

# HEALthy Brain and Child Development Study

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CRAN Council

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HEALthy Brain and Child Development  
*Babies • Brains • Bright Futures*

# What is HBCD?

- A prospective longitudinal study recruiting in 2<sup>nd</sup> trimester of pregnancy –following through ages 9-10
- Multi-modal assessments of brain, cognitive and emotional development, including influence of substances and environments from birth through childhood
- Characterize neurodevelopmental trajectories from large sample (~7,500 dyads)
- Determine how substance exposure and other environmental factors affect developmental trajectories
- Valuable resource; large dataset will be broadly shared with annual releases



# HBCD Support

NIH Helping to End Addiction  
Longterm Initiative (HEAL)

National Institute on Drug  
Abuse (NIDA)

National Institute of Mental  
Health (NIMH)

National Institute of  
Neurological Disorders and  
Stroke (NINDS)

National Institute on Alcohol  
Abuse and Alcoholism (NIAAA)

*Eunice Kennedy Shriver*  
National Institute of Child  
Health and Human  
Development (NICHD)

National Institute of  
Biomedical Imaging and  
Bioengineering (NIBIB)

National Institute of  
Environmental Health  
Sciences (NIEHS)

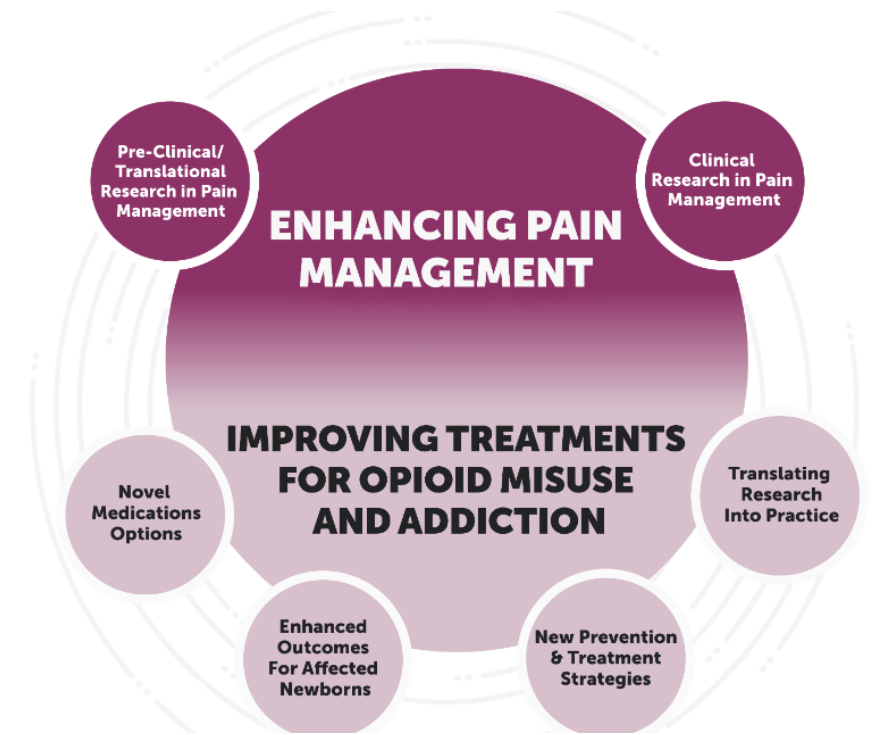
National Institute on Minority  
Health and Health Disparities  
(NIMHD)

Office of Behavioral and Social  
Sciences Research (OBSSR)

Office of Research on  
Women's Health (ORWH)

National Eye Institute (NEI)

## NIH HEAL INITIATIVE



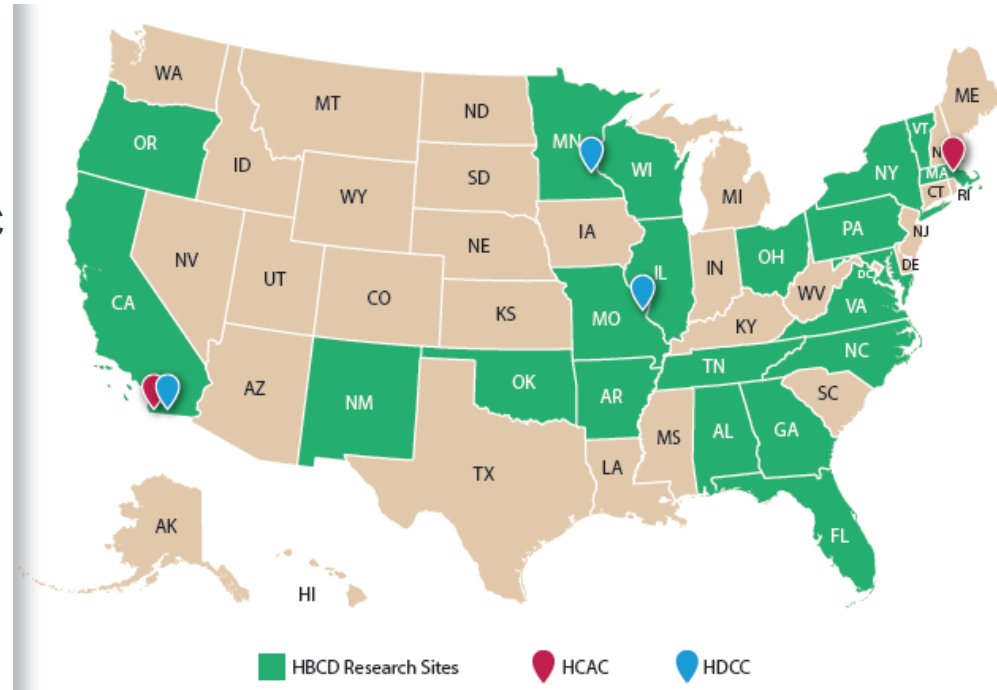


# 25 Research Sites



## UC San Diego

- Cincinnati Children's Hospital
- Children's Hospital Los Angeles/USC
- University of New Mexico
- Cedars Sinai
- Arkansas Children's Hospital
- Boston Children's Hospital
- Northwestern
- University of North Carolina
- Penn State
- University Of Maryland
- Children's Hospital of Philadelphia
- \*University of Minnesota



- University of Vermont
- Oregon Health Sciences University
- Oklahoma State University
- New York University
- Vanderbilt
- University of Florida
- Emory University
- Hopkins/Kennedy Krieger
- \*Washington University
- University of Alabama
- University of Wisconsin, Madison

## HBCD Study Aims

- What are typical neurodevelopmental trajectories and what is the normal range of variability in brain development from birth through childhood?
- How do biological and other environmental exposures affect these developmental trajectories?
- How do genetic influences interact with environmental factors to influence neurodevelopment and cognitive, emotional, and social behavior?
- How does early life exposure to opioids, other substances, and/or other adverse environmental circumstances affect developmental trajectories?
- Are there key developmental windows during which the impact of adverse environmental exposures (e.g., stress, COVID-19) influence later neurodevelopmental outcomes?
- Are there key developmental windows during which ameliorating influences (e.g, substance use disorder treatment; social/economic support) are protective against the potential neurodevelopmental insults of early adverse exposures?
- What is the impact of early parent/caretaker interactions with their children on later health and other outcomes?

