• **Enrollment**
  • Preliminary Descriptive Data
  • Follow-up Assessments
  • ABCD Sub-studies
  • Data Sharing
Locations of ABCD Research Sites in the United States

Coordinating Center: University of California, San Diego
Data Analysis and Informatics Center: University of California, San Diego
Research Sites:
- Children's Hospital of Los Angeles
- Florida International University
- Laureate Institute for Brain Research
- Oregon Health & Science University
- SRI International
- University of California, Los Angeles
- University of California, San Diego
- University of Colorado
- University of Florida
- University of Maryland
- University of Michigan
- University of Minnesota
- University of Pittsburgh
- University of Rochester
- Medical University of South Carolina
- University of Utah
- University of Vermont
- Virginia Commonwealth University
- Washington University in St. Louis
- University of Wisconsin-Milwaukee
- Yale University
ABCD Enrollment as of May 13, 2018

Number of Participants

Singletons | Twins | Total | Target

9/1/2016: 55, 193, 417, 670, 1004, 1363, 1822, 2277, 2736, 3398, 4073, 4745, 5214, 5820, 6391, 6900, 7416, 7920, 8517, 9087, 9321

Graph showing enrollment growth from 9/1/2016 to 5/1/2018.
ABCD Projections as of May 13, 2018
ABCD Demographics as of May 13, 2018

- Male: 4889
  - 52%
- Female: 4424
  - 48%
- Other: 8
- Total: 9321

Singletons:
- ABCD 96.2%
  - White (53/49%)
  - Hispanic (22/23%)
  - Black (12/17%)
  - Other (11/5%)

Twins:
- ABCD 95.5%
  - White (57/88%)
  - Hispanic (10/12%)
  - Black (14/17%)
  - Other (9/13%)
## Socioeconomic Status

### Income

<table>
<thead>
<tr>
<th>Income Level</th>
<th>ACS</th>
<th>ABCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25k</td>
<td>23%</td>
<td>11%</td>
</tr>
<tr>
<td>25k-50k</td>
<td>30%</td>
<td>13%</td>
</tr>
<tr>
<td>50k-75k</td>
<td>15%</td>
<td>17%</td>
</tr>
<tr>
<td>75k-100k</td>
<td>9%</td>
<td>14%</td>
</tr>
<tr>
<td>100k-200k</td>
<td>15%</td>
<td>17%</td>
</tr>
<tr>
<td>&gt;200k</td>
<td>25%</td>
<td>12%</td>
</tr>
</tbody>
</table>

### Response Rate

- **ACS**: 92%
- **ABCD**: 95%
- **White**: 95%
- **Black**: 85%
- **Hispanic**: 87%
- **Asian**: 88%
- **Other**: 92%

### Education

<table>
<thead>
<tr>
<th>Education Level</th>
<th>ACS</th>
<th>ABCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;HS</td>
<td>20%</td>
<td>45%</td>
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<tr>
<td>HS or GED</td>
<td>22%</td>
<td>57%</td>
</tr>
<tr>
<td>Some College or Associates</td>
<td>10%</td>
<td>44%</td>
</tr>
<tr>
<td>Bachelors</td>
<td>18%</td>
<td>41%</td>
</tr>
<tr>
<td>Post-Graduate</td>
<td>24%</td>
<td>74%</td>
</tr>
</tbody>
</table>

### Enrolled (n=7872)
• Enrollment

• **Preliminary Descriptive Data**
• Follow-up Assessments
• ABCD Sub-studies
• Data Sharing
Your heritage culture (other than mainstream American) is:

ABCD Diversity

Courtesy of Raul Gonzalez (FIU)
Bilingualism

Parent

Speak Language other than English

- 32% English Only
- 68% English Only

n = 3419

Spoken with Friends

- 14% Eng Always
- 47% Eng Mostly
- 27% Other Always
- 15% Other Mostly
- 40% Same

n = 2317

Spoken with Family

- 15% Eng Always
- 23% Eng Mostly
- 21% Other Always
- 14% Other Mostly
- 46% Same

n = 1326

Youth

Speak Language other than English

- 39% English Only
- 61% English Only

n = 3412

Spoken with Friends

- 25% Eng Always
- 65% Eng Mostly
- 14% Other Always
- 14% Other Mostly
- 46% Same

n = 1326

Spoken with Family

- 21% Eng Always
- 46% Eng Mostly
- 21% Other Always
- 14% Other Mostly
- 46% Same

n = 1326

Courtesy of Raul Gonzalez (FIU)
BMI

Boys  Girls

Number of Participants

≥32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
≤12
(n=4,524)
Extracurricular Activities

