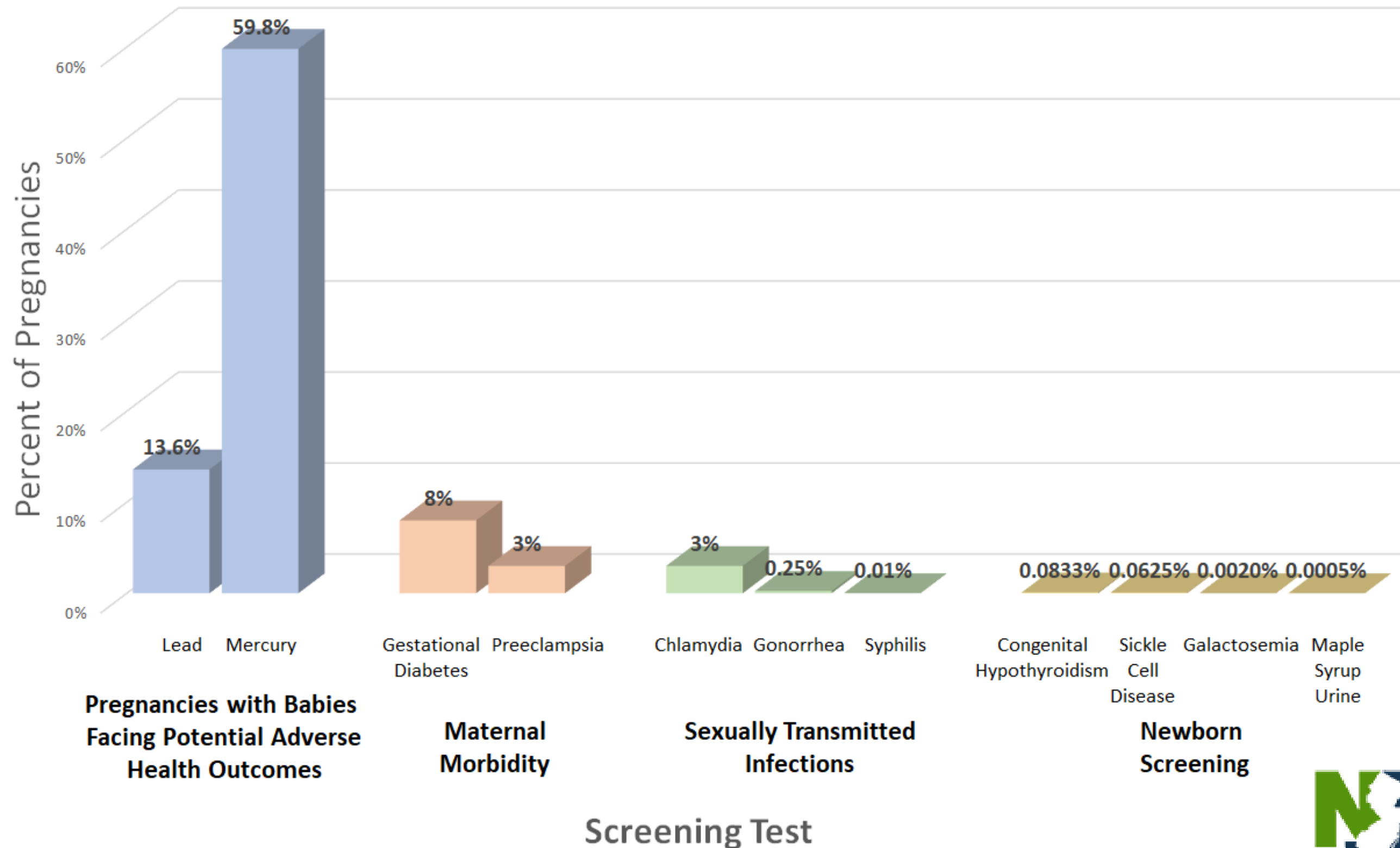
## Newborn Screening

- Universal requirement
- 60+ genetic diseases



# How Does it Compare?

Prevalence of Select Prenatal and Newborn Screening Data



# Lead as a Public Health Success Story

Lead... is a pathway through which racial inequality literally gets into the body.