# Sampling Design

## • Need To Accomplish Both Internal And External Validity

Descriptions of developmental trajectories

Questions regarding substance use effects on child health and developmental trajectories

Questions regarding other exposures and/or effect modifiers on child health and developmental trajectories

### External Validity / Generalizability

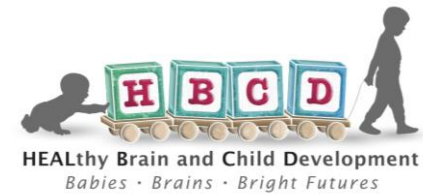
Representativeness of results to target population

- *intermediate target*: local source population
- *ultimate target for consortium*: US population

### Internal validity

Ability to make causal inference (from observational data) by minimizing bias and confounding

# HEALTHy Brain and Child Development Study

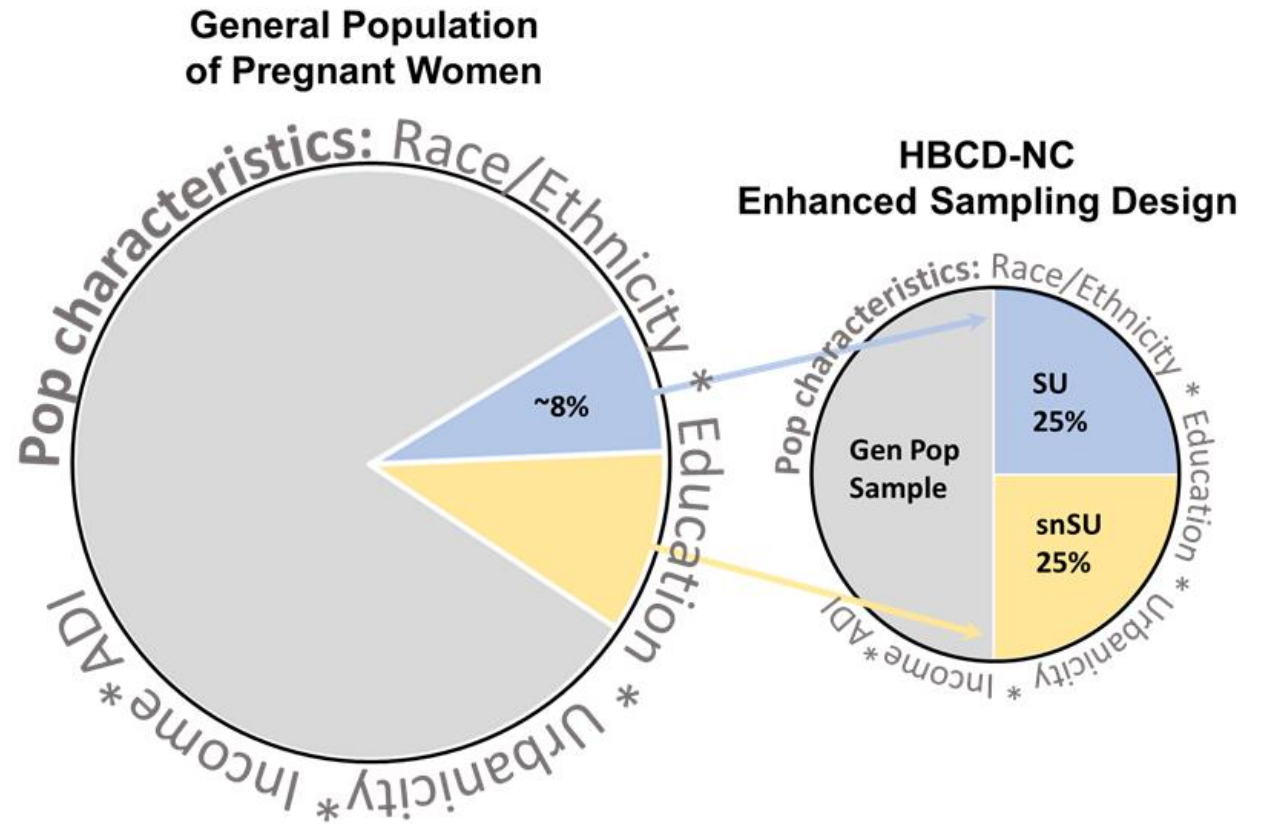


**Goal 1:** 7500 pregnant women (300 women in each of the 25 sites)

**Goal 2:** 25% (1,875 total or 75 per site) of whom report or have biomarkers indicative of substance use during pregnancy

**Goal 3:** To recruit a study population that reflects birthing women ages 15-49 in the US (2020 US Census)

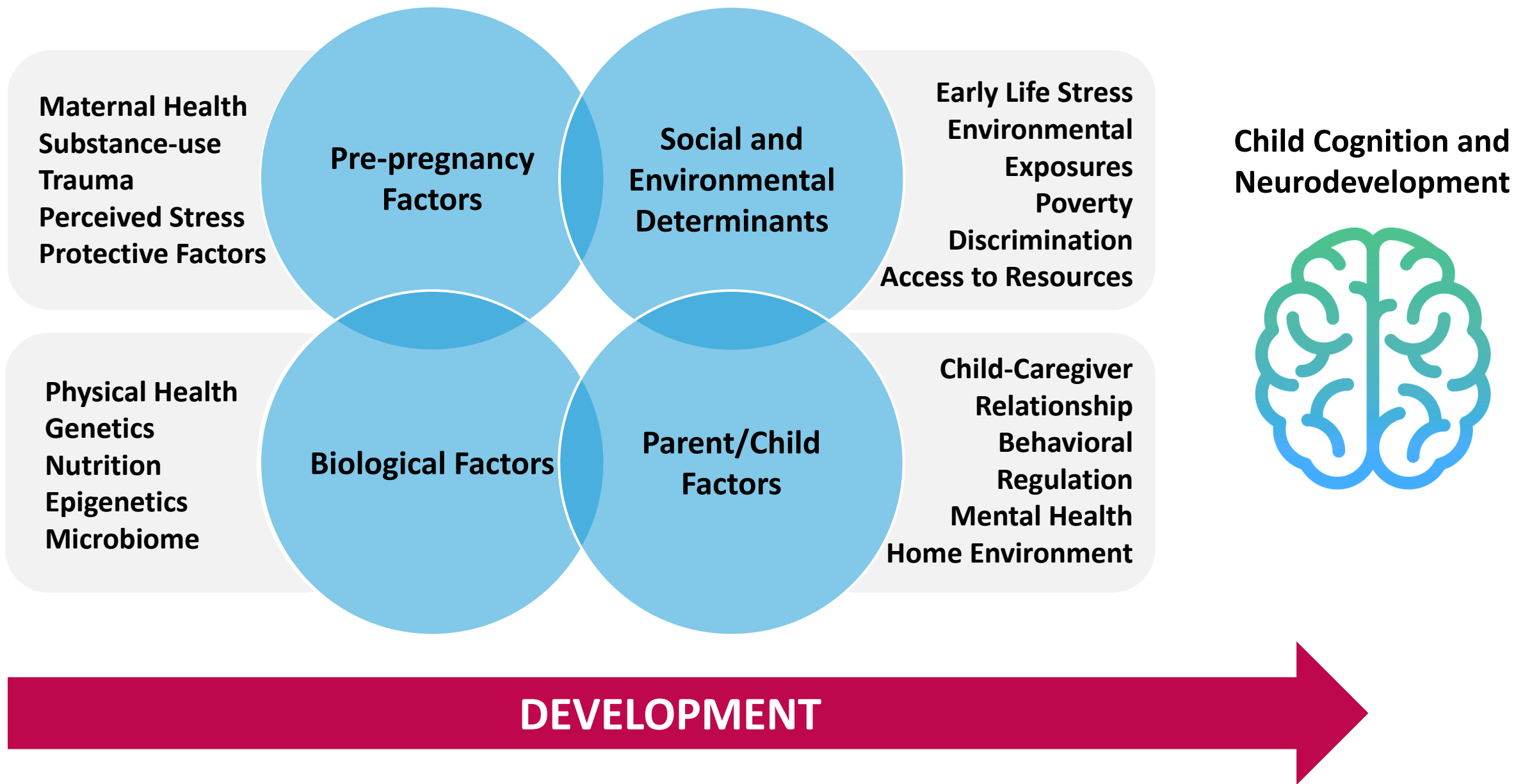
**Goal 4:** To recruit women similar to those who used substances during pregnancy to ensure reasonable balance of potential confounders and improve the internal validity for scientific questions of substance use during pregnancy and child development