Number of Active Kids in U.S. Sample

Music and Arts Instruction

(4,524)
Screen Time

- **Watch TV shows or movies?**
  - Weekday: 1200
  - Weekend: 1000

- **Watch videos (such as YouTube)?**
  - Weekday: 800
  - Weekend: 600

- **Play video games on a computer, console, phone or other device?**
  - Weekday: 400
  - Weekend: 200

**Number of Participants**
- Never: 300
- Once in a while: 500
- Regularly: 1000
- All the time: 2000

*(n=4,524)*
Social Media

- Text on a cell phone, tablet, or computer?
- Visit social networking sites?
- Video chat?

Number of Participants

Weekday | Weekend
---|---
Text on a cell phone, tablet, or computer? | Visit social networking sites? | Video chat?
0 | <30 min | 30 min | 60 min | 120 min | 180 min | 240 min+

(n=4,524)
Substance Use

Heard of...

- Alcohol: 97.6%
- Tobacco: 94.9%
- Marijuana: 57.9%

1.7% "heard of" fake drug – “Bittamugen or byphidotin?”

Courtesy of Mary Heitzeg (University of Michigan)
Substance Use: Heard of...

**Rx Drug Misuse (36.6%)** - Taking pills, liquids, or medications to get high in a way that your doctor or parents did not direct you to use them?

**Inhalants (26.6%)** - Sniffing liquids, sprays and or other products to get high?

**Other drugs (12.7%)** - Have you heard of people using anything else to make them feel high, dizzy or different?

- Stimulant drugs such as cocaine, crack cocaine (5.5%)
- Heroin, opium, junk, smack, or dope (2.4%)

Total # - M > F; p < .001

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>M=4.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M=4.13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean # "heard of"

Not heard of: [Graph]

Heard of: [Graph]

Courtesy of Mary Heitzeg (University of Michigan)
Substance Use

Majority have **not tried** ANY illicit substance (73.3%)
Peer Substance Use

- Vast majority have no peers doing any drugs (95%)
- Males > Females more likely to have at least a “few” peers that:
  - Use cigarettes (p=.01) or e-cigarettes (p=.01)
  - Drink alcohol (p=.02) or have been drunk (p<.001)
  - Sell or give drugs to others (total n=24; p<.01)
  - Endorse any peer substance use (p<.001)

Intention to Use

- Vast majority do not want to try alcohol (91%), tobacco (93%) or marijuana (98%)
- Male > Female to be a little to very likely to try:
  - Alcohol (11.6% vs. 8.1%; p=.001)
  - Nicotine (8.3% vs. 4.9%; p<.001)

Courtesy of Mary Heitzeg (University of Michigan)
Substance Use: Sipping Alcohol

- **# Total Sips** – range 1-500 (M=4.7, SD=20)
- **# Non-religious** – range 0-158 (M=2.2, SD=6.9)
  - 60% 1-2 sips
  - No Sex Difference
- **Average age of first sip** - 7.5 (range 1-10)
  - No sex difference
- 1.1% finished the drink after the first sip
- More males report either being **offered sip** or **intentionally taking sip in secret**
- More females report **accidentally taking sip**
  - Sex difference: Chi-sq=12.0, p=.002

Courtesy of Mary Heitzeg (University of Michigan)
Mental Health

Courtesy of Hugh Garavan (University of Vermont)
Suicidal Ideation

Parent Report

Child Report

( Courtesy of Deanna Barch (Washington University St. Louis – WUSTL) n=4,741 )
Familial Depression

Number of Immediate Family Members with Depression

(\(n=4,524\))

Courtesy of Hugh Garavan (University of Vermont)
Psychosis Proneness Questionnaire

PQ-B Total Score
62% had score >= 1 (range = 0-21)

PQ-B Distress Score
43.3% distressed by at least one positive symptom item (range 0-104)

Courtesy of Deanna Barch (Washington University St. Louis – WUSTL)
### Psychosis Proneness Questionnaire

