

Preliminary Substance Use Findings

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Adolescent Brain Cognitive Development[®]

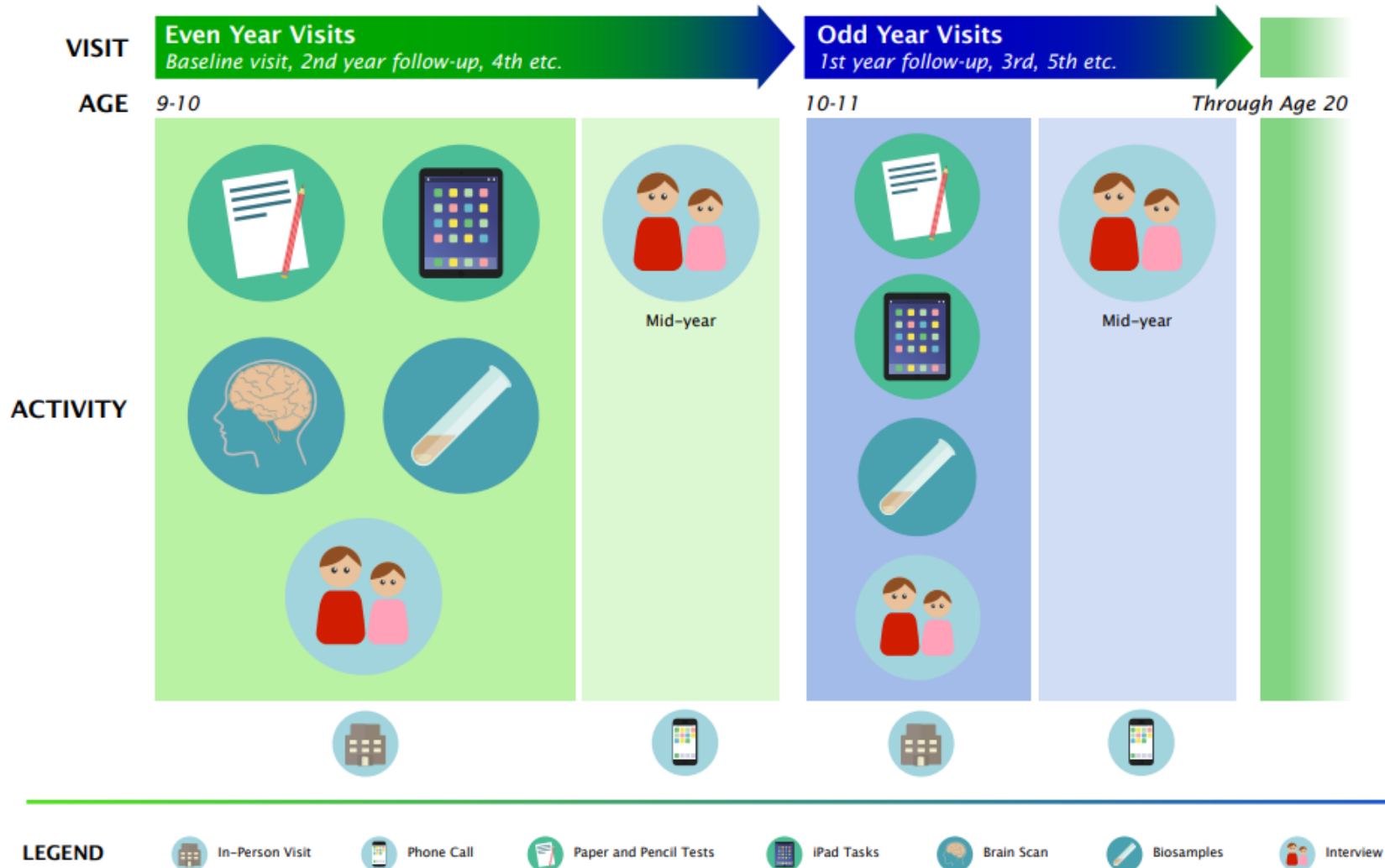
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The ABCD Study is the largest long-term study of brain development and child health in the United States.



ABCD Study

TIMELINE OF EVENTS



Research Objectives

- Describe individual developmental trajectories (e.g., brain, cognitive, emotional, academic), and the factors that can affect them.
- Develop national standards of healthy brain development.
- Investigate the roles and interaction of genes and the environment on development.
- Study how physical activity, sleep, screen time, sports injuries, and other experiences affect brain development.
- Examine the factors that influence the onset, course, and severity of psychological disorders.
- Understand the relationship between mental health and substance use.
- Study how use of different substances (caffeine, nicotine, alcohol, cannabis) affects developmental outcomes, and vice versa.

ABCD Recruitment



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11,875

Families (parent and one guardian), recruited over 2 years.

98.4% retention at 5-year mark.

ABCD Youth Protocol Summary: Baseline

Physical Health

PhenX Anthropometrics (height/weight/waist measurements)
Snellen Vision Screener
Edinburgh Handedness Inventory
Youth Risk Behavior Survey: Exercise
Pubertal Development Scale
Menstrual Cycle Survey (pubescent girls)
Screen Time Survey

Brain Imaging

Structural MRI

- 3D T1 - Weighted
- 3D T2 - Weighted
- Diffusion Tensor Imaging

Functional MRI (fMRI)

- Resting State
- Monetary Incentive Delay Task
- Stop Signal Task
- Emotional N-Back Task

Biospecimens

Breathalyzer and Oral Fluids (subset)
Saliva Samples for DNA, Puberty
Blood Samples (subset)
Hair Sample
Baby Teeth

Mental Health

Kiddie Schedule for Affective Disorders and Schizophrenia

- Background Items Survey
- Diagnostic Interview for DSM-5 (5 modules)

PhenX UPPS-P for Children Survey

PhenX Behavioral Inhibition/Behavioral Approach System (BIS/BAS) Scales

Prodromal Psychosis Scale

Youth Resilience Scale

Neurocognition

NIH Toolbox Tasks:

- Picture Vocabulary
- Flanker Inhibitory Control & Attention
- List Sorting Working Memory
- Dimensional Change Card Sort
- Pattern Comparison Processing Speed
- Picture Sequence Memory
- Oral Reading Recognition