## Visit Structure Considerations

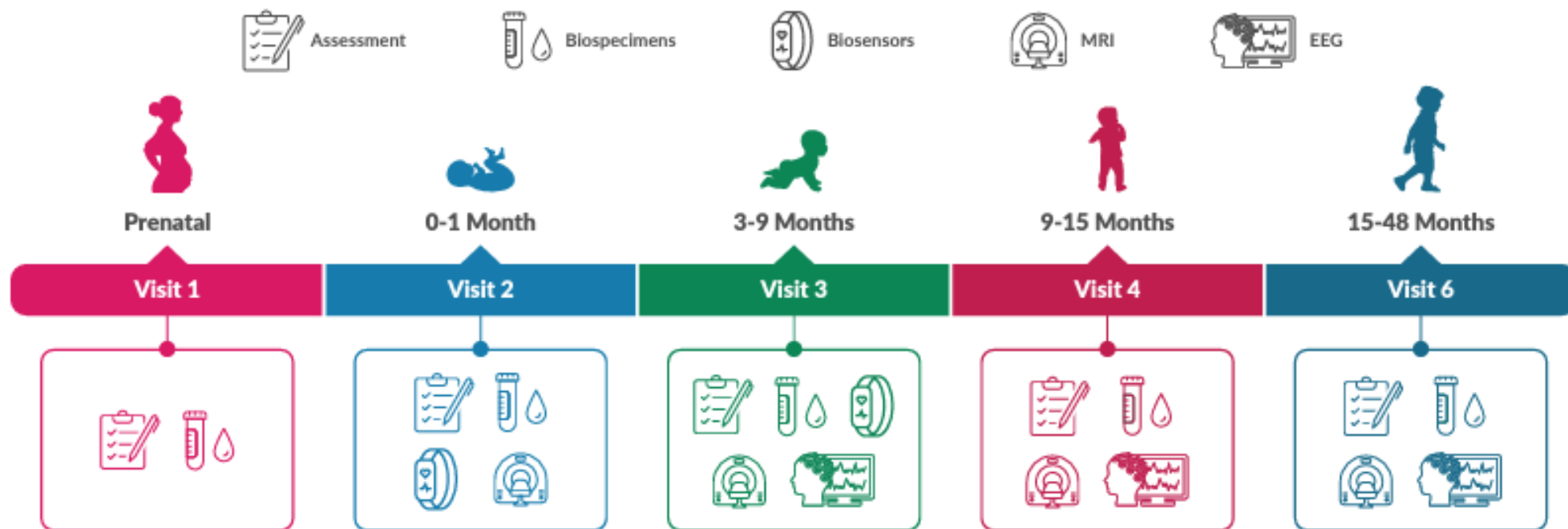
- Ability to address the Study Aims
- Estimation of trajectories, including impacts of various factors, including:
  - Time-invariant (e.g., genetics, prenatal environment)
  - Time-varying (e.g., family environment)
  - Mediators (e.g., neurodevelopment)
- Good (longitudinal) coverage of the entire 0-48 months age span
- Facilitate statistical analyses without undue complexity
- Enough flexibility to maximize data collection and retention





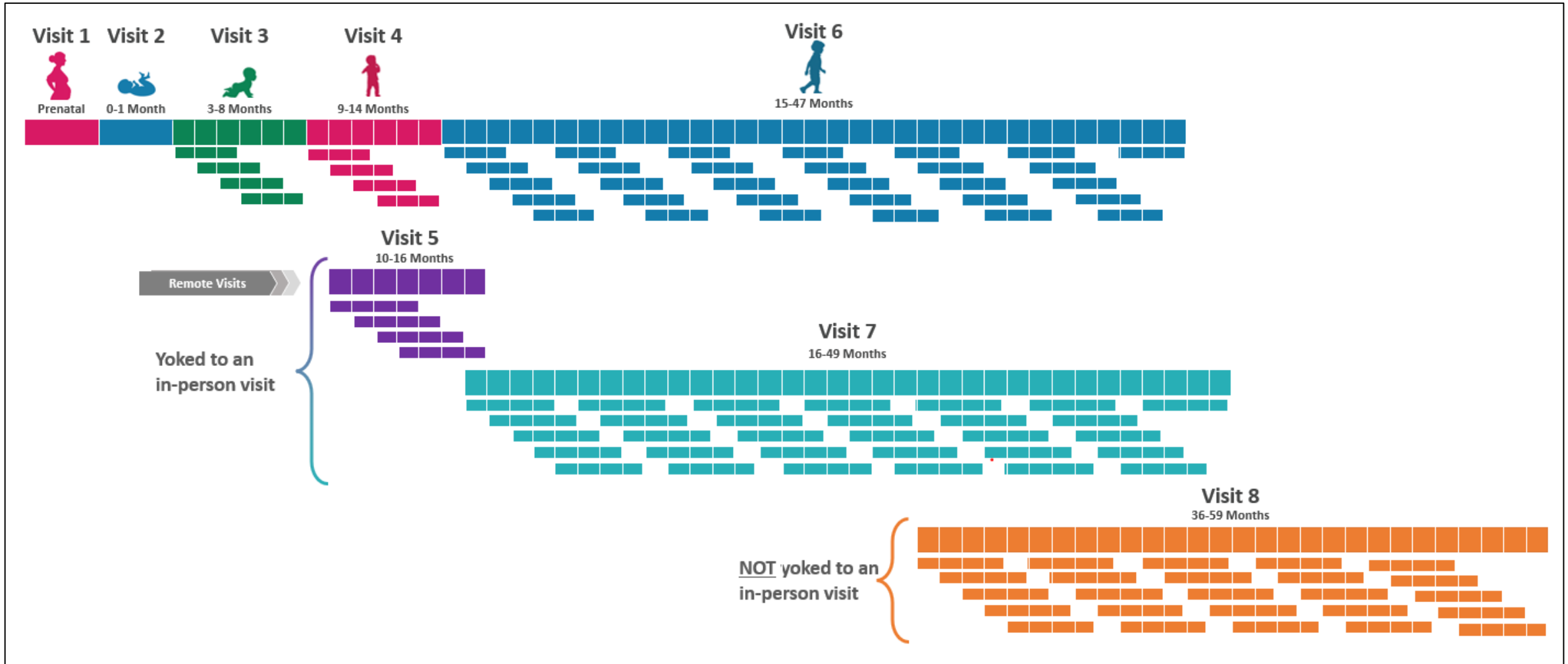
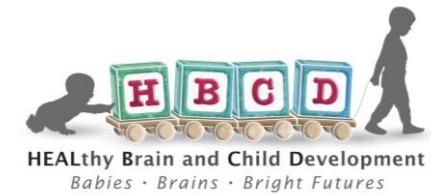