#### Linear Regression Estimates for NIH Toolbox Tests for PQ-B Distress Score

<table>
<thead>
<tr>
<th></th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Covariates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>0.010</td>
<td>0.347</td>
<td>0.728</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.040</td>
<td>1.462</td>
<td>0.144</td>
</tr>
<tr>
<td>Other</td>
<td>0.015</td>
<td>0.507</td>
<td>0.612</td>
</tr>
<tr>
<td>Gender</td>
<td>0.003</td>
<td>0.183</td>
<td>0.855</td>
</tr>
<tr>
<td>Income to Needs</td>
<td>-0.024</td>
<td>-1.327</td>
<td>0.185</td>
</tr>
<tr>
<td><strong>Family History of Psychotic Disorder</strong></td>
<td><strong>0.064</strong></td>
<td><strong>3.904</strong></td>
<td><strong>0.000</strong></td>
</tr>
<tr>
<td><strong>Step 2: NIH Toolbox</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card Sort Test</td>
<td>-0.018</td>
<td>-0.976</td>
<td>0.329</td>
</tr>
<tr>
<td>Flanker Test</td>
<td>0.010</td>
<td>0.552</td>
<td>0.581</td>
</tr>
<tr>
<td>Picture Sequence Test</td>
<td>-0.007</td>
<td>-0.409</td>
<td>0.682</td>
</tr>
<tr>
<td><strong>Pattern Comparison Test</strong></td>
<td><strong>-0.044</strong></td>
<td><strong>-2.444</strong></td>
<td><strong>0.015</strong></td>
</tr>
<tr>
<td>List Sorting Test</td>
<td>-0.047</td>
<td>-2.588</td>
<td>0.010</td>
</tr>
<tr>
<td>Picture Vocabulary Test</td>
<td>-0.044</td>
<td>-2.213</td>
<td>0.027</td>
</tr>
<tr>
<td>Reading Recognition Test</td>
<td>-0.042</td>
<td>-2.199</td>
<td>0.028</td>
</tr>
</tbody>
</table>

---

**Family History**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average PQ-B Distress Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychotic Disorder N=104</td>
<td><img src="image" alt="Psychotic Disorder" /></td>
<td><img src="image" alt="Depression" /></td>
</tr>
<tr>
<td>Depression N=1300</td>
<td><img src="image" alt="Depression" /></td>
<td><img src="image" alt="Mania" /></td>
</tr>
<tr>
<td>Mania N=179</td>
<td><img src="image" alt="Mania" /></td>
<td><img src="image" alt="Mania" /></td>
</tr>
</tbody>
</table>

*** $p<.001$

---

Courtesy of Deanna Barch (Washington University St. Louis – WUSTL)
Biospecimens

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

Testosterone

Male

\[ p = 0.0008181 \]
\[ \text{Pearson} = 0.1124873 \]

Female

\[ p = 8.339 \times 10^{-12} \]
\[ \text{Pearson} = 0.2370104 \]

Estradiol

Female

\[ p = 0.00069 \]
\[ \text{Pearson} = 0.1201692 \]
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
Stop Signal Task

Go trials:
- Cue
- Reaction time
- Button press
- Fixation
- ITI
- Response Terminated (<1000ms)
- 1000ms - RT
- 700-2000 ms

Stop Trials:
- Cue
- Stop signal (SS)
- Stop-signal reaction time
- Successful inhibition
- Fixation
- ITI
- Cue = SSD (< 900ms)
- 300 ms *
- 1000 - (SS + SSD)
- 700-2000 ms

* If the SSD > 700 ms then the SS duration = 1000-SSD.
Stop Signal Task

A. Proportion of Responses
- Go Correct
- Stop Error

B. Reaction Time (ms)
- Go Correct
- Stop Error
- SSD
- SSRT

Runs
- All Trials
- Run 1 Trials
- Run 2 Trials

Contrast: Correct Stop vs Correct Go

Brain regions:
- PPC
- SMA/ACC
- vlPFC
- Striatum

(n=750)
• Enrollment
• Preliminary Descriptive Data

• **Follow-up Assessments**
• ABCD Sub-studies
• Data Sharing
## ABCD Study

### Timeline of Events

<table>
<thead>
<tr>
<th>STUDENT AGE</th>
<th>STUDENT TIME</th>
<th>STUDENT ACTIVITY</th>
<th>PARENT TIME</th>
<th>PARENT ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-10</td>
<td>6-7 hours</td>
<td></td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>10-11</td>
<td>15 minutes</td>
<td></td>
<td>5 minutes</td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>2-3 hours</td>
<td></td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 minutes</td>
<td></td>
<td>5 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6-7 hours</td>
<td></td>
<td>1 hour</td>
<td>iPad Tasks, Interview</td>
</tr>
</tbody>
</table>

