Adolescent Brain Cognitive Development


An NIH Collaboration:
NIDA, NIAAA, NCI,
NIMH, NIMHD, NICHD,
NINDS, OBSSR

Gaya J. Dowling, Ph.D.
Director, ABCD Project
Division of Extramural Research, NIDA
June 9, 2016
NIH Collaboration

National Institute on Drug Abuse

Eunice Kennedy Shriver National Institute of Child Health and Human Development

National Institute on Alcohol Abuse and Alcoholism

National Cancer Institute

National Institute of Mental Health

National Institute on Minority Health and Health Disparities

National Institute of Neurological Disorders and Stroke

NIH Office of Behavioral and Social Sciences Research
A longitudinal study of about 10,000 children from ages 9-10 through early adulthood to assess factors that influence individual brain development trajectories and functional outcomes.
Why?

**Adolescence**: a time of extraordinary physical, emotional, and intellectual growth
Yet, there is much we don’t know...

About how childhood experiences (participation in sports or music, playing video games, sleep patterns, alcohol, marijuana, and tobacco use, and others) affect brain, social, emotional, and academic development.
Research Objectives

• Characterize individual developmental trajectories (e.g., brain, cognitive, emotional, academic), and the factors that can affect them.

• Develop of national standards of normal brain development in youth.

• Disentangle the role of genetic vs. environmental factors on development, including comparisons of twin participants (800 pairs) who will be recruited into the study.

• Examine the effects of physical activity, sleep, screen time, as well as sports and other injuries on brain development and other outcomes.

• Study the onset and progression of mental disorders, factors that influence their course or severity, and the relationship between mental disorders and substance use.

• Understand how exposure to different substances like alcohol, marijuana, nicotine, caffeine, and others, individually or in combination, affect various developmental outcomes and vice versa.
Activities Leading up to Funding

- **Expert panel workshop** to develop recommendations on best large-scale designs and measures to assess developmental effects of substance exposure. **May 27-28, 2014**
- A **Request For Information** to get input on proposed study design/measures. **July-August, 2014**
- **Revised design** based on input from RFI and discussion at SfN satellite symposium. **October, 2014**
- **FOAs released:** U24—Coordinating Center, Data Analysis and Informatics Center; U01 Research sites. **January, 2015**
- **Robust response to the FOAs;** applications reviewed **July, 2015**
- **Grants awarded:** 13 awards: 1 CC, 1 DAIC, 11 Research Grants (19 Research Sites) **Sept, 2015**
<table>
<thead>
<tr>
<th>Institute/Program</th>
<th>Allocation</th>
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<tbody>
<tr>
<td>National Institute on Drug Abuse</td>
<td>$18,400,000</td>
</tr>
<tr>
<td>National Institute on Alcohol Abuse and Alcoholism</td>
<td>$6,800,000</td>
</tr>
<tr>
<td>National Cancer Institute</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Eunice Kennedy Shriver National Institute of Child Health and Human Development</td>
<td>$1,000,000</td>
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<td>National Institute of Mental Health</td>
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<tr>
<td>National Institute on Minority Health and Health Disparities</td>
<td>$300,000</td>
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<tr>
<td>National Institute of Neurological Disorders and Stroke</td>
<td>$500,000</td>
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<tr>
<td>NIH Office of Behavioral and Social Sciences Research</td>
<td>$500,000</td>
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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
- Icahn School of Medicine at Mount Sinai
- Oregon Health & Science University
- SRI International
- University of California, Los Angeles
- University of California, San Diego
- University of Colorado
- University of Florida
- University of Hawaii at Manoa
- University of Michigan
- University of Minnesota
- University of Pittsburgh
- University of Utah
- University of Vermont
- Virginia Commonwealth University
- Washington University in St. Louis
- Yale University
Since Funding

 ✓ First PI meeting. Oct, 2015
 ✓ External Advisory Board meeting. January 14-15, 2016 to review and provide recommendations on initial protocol
 ✓ January – May, 2016
   ✓ Refinement of protocol to reduce length, improve acceptability
   ✓ Development of informatics systems for data capture and transfer
   ✓ Development of outreach strategies/materials to raise awareness of the study and engage school systems
 ✓ Hiring and training staff. Train-the-trainer meeting April 18-20, 2016.
Structure
Organization
Function
ABCD Governance Structure

Steering Committee
Voting Members: CC, DAIC, Site PIs (subset), NIH (1 vote)
Non-voting members: other NIH staff
Decision Making Body

Operations Group
CC Dirs and Assoc Dirs, DAIC Dir
NIH PD and DAIC Workgroup LDRs
Implementation Group

Council of Investigators
CC, DAIC, Site PIs, NIH PO, NIH PD, NIH SOs

Data Analysis & Informatics Center

19 Research Sites

External Advisory Board
Makes Recommendations

OSMB
Clinical Risk Management

NIH ABCD Collaborators Group
NIDA, NIAAA, NCI, NIMH, NIMHD, NICHD, NINDS, OBSSR

Program Official
Bethany Deeds
Provides programmatic assistance, guidance, and coordination

NIH Science Officials

Project Director
Gaya Dowling
Provides scientific assistance, guidance, and coordination

NIH Science Officials

Coordinating Center

Kevin Conway
John Matochik

Program Official
Bethany Deeds
Provides programmatic assistance, guidance, and coordination

NIH Science Officials

Antonio Noronha

Steve Grant
Antonio Noronha

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Antonio Noronha

19 Research Sites
ABCD External Advisory Board

• **Role:** To provide scientific and administrative oversight throughout the study course, including:
  - Review study protocol before initiation
  - Assess progress and related activities
  - Suggest modifications to the scope of the research program if needed
  - Consult on recruitment and retention of new scientific staff and faculty
  - Represent and communicate community interests and views.