# Timeline of Events



Remote assessments will take place at visits **5** (10-17 months), **7** (16-50 months), and **8** (36-60 months).

# HEALTHy Brain and Child Development Study



# Visit 1

## Assessments

Health V1

Timeline Follow Back

ASSIST V1

Demographics V1

APA Level 1 DSM5 Severity Acute Stress or PTSD

APA Level 2

PACES (Current)

BFY – Benefits/Services, Economic Stress

PROMIS Perceived Stress/Social Support

Edinburgh Postnatal Depression Scale

Personal and family psychiatric history

PhenX+ Discrimination

eHITS

PhenX+ Neighborhood Safety/ Geocode

Protective Factors  
Available Resources  
Risks  
Stressors  
Vulnerability Factors  
Parental Health  
Parental Mental Health

## Biospecimens

Blood, urine, saliva (maternal)



# Visit 2

## Assessments

MAP-TL, Version: Infancy (< 1 year)  
APA Level 1  
DSM5 Severity Acute Stress or PTSD  
APA Level 2  
PROMIS Perceived Stress/Social Support  
Edinburgh Postnatal Depression Scale  
Breast Feeding History  
2-Item Food Insecurity  
Participant Feedback Form- Main Study  
Health V2  
Timeline Follow Back  
ASSIST V2

## Biospecimens

Child - urine, stool, saliva  
Birth parent – saliva, nails

Protective Factors  
Available Resources  
Risks/Stressors  
Vulnerability Factors  
Parental Health  
Parental Mental Health  
Infant Health

## Anthropometrics

Infant height, weight, head circumference

## Wearable Biosensors

Child (sent home, wear 72 hours and return) to measure sleep cycle, activity, heart rate

## MRI

Structural (T1/T2)  
Diffusion, Functional, Quantitative MRI  
MR Spectroscopy

## Abstraction from obstetric and birth records

# Visit 3

## Assessments

SPM-2 Infant  
IBQ-R Very Short Form + Behavior Inhibition  
MAP-TL, Version: Infancy (< 1 year)  
APA Level 1  
ASSIST V3  
DSM5 Severity Acute Stress or PTSD  
APA Level 2 PROMIS Perceived Stress/Social Support  
Edinburgh Postnatal Depression Scale  
ecPROMIS (<1 y/o) - Caregiver Child Relationship Scale  
Breast Feeding History  
2-Item Food Insecurity  
ERICA  
NIH\_BT B Cognitive/Executive Function/Memory  
NIH\_BT B Language

## Biospecimens

Child - urine, stool, saliva  
Birth parent – saliva

Protective Factors  
Available Resources  
Risks/Stressors  
Vulnerability Factors  
Parental Health  
Parental Mental Health  
Infant Health  
Infant Behavior

## Anthropometrics

Infant height, weight, head circumference

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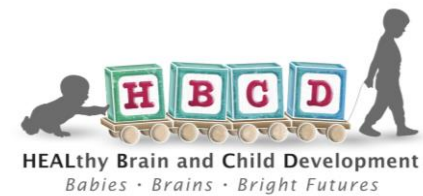
## MRI