### Legend
- In-Person Visit
- Biosamples
- Phone Call
- Brain Scan
- iPad Tasks
- Interview
### One-year Follow-up - Youth

#### Physical Health – ~30 min
- Anthropometrics*
- Puberty & Menstrual
- Gender Identity Questionnaire
- Screen Time Survey

#### Mental Health
- Prodromal Psychosis Scale
- Brief Problem Monitor Scale
- 7-Up Mania Items
- 10 Item Delinquency Scale
- Kiddie Schedule for Affective Disorders and Schizophrenia
- KSADS Background Items
- Life Events Scale
- Toolbox Positive Affect Items

#### Substance Use - ~15-30 min
If heard of alcohol, marijuana, tobacco, other drugs:
- Substance Use Interview
- Low level alcohol use
- Low-level tobacco use
- Low-level MJ use
- Timeline Followback
- Caffeine Intake
- PhenX Peer Tolerance of Use
- PhenX Peer Group Deviance
- Intention to Use
- PhenX Perceived Harm of Substance Use
- PhenX Alcohol Subjective Effects
- Adolescent Smoking Consequences Questionnaire
- Nicotine Subjective Effects
- MJ Effect Expectancies Q - Brief
- Acute Response to Marijuana

If used 5+ times (lifetime):
- Nicotine Dependence
- Hangover Symptom Scale
- Rutgers Alcohol Problem Index
- Marijuana Problem Index
- Drug Problem Index
- Participant Last Use Survey

But at baseline this was in "heard of" section

#### Culture and Environment - ~15 min
- Acculturation Survey*
- Prosocial Tendencies Survey
- Acceptance Subscale from Children's Report of Parental Behavior Inventory (CRPBI) - Short
- Parental Monitoring Survey
- Family Environment Scale: Family Conflict Subscale*
- Neighborhood Safety/Crime Survey*
- School Risk & Protective Factors Survey
- Discrimination Measure
- Wills Problem Solving

#### Neurocognition - ~12 min
- Delay Discounting task
- Emotional Faces Stroop Task

#### Biospecimens – ~10 min
- Pubertal Hormones
- Substance Use History
- Alcohol Screen*
- Drug Screen*
- NicAlert

#### Culture and Environment - ~15 min
- Acculturation Survey*
- Prosocial Tendencies Survey
- Acceptance Subscale from Children's Report of Parental Behavior Inventory (CRPBI) - Short
- Parental Monitoring Survey
- Family Environment Scale: Family Conflict Subscale*
- Neighborhood Safety/Crime Survey*
- School Risk & Protective Factors Survey
- Discrimination Measure
- Wills Problem Solving

#### Neurocognition - ~12 min
- Delay Discounting task
- Emotional Faces Stroop Task
## One-year Follow-up – Parents

<table>
<thead>
<tr>
<th>Physical Health</th>
<th>Mental Health</th>
<th>Culture and Environment’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puberty &amp; Menstrual</td>
<td>Kiddie Schedule for Affective Disorders and Schizophrenia</td>
<td>Acculturation Survey*</td>
</tr>
<tr>
<td>Gender Identity Questionnaire</td>
<td>KSADS Background Items</td>
<td>Prosocial Tendencies Survey</td>
</tr>
<tr>
<td>Demographics Survey*</td>
<td>Life Events Scale</td>
<td>Family Environment Scale: Family Conflict Subscale*</td>
</tr>
<tr>
<td>Ohio State TBI Screen-Short</td>
<td>Child Behavior Checklist</td>
<td>Neighborhood Safety/Crime Survey*</td>
</tr>
<tr>
<td>Medications Survey*</td>
<td>Parent General Behavior Inventory - Mania</td>
<td>Mexican American Cultural Values Scale</td>
</tr>
<tr>
<td>Sleep Disturbance Scale for Children</td>
<td>Sports and Activities Involvement Questionnaire</td>
<td></td>
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<tr>
<td>Screen Time Survey</td>
<td></td>
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<tr>
<td>Child Nutrition Assessment</td>
<td></td>
<td></td>
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<tr>
<td>Biospecimens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baby Teeth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Domain