Rey Auditory Verbal Learning Task

Cash Choice Task

Little Man Task

Matrix Reasoning Task

RAVLT Delayed Recall

Culture & Environment

Prosocial Tendencies Survey

PhenX Acculturation Survey

Parental Monitoring Survey

Acceptance Subscale from Children's Report of Parental Behavior Inventory (CRPBI) - Short

PhenX Family Environment Scale - Family Conflict

PhenX Neighborhood Safety/Crime Survey

PhenX School Risk & Protective Factors Survey

Substance Use

For most participants*:

Timeline Follow-Back Survey
PhenX Peer Group Deviance Survey
PATH Intention to Use Tobacco Survey
Caffeine Intake Survey
Participant Last Use Survey (PLUS) for substance use within the last 24 hrs

Other Data Sources

Geocoding from Residential History
School Records
FitBit® (subset)
Brief Problem Monitor - Teacher Form



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ABCD Parent Protocol Summary: Baseline

Physical Health

PhenX Demographics Survey
Medical History Questionnaire
Developmental History Questionnaire
PhenX Medications Survey
Menstrual Cycle Survey
Sleep Disturbances Scale for Children
Sports and Activities Involvement Questionnaire
Screen Time Survey
Ohio State TBI Screen - Short

Mental Health

Kiddie Schedule for Affective Disorders and Schizophrenia

- Background Items Survey
- Diagnostic Interview for DSM-5

Child Behavior Checklist
General Behavior Inventory - Mania
Adult Self Report Survey
Family History Assessment Survey

Substance Use

Parent Rules Survey
PhenX Community Risk and Protective Factors
Participant Last Use Survey (PLUS) for substance use within the last 24 hrs.

Culture & Environment

Vancouver Index of Acculturation - Short Survey
Multi-Group Ethnic Identity Measure-R Survey
Prosocial Tendencies Survey
Mexican American Cultural Values Scale
PhenX Acculturation Survey
PhenX Family Environment Scale - Family Conflict
PhenX Neighborhood Safety/ Crime Survey
Native American Acculturation Scale



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ABCDStudy.org

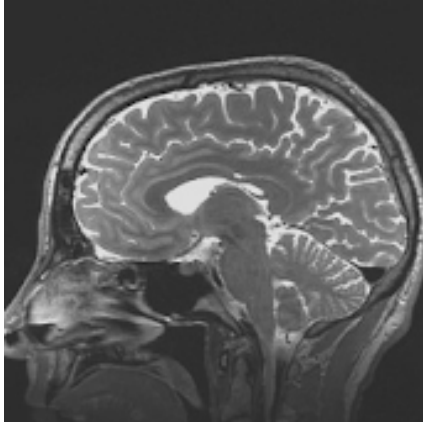


Additional Measures

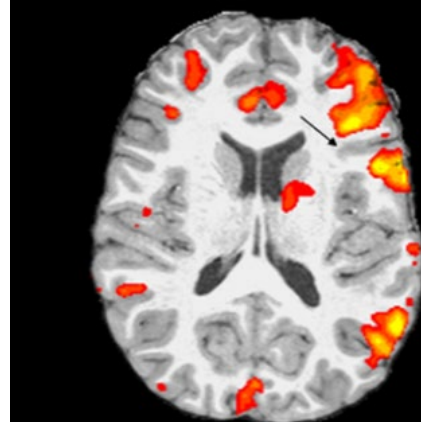
- Year 2: Fitbit (sleep, physical activity)
- Year 3: EARS app (screentime)

Neuroimaging

2 hour scans every other year (BL, Y2, Y4...)



Structural MRI



Functional MRI

Resting State fMRI

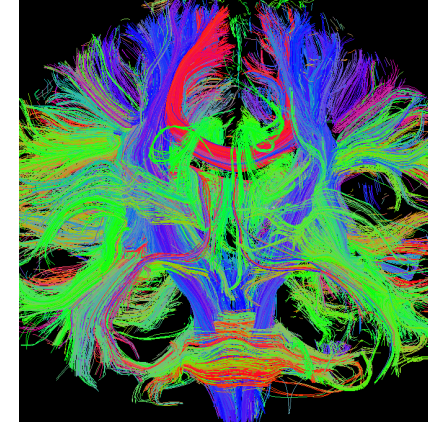
20 minutes

Task Based fMRI

Stop-Signal Task

Emotional N-Back

Monetary Incentive Delay



**Diffusion Tensor
Imaging**

Substance Use - Have You Heard of:

- Alcohol
- Tobacco products (e.g., cigarettes, smokeless, hookah, e-cigs)
- Marijuana (including dabs, drinks, food)
- Fake or synthetic marijuana
- Bittamugen or byphoditin
- Caffeine (e.g., coffee, tea, energy drinks)
- Sniffing liquids, sprays, or other products to get high
- Taking pills or medications to get high
- Have you heard of people using anything else to get high such as cocaine, methamphetamine, ecstasy, etc.
- What other drugs have you heard of?

Have you ever used...
For each drug endorsed...

- Age of onset for each type
- Have you begun using regularly (at least once a week for 6 months)?
- Lifetime quantity
- Largest quantity in one sitting
- When is the last time used (showing calendar for guidance)?