Structural (T1/T2), Diffusion, Functional, Quantitative, MR Spectroscopy

## EEG

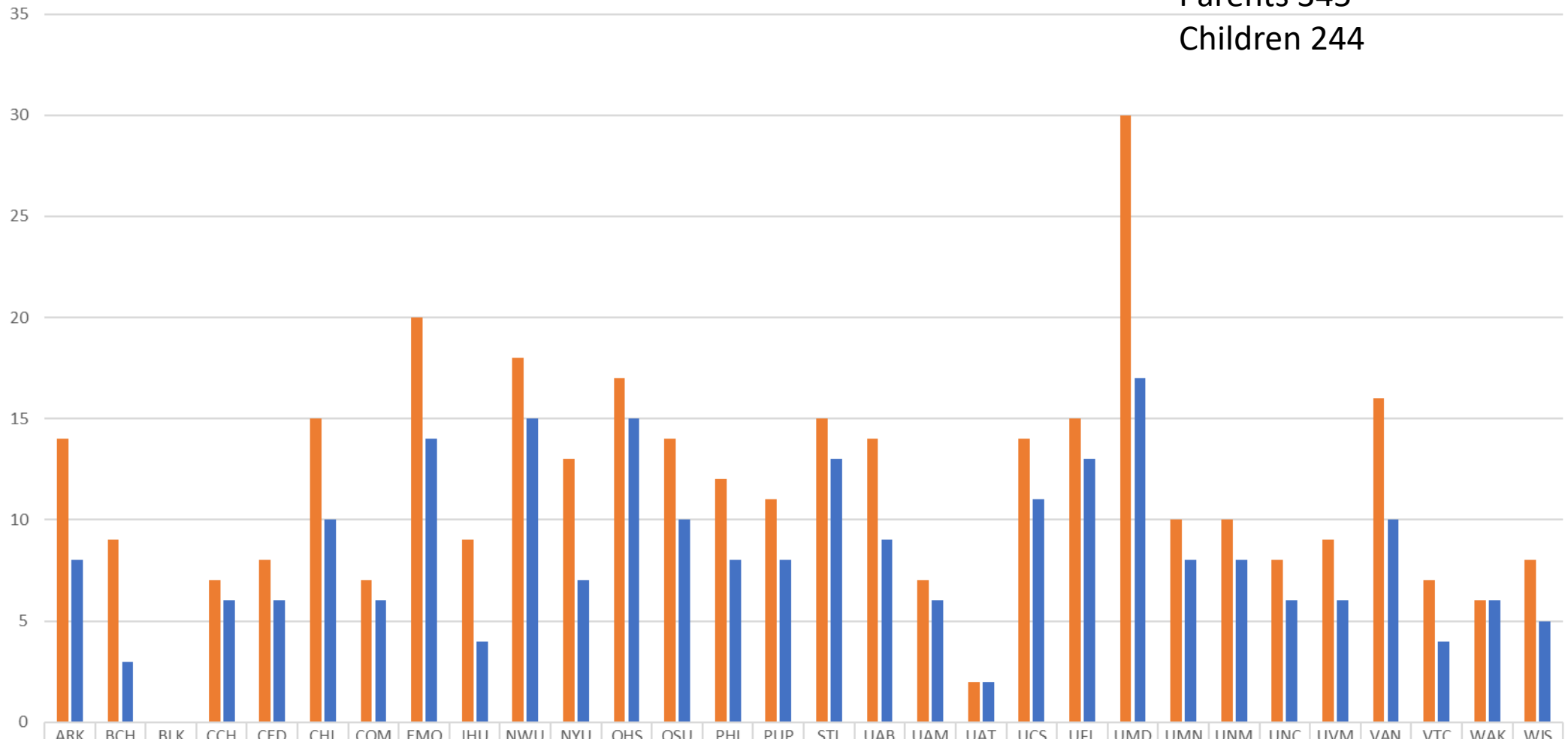
Baseline, Auditory Oddball, VEP, Faces

# HEALTHy Brain and Child Development Study



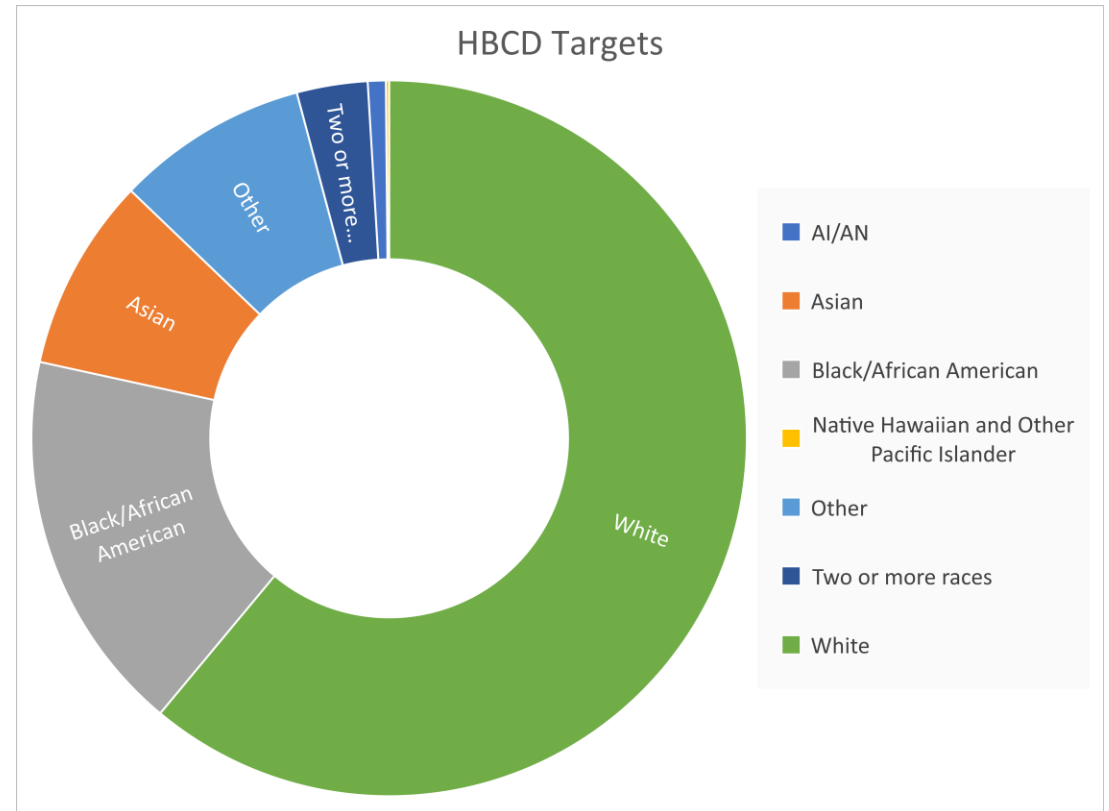
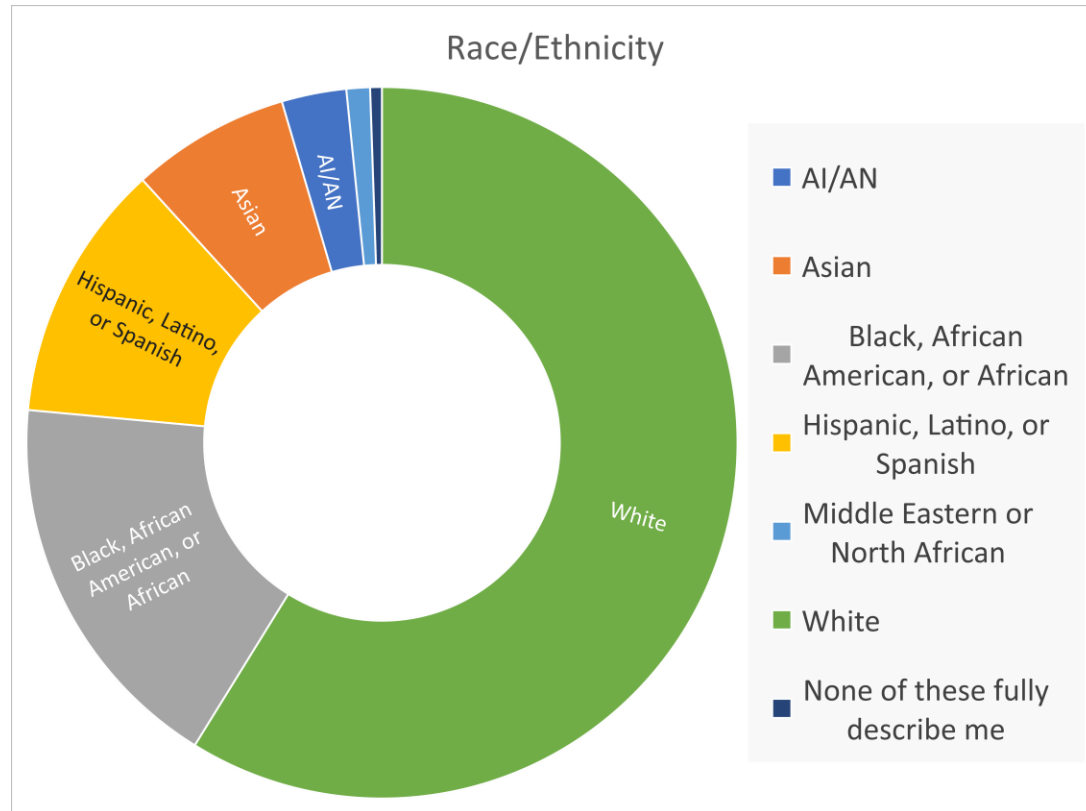
Number of Consented Parents and Children

Parents 345  
Children 244



Number of Parents	14	9	0	7	8	15	7	20	9	18	13	17	14	12	11	15	14	7	2	14	15	30	10	10	8	9	16	7	6	8
Number of Children	8	3	0	6	6	10	6	14	4	15	7	15	10	8	8	13	9	6	2	11	13	17	8	8	6	6	10	4	6	5