<table>
<thead>
<tr>
<th>Substance Use</th>
<th>Mental &amp; Physical Health</th>
<th>Culture &amp; Environment</th>
<th>Neurocognition</th>
<th>Biospecimens</th>
<th>Imaging</th>
<th>Other (consent, locator, residential history, school &amp; teacher permissions, breaks)</th>
<th>TOTAL (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-30</td>
<td>33</td>
<td>15</td>
<td>12</td>
<td>10</td>
<td>N/A</td>
<td>15</td>
<td>99-115</td>
</tr>
<tr>
<td>6</td>
<td>45</td>
<td>10</td>
<td>N/A</td>
<td>5</td>
<td>N/A</td>
<td>20</td>
<td>86</td>
</tr>
</tbody>
</table>

**Notes:**
- Participant Last Use Survey: But at baseline this was in "heard of" section.
- Parent Rules
- Community Risk & Protective Factors
Monitoring Follow-Up Visits

Retention

ABCD-1-year: 96%
ABCD-6-month: 93%

Complete: #1859
Not Complete: #361
Total: #2220

Retained: 99.6%

Complete Incurred: 99%
Not Complete Incurred: 100%
Total Incurred: 99%

ABCD
• Enrollment
• Preliminary Descriptive Data
• Follow-up Assessments
• **ABCD Sub-studies**
• Data Sharing
ABCD-Social Development

- **Participating Sites** - University of Pittsburgh, University of Florida, University of Michigan, Yale University, University of Maryland, Baltimore

- **Funding** – National Institute of Justice, CDC Division of Violence Prevention

- **Brain indicators as explanatory factors of the onset and persistence of substance use, delinquency, and victimization**
  - Which contextual, personality, cognitive, and environmental risk factors mediate or moderate these brain indicators?

- **Brain indicators and their associations with early forms of desistance/cessation in substance use, delinquency, and victimization.**
  - Which contextual, personality, cognitive, and environmental protective factors mediate or moderate these brain indicators?
  - Are persons with psychopathic traits less likely to desist/cease in terms of the substance use-delinquency-victimization?
Disaster and Youth, Neural and Affective Maturation in Context (DYNAMIC) Study

- **Participating Sites** – Florida International University, University of Florida, Medical University of South Carolina, University of California, San Diego

- **Funding** – NSF

- **Specific Aims**
  - Explore the impact of disaster exposure on structural brain development and cognitive and affective outcomes.
  - Evaluate the extent to which pre-Irma structural factors predict and moderate effects of Irma exposure on cognitive and affective outcomes.

- **Added Measures** - 10-minute youth and caregiver online surveys of Irma-related experiences (e.g., exposure, media use, evacuation experiences, property damage, power/water outages, school closures, etc), and Irma-related post-traumatic stress symptoms
• Enrollment
• Preliminary Descriptive Data
• Follow-up Assessments
• ABCD Sub-studies

• **Data Sharing**
ABCD Open Science —
A Unique Resource for the Entire Scientific Community

Fast-Track Neuroimaging Data - The ABCD Study is releasing raw DICOM images on an ongoing basis

Annual Curated Data Release – Includes:
• Basic demographics,
• Assessments of:
  o Physical and mental health,
  o Substance use,
  o Culture and environment, and
  o Neurocognition,
• Tabulated structural and functional neuroimaging data,
• Minimally processed brain images,
• Biological data (e.g., pubertal hormone analyses), and
• Residential history derived data from
  o EPA Smart Location Database (residential density/walkability),
  o FBI Uniform Crime Report,
  o ACS Area Deprivation Index,
  o Elevation from Google Maps, and
  o NASA SEDAC population density and satellite-based pollution measures

ABCD Data Access:
• 531 NDA accounts with ABCD access
• 3,440 ABCD data packages (includes testing by NDA)
  o 143 distinct users
  o Not including prepackaged release data available to all approved users
DCN Special Issue

- Demographic, physical and mental health assessments in the adolescent brain and cognitive development study: Rationale and description - https://www.sciencedirect.com/science/article/pii/S1878929317300683?via%3Dihub
Funding Opportunities

PAR-18-062 — Accelerating the Pace of Drug Abuse Research Using Existing Data
Standard dates apply.