Substance Use Follow-up Questions

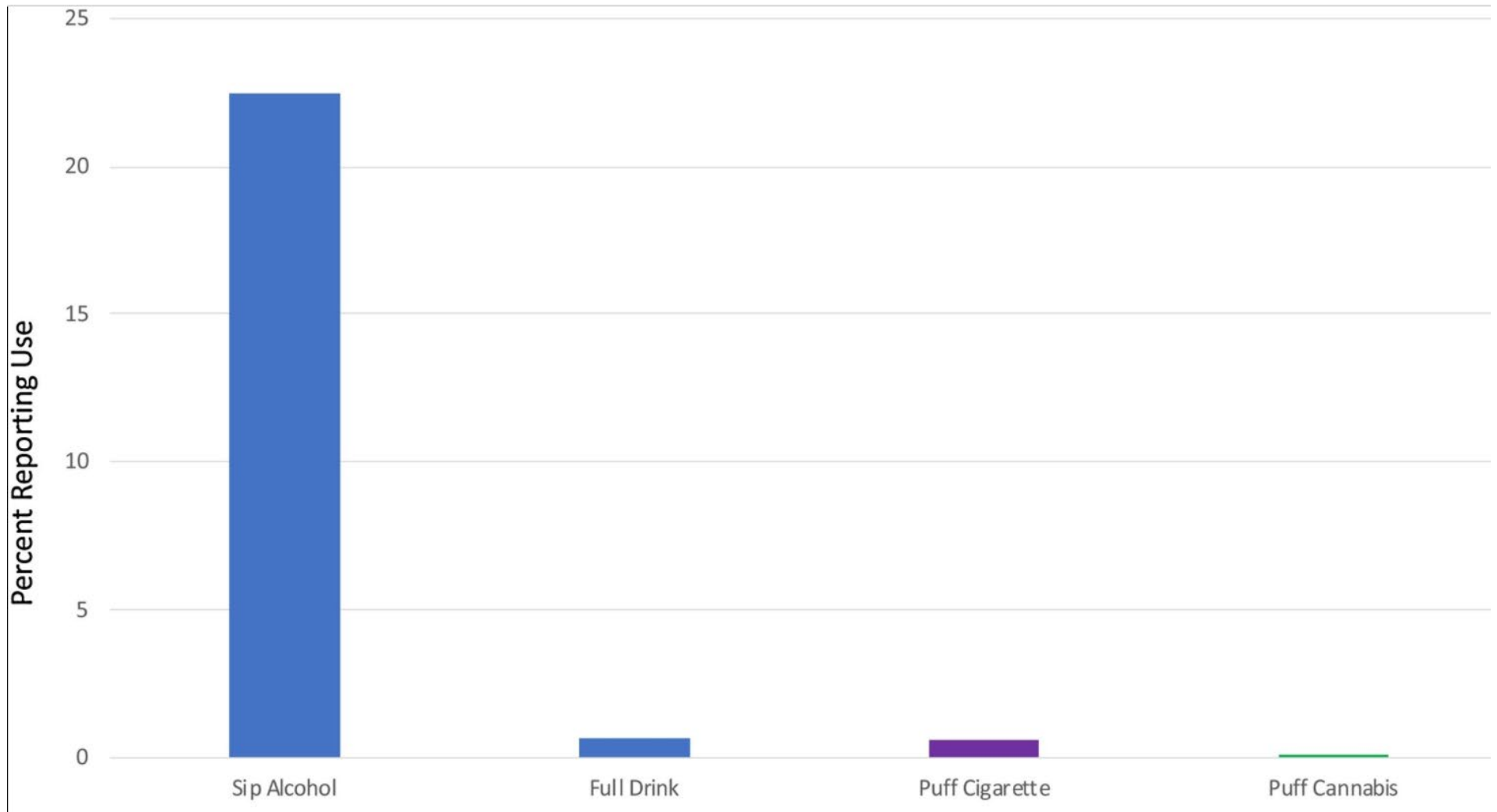
- Friend use
- Curiosity about trying (insert drug)
- Acute subjective responses
- Problematic levels of use
- Cannabis: details of THC/CBD, strain, method of use, etc.