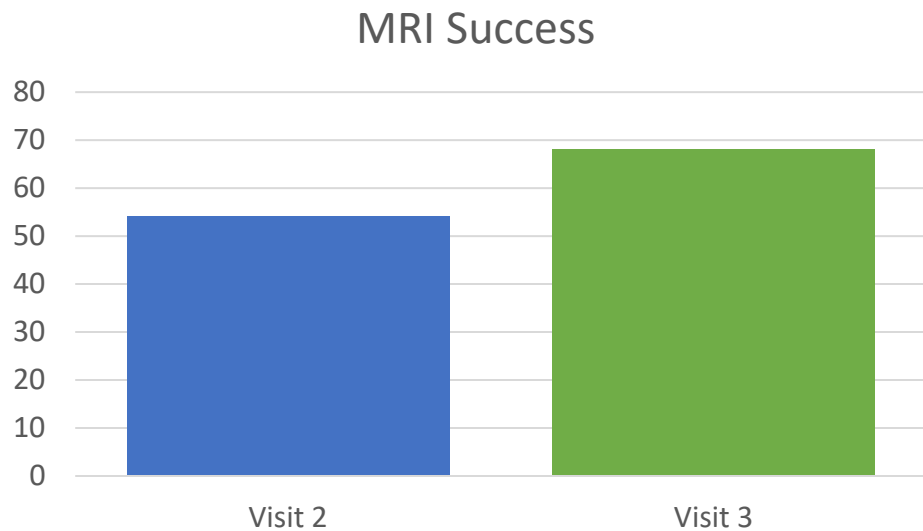
# Race/Ethnicity of Pilot Participants



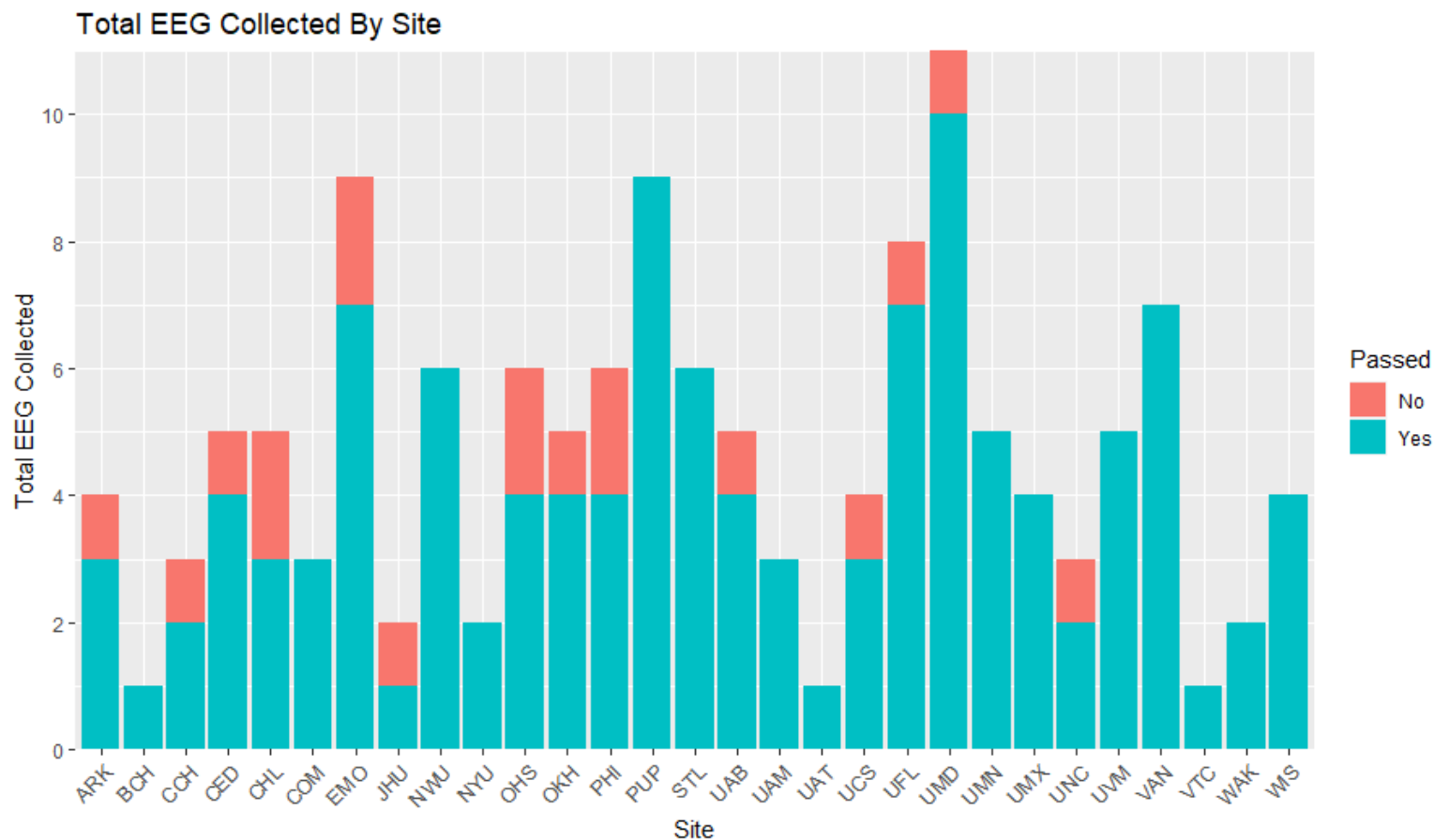


# MRI Protocol - Visits 2 and 3

- T1, T2 structural MRI
- Resting fMRI
- Diffusion MRI
- qMRI
- MRS



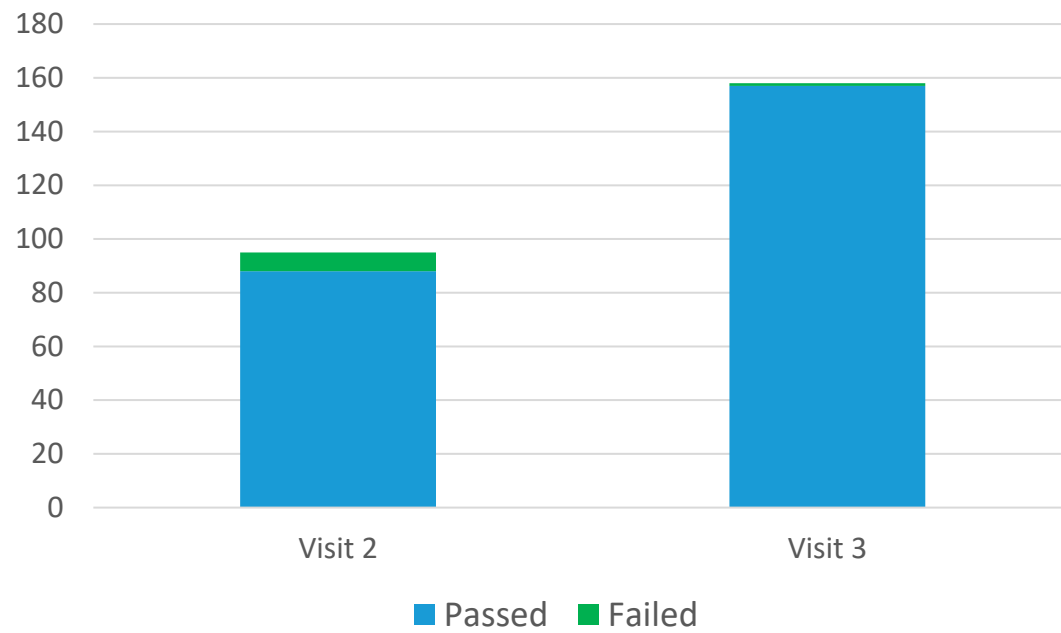