RFA-DA-19-006 — Workshops on the Use of Adolescent Brain Cognitive Development (ABCD) Data
Letter of Intent Due Date - June 25, 2018
Application Due Date(s) - July 25, 2018
ABCD Becoming Mainstream

NIAC JESTIONS

12

NIDA scientists are coordinating a large study with more than 10,000 young people to find out how things like drugs, social experiences, sports injuries, accidents, and other factors affect the development of the brain. It is called the ABCD Study. ABCD stands for:

A. Analysis of Basic Childhood Discipline
B. A Big Childhood Data-Grab
C. Assessment of Behavior, Children, and Drugs
D. Adolescent Brain Cognitive Development

Courtesy of Hugh Garavan (University of Vermont)
Adolescent Brain Cognitive Development

For More Information, Please Visit: ABCDStudy.org
Proposed Additions to Two-year Follow-up

- Munich Chronotype Questionnaire
- Peer Relationships – Victimization and Perpetration
- Cyberbullying
- Pain
- Peer Behaviors/Networks
- Substance Use Density, Storage, Exposure
- PhenX Early Adolescent Temperament
- Game of Dice Task
- Social Influence Risk Perception Task
- Blood draw
ABCD Enrollment as of May 13, 2018
• Enrollment

• **Data Quality Monitoring**

• Preliminary Descriptive Data
• Follow-up Assessments
• ABCD Sub-studies
• Data Sharing
Non-imaging Assessment Completeness as of May 13, 2018

Total: #9321
Complete: #6587
Not Complete: #2734
Imaging Completeness as of May 13, 2018

99.98% 96.65% 97.05% 98.07% 90.26% 89.34% 88.32%

T1 #9179  T2 #8873  DTI #9004  rsfMRI #9181
MID #8287  SST #8202  NBACK #9181  Received #9321
Enrolled
Resting State Motion

82%
Locations of ABCD Research Sites in the United States

- **Medical and Recreational Marijuana**
  - University of California, San Diego
  - Florida International University
  - Laureate Institute for Brain Research
  - Icahn School of Medicine at Mount Sinai
  - Oregon Health & Science University

- **Medical Marijuana**
  - University of California, Los Angeles
  - University of California, San Diego
  - University of Colorado
  - University of Florida

- **Limited Medical Access, Low THC/High CBD**
  - University of Maryland
  - University of Michigan
  - University of Minnesota
  - University of Pittsburgh
  - Medical University of South Carolina
  - University of Utah
  - University of Vermont
  - Virginia Commonwealth University
  - Washington University in St. Louis
  - University of Wisconsin-Milwaukee
  - Yale University
Opioid-Related Overdose Death Rates (per 100,000 people)¹

- <5.9
- 6.0 - 9.9
- 10 – 14.9
- >15

 NOWS Incidence ≥ 5.1 per 1,000 hospital births²

---

Opioid-Related Overdose Death Rates (per 100,000 people)\(^1\)

\begin{center}
\begin{tabular}{c|c|c|c|c}
& <5.9 & 6.0-9.9 & 10-14.9 & >15 \\
\hline
NOWS Incidence & \textcolor{red}{\geq 5.1} & per 1,000 hospital births & \textcolor{red}{\geq 5.1} & per 1,000 hospital births
\end{tabular}
\end{center}

\begin{itemize}
\item Relevant IDea States
\item Relevant ABCD Sites
\item Relevant NRN Sites
\item Relevant NIMH Sites
\item Infant Brain Imaging Study
\item Relevant ECHO sites
\end{itemize}


## FitBit Validation Study (n=59)

<table>
<thead>
<tr>
<th>Category</th>
<th>#</th>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>1</td>
<td>Sitting quietly</td>
<td>5 minutes</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sitting listening to music</td>
<td>5 minutes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Sitting playing a game on iPad</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Effort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bike</td>
<td>4</td>
<td>Moderate cycling (0.8W/kg) @ 55+ rpm</td>
<td>6 minutes</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Vigorous cycling (1.2W/kg) @ 55+ rpm</td>
<td>6 minutes</td>
</tr>
<tr>
<td>Speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treadmill</td>
<td>6</td>
<td>Moderate walking (3 mph)</td>
<td>6 minutes</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Vigorous walking/running (4 mph)</td>
<td>6 minutes</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Moderate walking (3 mph) with 15% of body weight</td>
<td>6 minutes</td>
</tr>
<tr>
<td>Direction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stairs</td>
<td>9</td>
<td>Walking up stairs</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Walking down stairs</td>
<td>5</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor</td>
<td>11</td>
<td>Walking uphill</td>
<td>200 m</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Walking flat</td>
<td>400 m</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Walking downhill</td>
<td>200 m</td>
</tr>
<tr>
<td>Agility Drills</td>
<td>14</td>
<td>Ladder Drills</td>
<td>5 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flag/Cones Drills</td>
<td></td>
</tr>
</tbody>
</table>