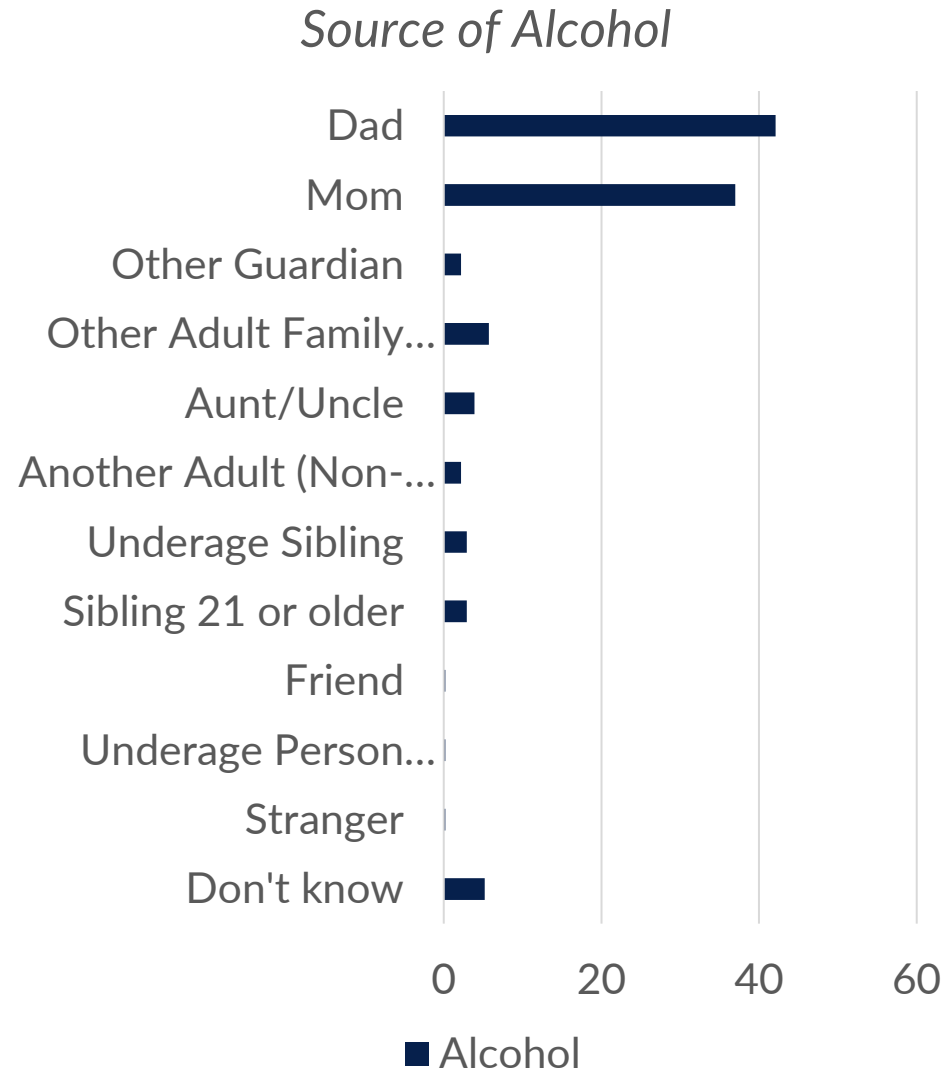
BASELINE CHARACTERISTICS

Scientific Highlights

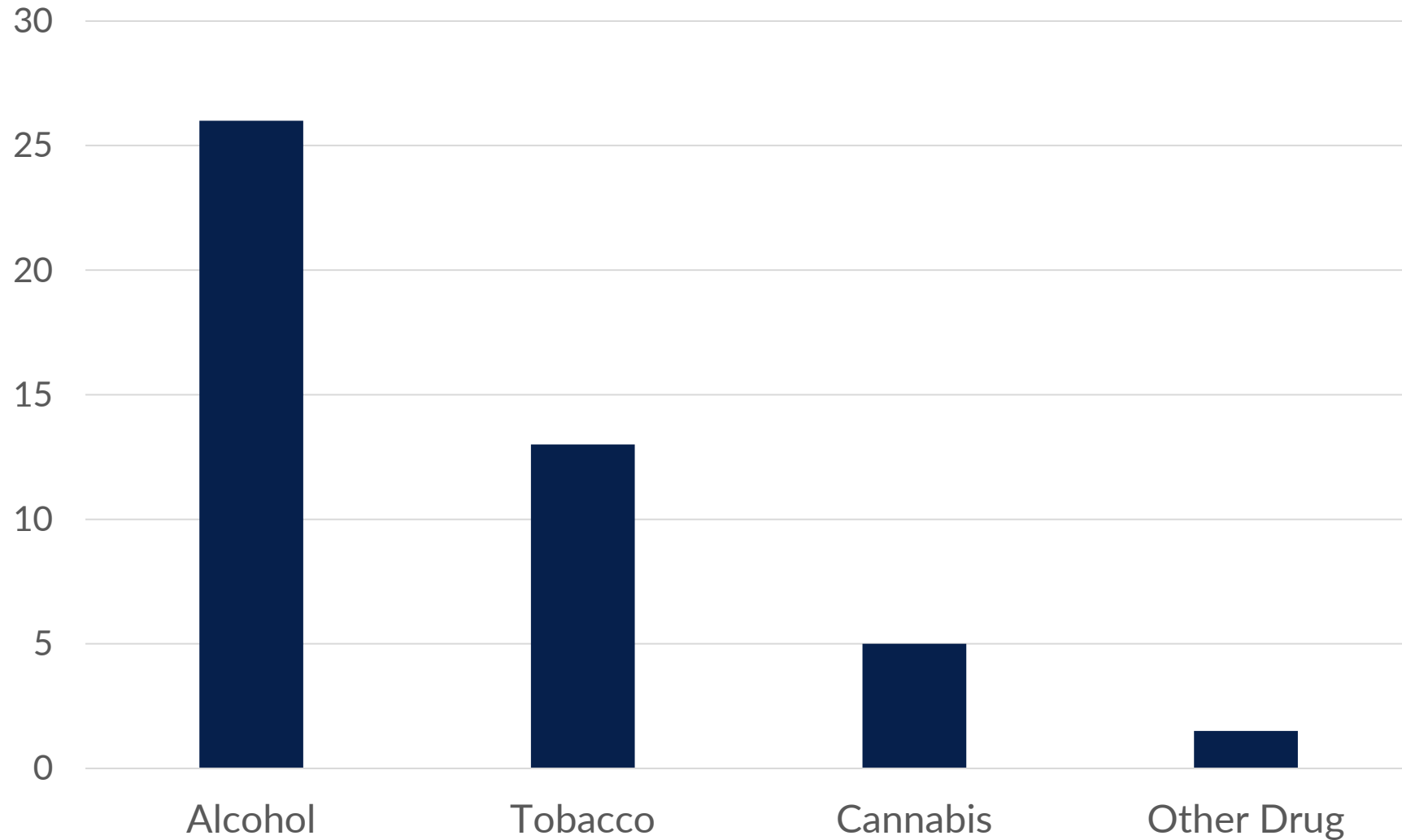
Baseline Substance Use



Baseline Substance Use



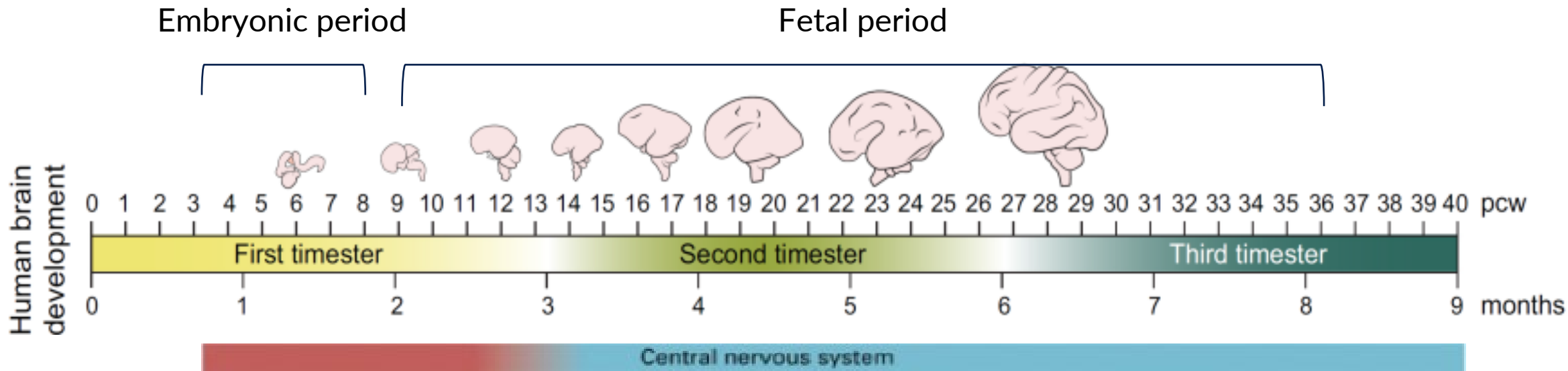
Prenatal Substance Exposure



SUBSTANCE USE

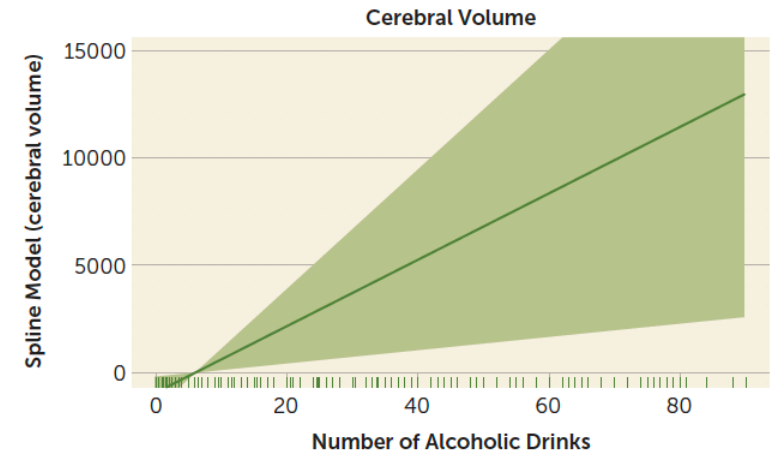
Scientific Highlights

Prenatal Brain Development



Prenatal Alcohol Exposure

- Few examinations of moderate drinking effects on prenatal brain development
- ABCD: 26% were exposed to alcohol prenatally
- Dose-dependent relationships: The more alcohol consumed when pregnant, the greater the differences in a child's brain structure.
- Aberrant development contributed to emotional and behavioral problems



Alcohol use

Risk factor for:

1-2 drinks during any week in pregnancy

- Anxiety, depression
- Attention problems
- High impulsivity