# Pilot EEG data collection



The EEG team evaluates the data for quality. Updated 5/2/2023

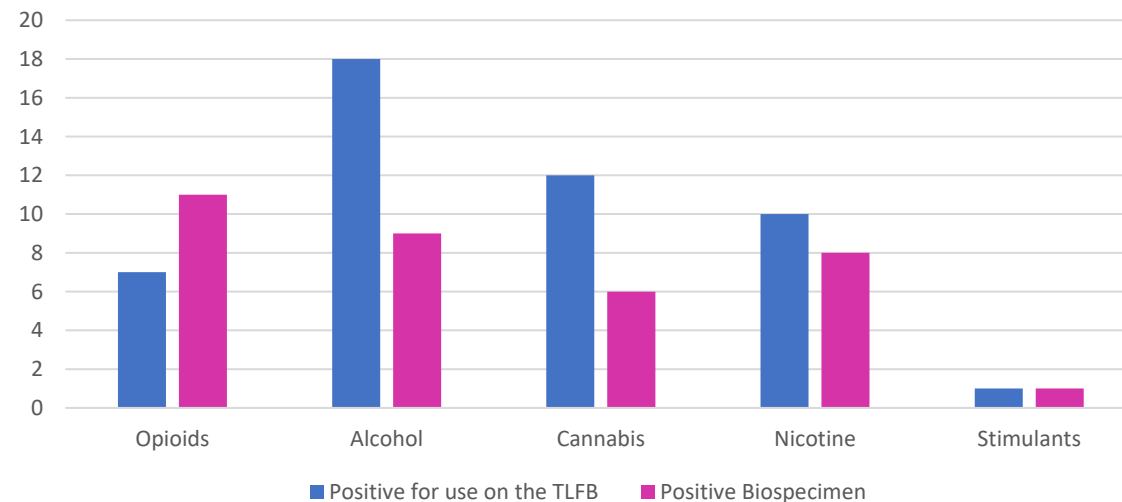
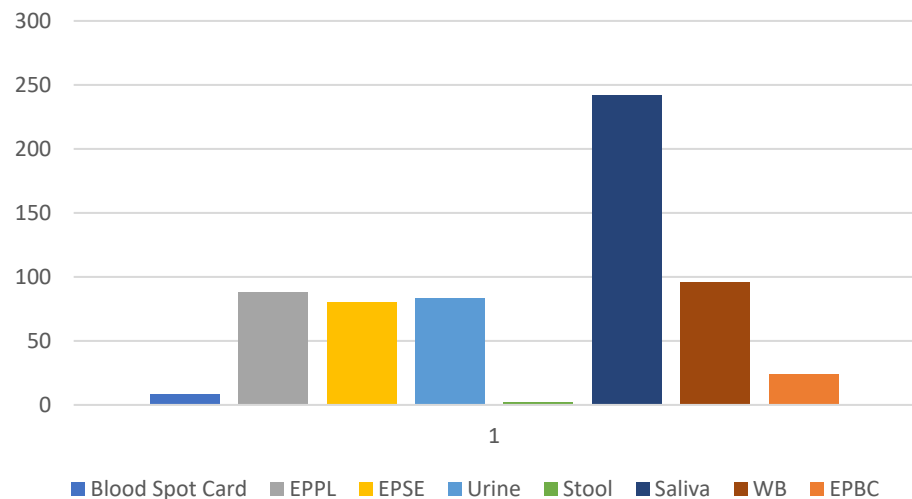
# Wearable Technology Visits 2 & 3

## Movement Sensors

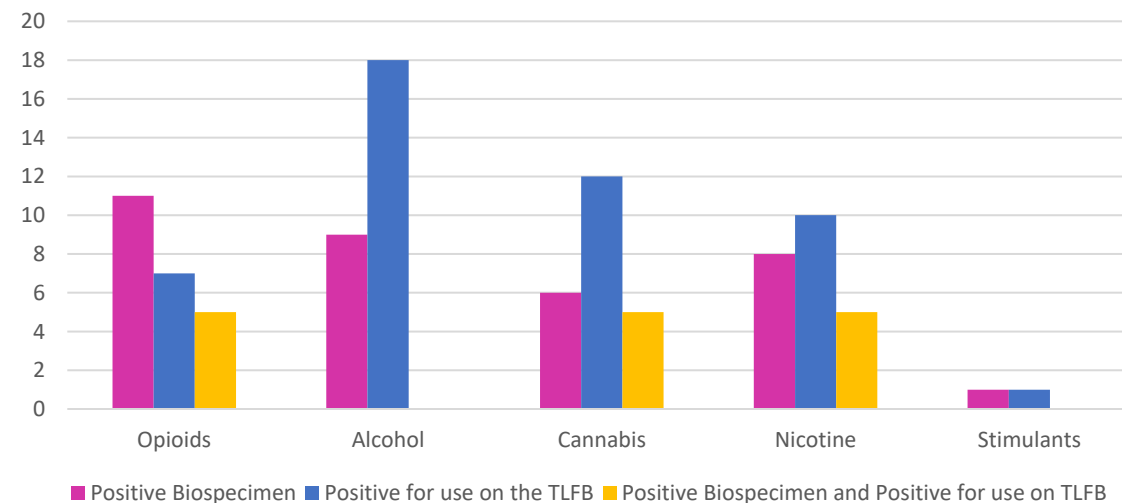
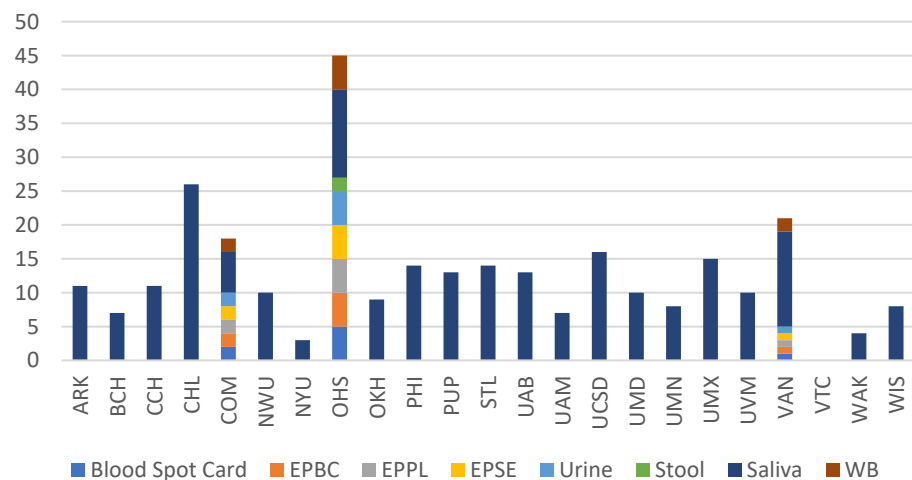