• The EAB will provide recommendations to the ABCD Steering Committee and the NIH regarding scientific program and activities.

• **Composition:** National experts in relevant fields and scientific areas critical to study design and implementation.

- Child and adolescent development
- Prevention research
- Mental health
- Education and education research
- Bioethics

- Community outreach
- Cognitive development
- Neuroimaging
- Informatics
- Data sharing
ABCD Observational Study
Monitoring Board

• **Role:** The principal role of the OSMB is to monitor regularly the observational study and make recommendations to the NIH with respect to:
  - Participant safety, confidentiality, and informed consent, including notification of and referral for abnormal findings
  - Participant burden
  - Impact of proposed ancillary studies and sub-studies on participant burden and overall achievement of the main study goals

• **Composition:** National experts in longitudinal adolescent studies, bioethics, regulations, and legal issues related to consent and confidentiality in studies of adolescents.
ABCD Functional Organization

NIH scientific and programmatic collaborators

Operations Group
CC Dirs and Assoc Dirs, DAIC Dir, NIH PD, and DAIC Workgroup LDRs
Implementation Group

Data Analysis & Informatics Center

19 Research Sites

Coordinating Center

Assessment Groups
• Substance Use
• Neurocognition
• Health & Mental Health
• Culture & Environment
• Biospecimen & Dev. Biomarkers
• Mobile Technology

Design & Biostatistics

Resource Sharing & Publications

Advisory Groups
Bioethics and Medical Oversight | Development, Risk, Resilience | Emerging Scientific Opportunity | Community Advisory Council
Standing Committees
Professional Development | Outreach and Dissemination

Image Analysis

Informatics

Image Acquisition
ABCD Protocol
Design and Recruitment

Recruitment Strategy (school-based strategy for non-twins)
- Identify all public and private schools with kids aged 9-10 within geographic catchment area for each site.
Design and Recruitment

Recruitment Strategy (school-based strategy for non-twins)

- Begin by engaging schools for their support.
- Schools send information packets to families of 9/10 year olds (at our expense)
- Interested families contacted by site.
- Screen with parent/guardian.
- Screener assesses inclusion/exclusion criteria (aim is to be very inclusive).

Twin Cohort (800 pairs)

- Four sites (Colorado, Minnesota, Missouri, Virginia)
- Birth registry records
## Assessment Protocol

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Neurocognition</td>
<td>Attention, learning, memory, information processing, verbal IQ, motivation, impulsivity</td>
</tr>
<tr>
<td>Substance Use</td>
<td>Parental rules, peer influences, intention to use, use, sensitivity, consequences</td>
</tr>
<tr>
<td>Mental Health, Health, &amp; Demography</td>
<td>Physical activity, mental health, puberty, sleep, TBI, screen time, family history, sports participation, food insecurity</td>
</tr>
<tr>
<td>Culture &amp; Environment</td>
<td>Ethnic identity, acculturation, discrimination, religiosity, neighborhood safety, parental monitoring, school environment</td>
</tr>
<tr>
<td>Biospecimens</td>
<td>Breath, saliva, hair (subsample), blood (subsample), baby teeth (optional)</td>
</tr>
<tr>
<td>Mobile Tech &amp; Passive Data</td>
<td>Fitbit, school records, pediatrician records, geocoding</td>
</tr>
<tr>
<td>Structural MRI</td>
<td>Shape, size, integrity of brain structures</td>
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<tr>
<td>rs- and task-based fMRI</td>
<td>Functional organization of the brain at rest or when doing a task</td>
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</tbody>
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# ABCD Study

**Timeline of Events**

<table>
<thead>
<tr>
<th>STUDENT AGE</th>
<th>9-10</th>
<th>10-11</th>
<th>11-12</th>
</tr>
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<tbody>
<tr>
<td>STUDENT TIME</td>
<td>6-7 hours</td>
<td>15 minutes</td>
<td>2-3 hours</td>
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## STUDENT ACTIVITY

- In-person Visit
- Biosamples
- Phone Call
- Brain Scan
- iPad Tasks
- Interview

### Every 3–6 months:

- Students: iPad tasks, brain scan
- Parents: In-person visit, iPad tasks

### Every 3 hours:

- Students: iPad tasks, biosamples
- Parents: In-person visit, interview

**Repeat until age 19-20**
ABCD Open Science Model –
A Unique Resource for the Entire Scientific Community

Sharing ABCD data will allow scientists worldwide to conduct “Big Data” analyses (10 petabytes), pool resources, and enrich the value of this study.

The ABCD Study will release:
• Raw, cleaned, anonymized data one month after data collection begins
• Curated, anonymized data annually beginning 1 year after data collection begins
• Computational workflows used to produce the data.
Adolescent Brain Cognitive Development


For More Information, Please Visit:
ABCDStudy.org