- Early alcohol experimentation

3+ drinks/occasion

- In addition to the above:
- Attention deficit hyperactivity disorder
 - Oppositional defiant disorder

Prenatal Cannabis Exposure

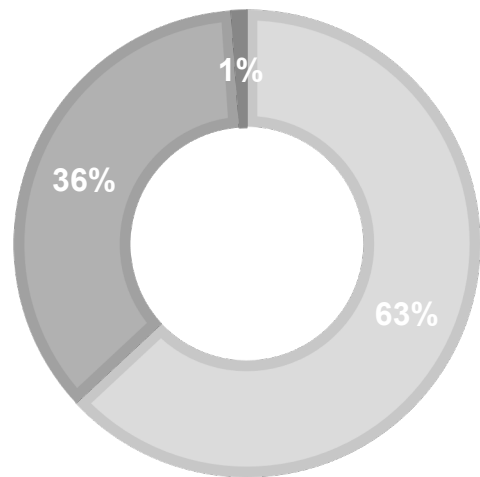
- Past month cannabis use among pregnant women: 7% with increases over the past decade.
- Prenatal cannabis exposure has been associated with decreased birth weight, impaired cognitive performance, and psychopathology.
- Limited cross-study replication and inability to account for potential confounders has left these associations tenuous.



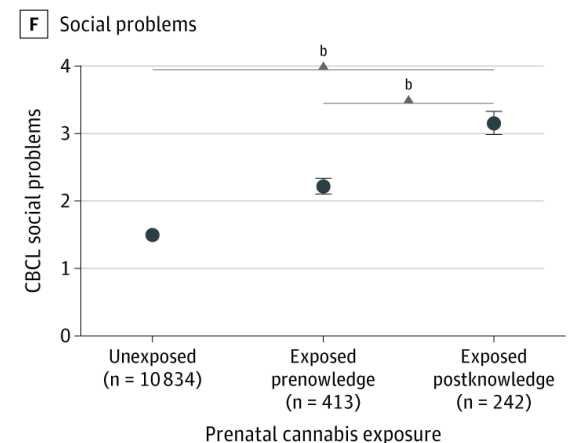
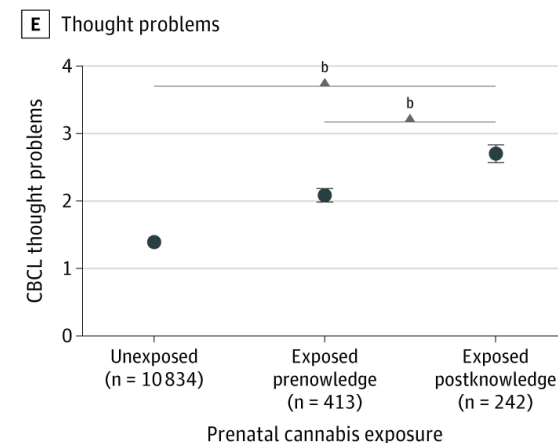
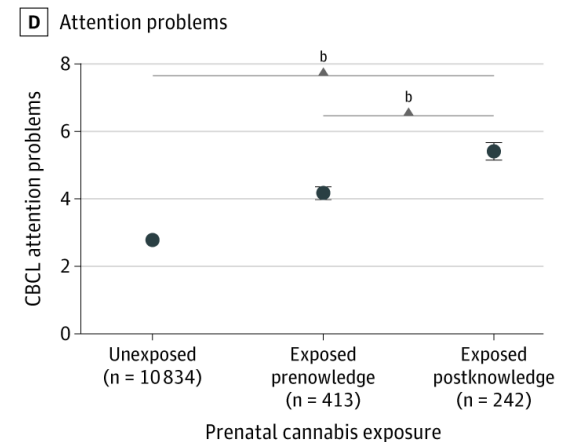
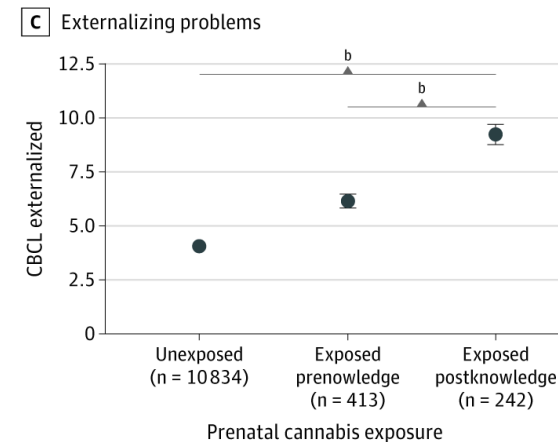
Prenatal exposure after maternal knowledge associated with externalizing, attention, thought, and social problems.