- Dr. Robert Sampson

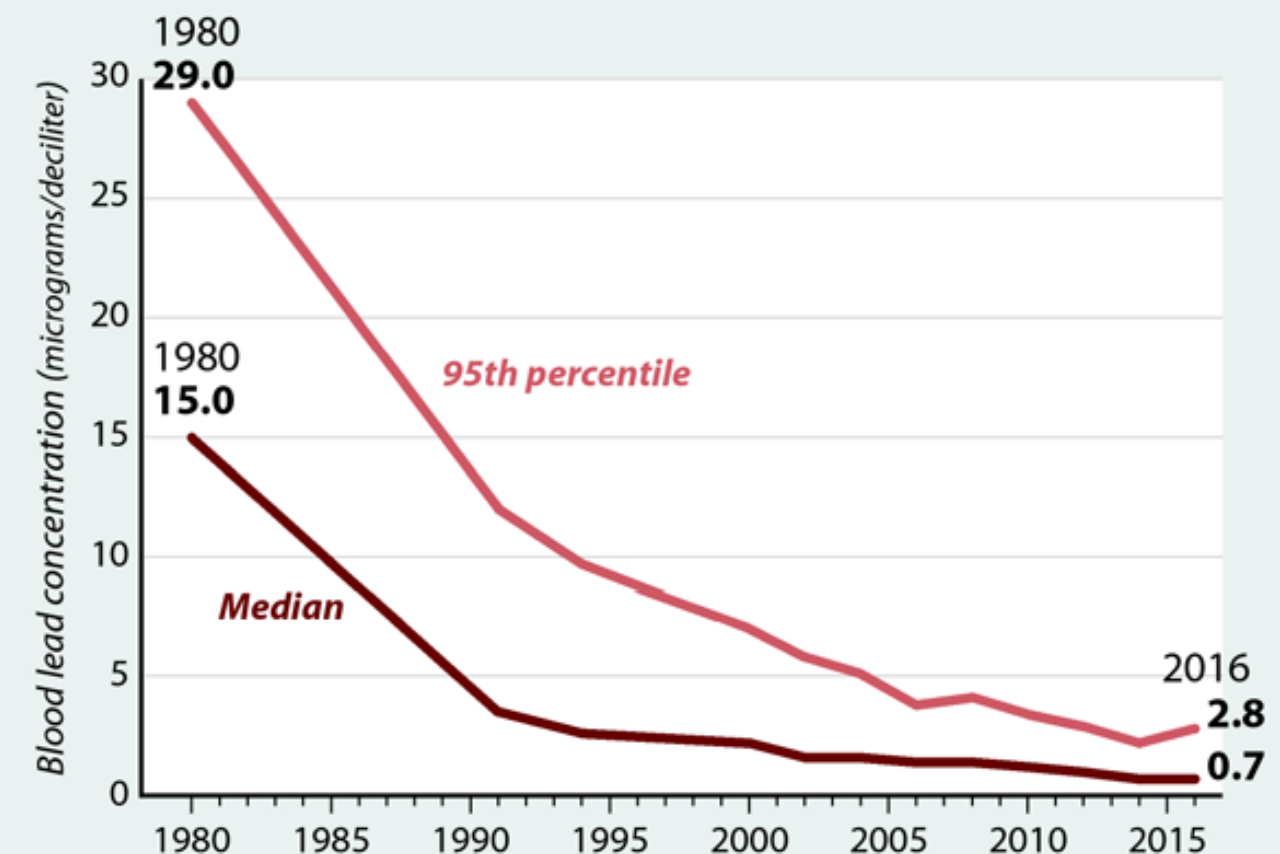
US has seen a 93% reduction in blood lead levels since the 1970s; however, disparities exist in the way levels went down.

## Lead Levels in Children

Childhood blood lead levels (BLLs) have fallen dramatically since the phaseout of leaded gasoline, once the primary source of lead exposure, began in 1973.

### LEAD IN U.S. CHILDREN AGES 1-5

Median and 95th percentile blood concentrations, 1980-2016



DATA: Centers for Disease Control and Prevention; National Center for Health Statistics and National Center for Environmental Health; National Health and Nutrition Examination Survey

SOURCE: EPA

PAUL HORN / Inside Climate News



# Legislation - Bills A4848/S3616

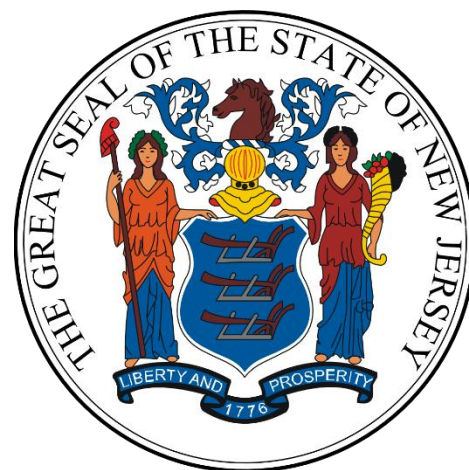
## Provider responsibility

- The bill requires a physician or registered professional nurse to assess each pregnant person for possible risk factors for lead exposure and elevated blood lead levels
- If they identify at least one risk factor, they must perform lead screening on the patient
- If a provider receives laboratory test results indicating elevated blood lead level, they must:
  - Notify the patient
  - Provide an explanation
  - Ensure that any of the patient's household members <6 are screened for lead
- First visit and 3<sup>rd</sup> trimester screening
- \*Patient may refuse test

## Laboratory responsibility

- The laboratory must report the results to NJDOH, the local health department, and the provider within 5 days

**NJDOH shall adopt rules and regulations necessary to carry out the provision of the act**



# What We Can Do for Our Communities

- Understand risks
- Improve messaging and distribution
- Hold constructive dialog about alternative practices
- Educate medical providers, expectant mothers/WCBA, public health professionals, and communities
- Reduce demand for and supply of harmful chemicals
- Advocate for reviewing screening policies
- Advocate for and establish pre- and perinatal screening programs
- Highlight resources available

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Dr. Tina Fan – NJ Biomonitoring PI  
Eric Bind – Program Lead  
Veronica Chandra  
Douglas Haltmeier  
Gurleen Kaur  
Colleen Lestician  
Sarah Mustaqali  
Izabella Saini  
Meraya Sirimis  
Dr. Andrew Steffens  
Dr. Chang Ho Yu

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NJDOH/NJDEP Toxics in Biota Committee  
Lead Free NJ,  
WE ACT for Environmental Justice  
Zero Mercury Working Group



# THANK YOU!

## CONTACT

Phone : 609-718-8188

Website : [nj.gov/health](http://nj.gov/health)

Email : [eric.bind@doh.nj.gov](mailto:eric.bind@doh.nj.gov)