# Pilot Biospecimen Collection

### Biospecimen by Type



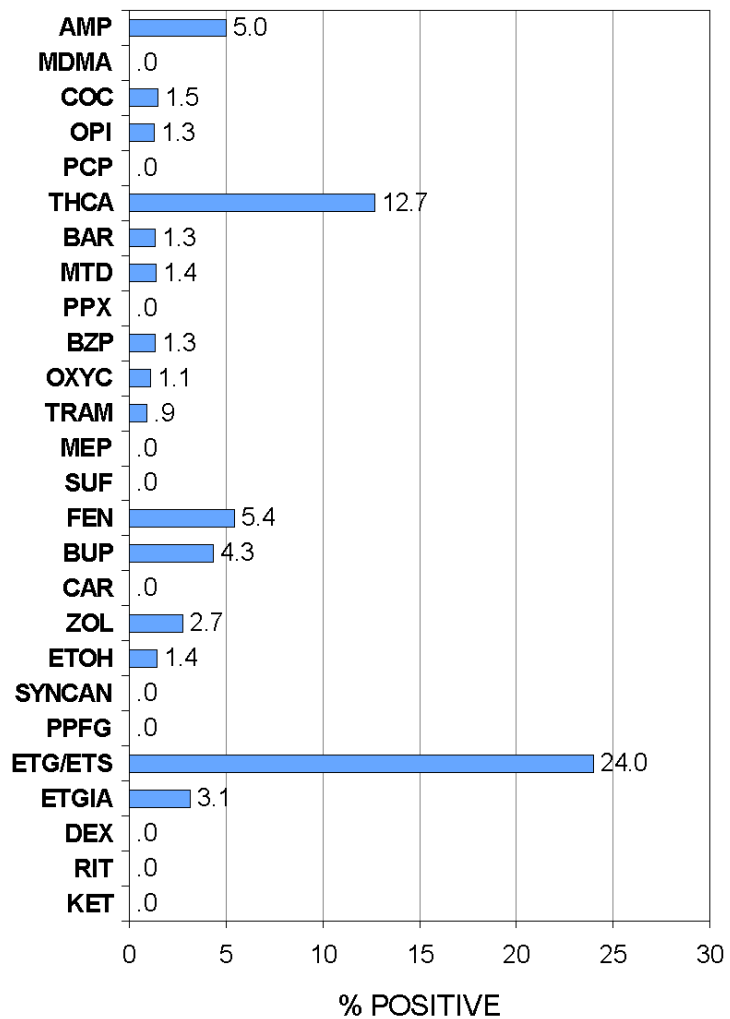
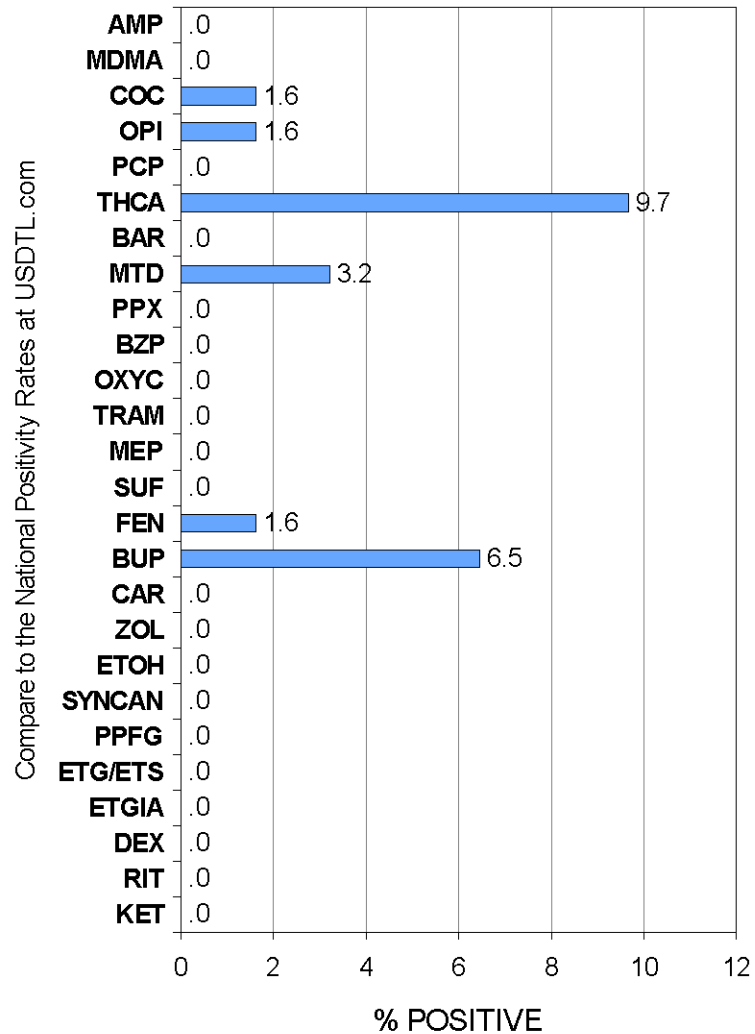
### Biospecimens Received @ Sampled

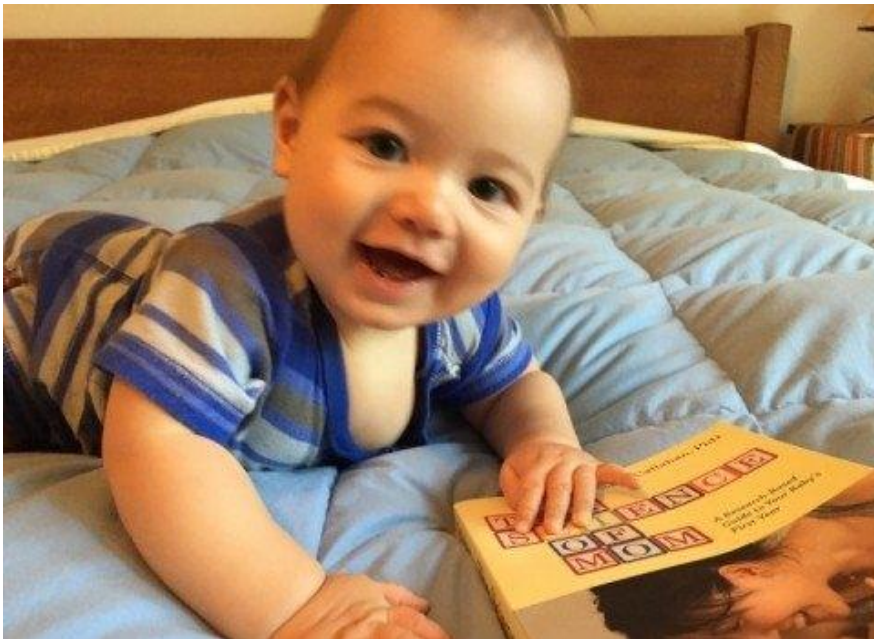


# Preliminary analysis of pilot samples

HBCD pilot N = 63

National Positivity rate N ~ 1500





Questions?

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