655 prenatally exposed cannabis

CANNABIS EXPOSURE BY MATERNAL KNOWLEDGE OF PREGNANCY



- Before maternal knowledge
- Before and after maternal knowledge
- After maternal knowledge

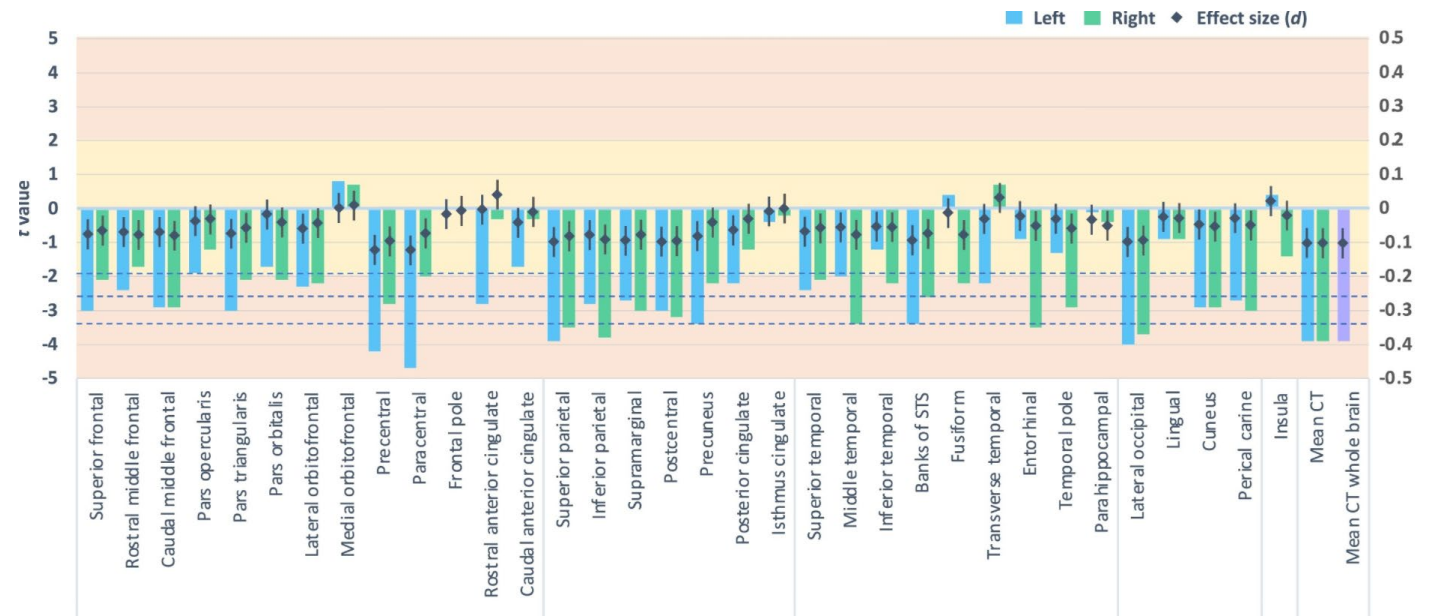


Impact of Family History of Substance Use on Substance Naïve Youth

- Family history of substance use disorder (SUD) is a major risk factor for adolescent substance use.
- Heritability estimates of SUDs range from 30% to 60%, and a shared environment with an individual with SUD explains an additional 10% of the risk.
- Neurobiological, cognitive risk indicators, and heightened psychopathology may all increase vulnerability to onset of SUDs.
- An obstacle to interpreting neuroimaging data in addiction is the relative lack of data from youth who have not initiated drug use.

Impact of Family History of Substance Use on Substance Naïve Youth

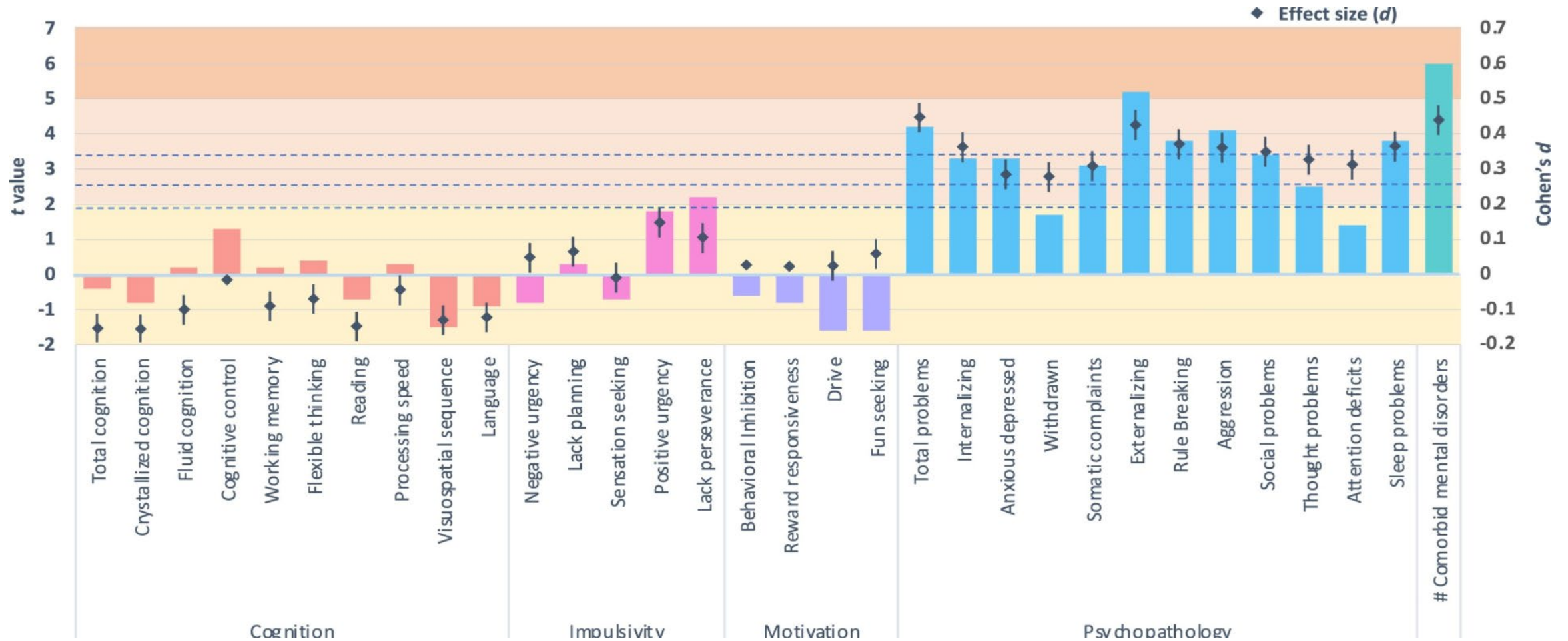
- ABCD: 41% had at least one biological parent or grandparent with a history of alcohol or substance use related problems.
- Youth with family history (FHP) exhibited lower cortical thickness of whole brain and nine specific areas than youth with no family history (FHN).