*Courtesy of Susan Tapert (UCSD)*
FitBit Pilot Study (n=152**)

• Design:
  – Conducted at 3 sites (VCU, SRI, UCSD)
  – Each asked to wear a Fitbit Charge 2 for 3 weeks
  – Study conducted between May-Dec 2017

<table>
<thead>
<tr>
<th>Sleep*</th>
<th>UCSD Mean ± SD</th>
<th>SRI Mean ± SD</th>
<th>VCU Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min of sleep/valid day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>504.8 ±46.0</td>
<td>502.2 ±38.6</td>
<td>506.3 ±29.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity**</th>
<th>Weekdays</th>
<th>Weekends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps</td>
<td>11,521.9 (±4814.9)</td>
<td>11,021.3 (±3482.5)</td>
</tr>
<tr>
<td>Moderate Vigorous Physical Activity (minutes)</td>
<td>51.3 (±44)</td>
<td>41.8 (±38)</td>
</tr>
<tr>
<td>Resting Heart Rate</td>
<td>65.4 (±19.3)</td>
<td>69.2 (±15.9)</td>
</tr>
</tbody>
</table>

*of those with 3+ wear days
*based on first 34 participants

Courtesy of Susan Tapert (UCSD)
Individual Differences – Brain Imaging

Courtesy of Damien Fair (Oregon Health & Science University)
Monetary Incentive Delay Task

Win trials
- Win $5.00
- Win $0.20

Lose trials
- Lose $5.00
- Lose $0.20

No win or loss trial
- $0

Time
- Cue: 2000 ms
- Fixation: 1500-4000 ms
- Target: 150-500 ms
- Response: 1500-1850 ms

Feedback
Monetary Incentive Delay Task

(A) Hit Rate
- Runs:
  - All Trials
  - Run 1 Trials
  - Run 2 Trials

(B) Reaction Time (ms)
- Runs:
  - All Trials
  - Run 1 Trials
  - Run 2 Trials

vmPFC

Contrast: Reward success vs fail

n=856
Emotional N-Back Task

O-back condition

0-back target =

Instruction 2500 ms
ISI 1000 ms
Stimulus 2000 ms

2-back condition

Instruction 2500 ms
ISI 1000 ms
Stimulus 2000 ms

TLme
Faces versus Places

Fear vs Neutral Faces

n=2350
Emotional N-Back Task

A

Accuracy

0.0
0.2
0.4
0.6
0.8
1.0

0-back
Memory load
2-back

B
dlPFC
Parietal Cortex
ACC

Contrast: 2-back – 0-back

Thalamus
Hippocampus

n=517
# Six-month Follow-up

<table>
<thead>
<tr>
<th>ABCD Measure</th>
<th>What it measures:</th>
<th>Youth (min)</th>
<th>Parent (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro, Update of locator info</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Brief Problem Monitor for Youth (ASEBA)</td>
<td>Dimensional psychopathology, adaptive functioning in past week</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Yes / No Substance Use Questions</td>
<td>Past 6-month heard-of or use of substances</td>
<td>3-7</td>
<td></td>
</tr>
<tr>
<td>NIH Toolbox Positive Affect Short Form</td>
<td>Positive emotions and affective well-being in past week</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>What’s next</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong> about 15 minute to administer in all.</td>
<td></td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>
Data Exploration and Analysis Portal

A web-portal for interactive data exploration, visualization, and hypothesis testing. Bartsch et al, Front Neuroinform, 2014; 8: 25
Can changes in anxiety be explained by cognitive development scores measured in the picture vocabulary test, if one corrects for known covariates?