Covariates: age, sex, race/ethnicity, parent education, household income, marital status, **prenatal alcohol exposure, prenatal substance exposure, family history of psychopathology**



Impact of Family History of Substance Use on Substance Naïve Youth Cognition and Psychopathology



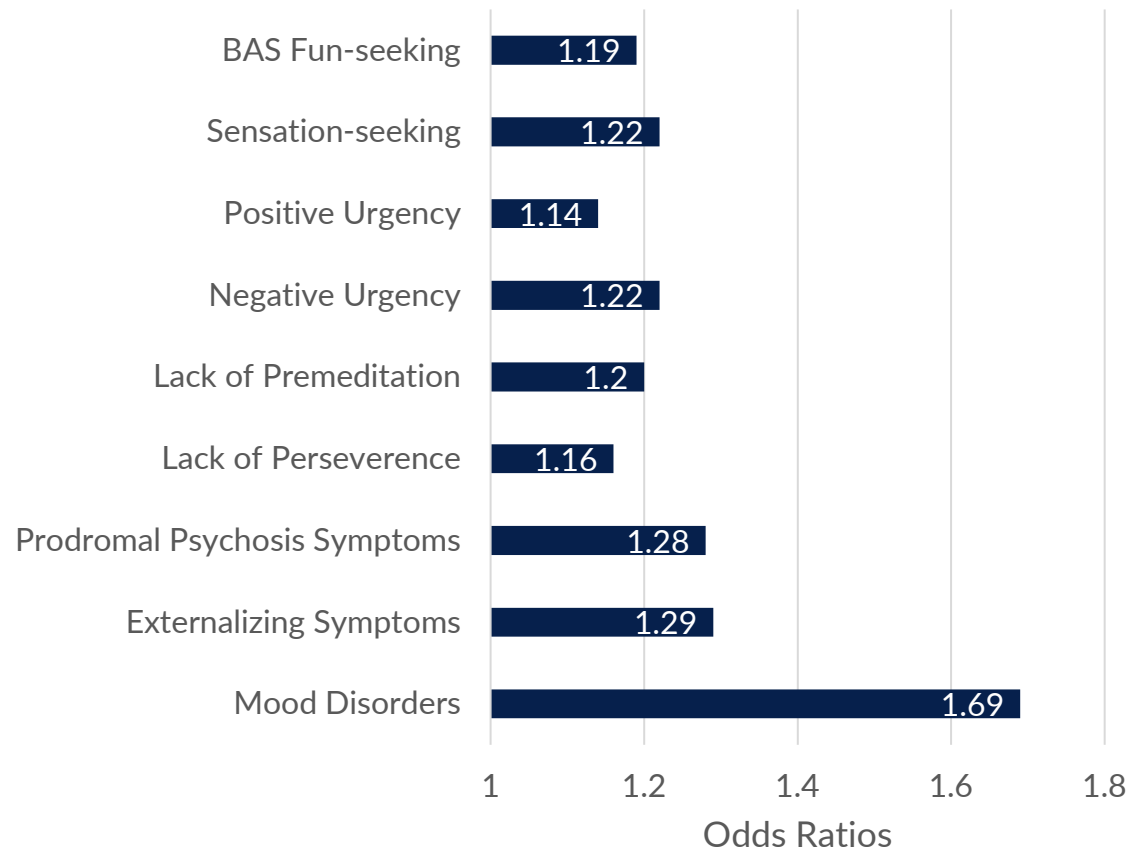
Alcohol Sipping

- Early alcohol initiation is predictive of subsequent alcohol problems.
- Risk for alcohol and psychosocial problems is more pronounced among those who initiate alcohol earlier.