**Model specification**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>User Covariates</th>
<th>Fixed Effect Covariates</th>
<th>Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>cbdl_scr_syn_arsdep_1</td>
<td>nhltbx_piovocab_uncorrected</td>
<td>Race/Ethnicity</td>
<td>GENDER EDU INC MARRITAL AGE</td>
<td>SITE FAMILY</td>
</tr>
</tbody>
</table>

**Data used in the model**

**Regression model fit**

**Result tables / Model comparisons**
## Risk and Protective Factors for Sipping

### Culture & Environment

<table>
<thead>
<tr>
<th>ABCD Baseline Measure Name</th>
<th>REDCap Abbreviation</th>
<th>What it measures:</th>
<th>Youth (min)</th>
<th>Parent (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosocial Tendencies Survey</td>
<td>PST</td>
<td>Resilience</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Acculturation Survey*</td>
<td>ACC</td>
<td>Cultural factors</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Parental Monitoring Survey</td>
<td>PMQ</td>
<td>Parental monitoring/ supervision</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Acceptance Subscale from Children’s Report of Parental Behavior Inventory (CRPBI) - Short</td>
<td>ASQ</td>
<td>Environment - Family &amp; Religion</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Family Environment Scale - Family Conflict Subscale*</td>
<td>FES</td>
<td>Family dynamics, cohesion, expressiveness, conflict</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Neighborhood Safety/Crime Survey*</td>
<td>NSC</td>
<td>Risk and protective factors, crime</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>School Risk &amp; Protective Factors Survey*</td>
<td>SRPF</td>
<td>Risk and protective factors</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vancouver Index of Acculturation - Short Survey</td>
<td>VIA</td>
<td>Acculturation</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Multi-Group Ethnic Identity - Revised Survey</td>
<td>MEIM</td>
<td>Cultural affiliation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Mexican American Cultural Values Scale</td>
<td>MACV</td>
<td>Familiarity, religion, independence, self-reliance</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Native American Acculturation Scale</td>
<td>NAA</td>
<td>Tribal affiliation (for Native American Parents only)</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Total Minutes**

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Male)</td>
<td>.209</td>
<td>.084</td>
<td>.012</td>
</tr>
<tr>
<td>Peer Use</td>
<td>.741</td>
<td>.182</td>
<td>.000</td>
</tr>
<tr>
<td>Availability (Hard)</td>
<td>-.913</td>
<td>.083</td>
<td>.000</td>
</tr>
<tr>
<td>Rules (Yes)</td>
<td>-1.526</td>
<td>.287</td>
<td>.000</td>
</tr>
<tr>
<td>Neighborhood Safety</td>
<td>-.093</td>
<td>.039</td>
<td>.018</td>
</tr>
<tr>
<td>School Involvement</td>
<td>-.092</td>
<td>.018</td>
<td>.000</td>
</tr>
</tbody>
</table>

Not significant

- Parental Monitoring
- Parenting Behavior – Acceptance
- Family Conflict
- School Disengagement
- School Environment

Total Model: R-sq: .088; p<.001; 79.5% accurate
# Risk and Protective Factors for Sipping

## Males

Total Model: R-sq: .083; p<.001; 77.6% accurate

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>S.E.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Use</td>
<td>.697</td>
<td>.218</td>
<td>.001</td>
</tr>
<tr>
<td>Availability (Hard)</td>
<td>-.815</td>
<td>.109</td>
<td>.000</td>
</tr>
<tr>
<td>Rules (Yes)</td>
<td>-1.628</td>
<td>.374</td>
<td>.000</td>
</tr>
<tr>
<td>School Disengagement</td>
<td>.089</td>
<td>.043</td>
<td>.039</td>
</tr>
<tr>
<td>School Involvement</td>
<td>-.066</td>
<td>.026</td>
<td>.010</td>
</tr>
</tbody>
</table>

Not significant
- Neighborhood Safety

## Females

Final Model: R-sq: .096; p<.001; 81.6% accurate

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>S.E.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Use</td>
<td>.961</td>
<td>.325</td>
<td>.003</td>
</tr>
<tr>
<td>Availability (Hard)</td>
<td>-1.035</td>
<td>.126</td>
<td>.000</td>
</tr>
<tr>
<td>Rules (Yes)</td>
<td>-1.422</td>
<td>.453</td>
<td>.002</td>
</tr>
<tr>
<td>Neighborhood Safety</td>
<td>-.156</td>
<td>.059</td>
<td>.008</td>
</tr>
<tr>
<td>School Disengagement</td>
<td>-.098</td>
<td>.028</td>
<td>.000</td>
</tr>
<tr>
<td>Family Conflict</td>
<td>-.090</td>
<td>.034</td>
<td>.009</td>
</tr>
</tbody>
</table>

Not significant
- School Disengagement

Courtesy of Mary Heitzeg (University of Michigan)