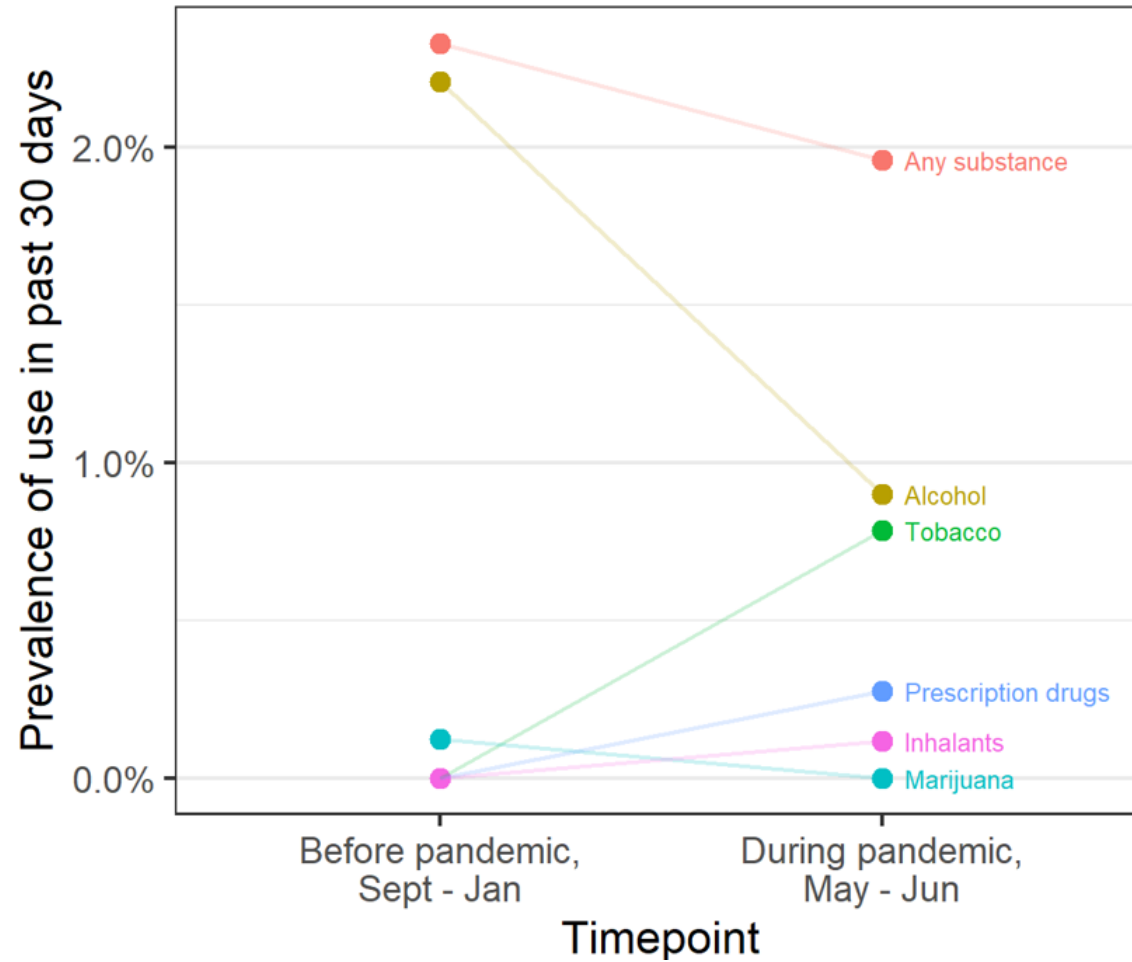


Psychopathology and Personality Indicators Associated with Slightly Higher Frequency of Alcohol Sipping

Psychopathology and personality and Non-religious Sipping

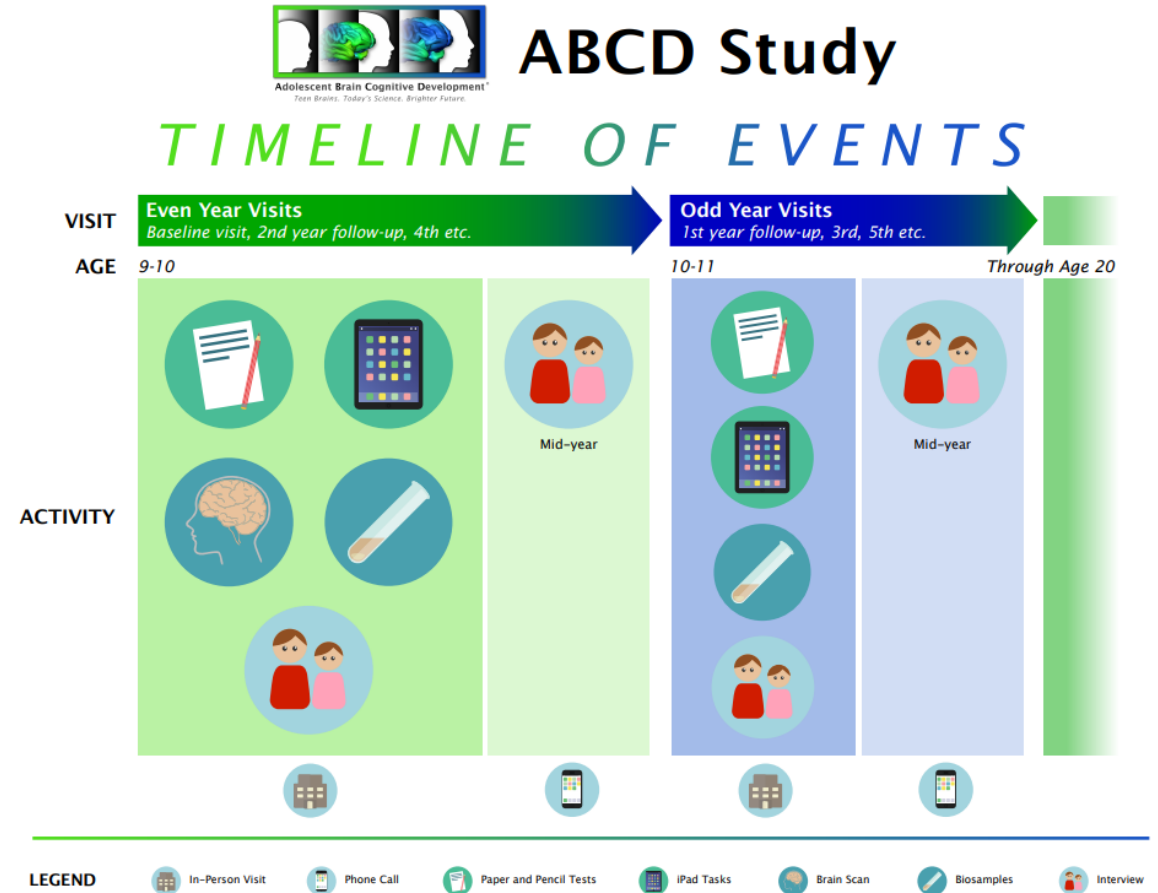


Assessing Impact of COVID-19



Caveats

- Low prevalence rates at baseline
- Retrospective (i.e., prenatal studies)
- Most studies to date are looking at associations at a single point in time
- Small effect sizes
- Limitations



Longitudinal nature of ABCD will allow greater exploration of these and other findings.

