

ABCD Human Subject Study

Adolescent Brain Cognitive Development – ABCDSTUDY.org

Release Notes: Adolescent Brain Cognitive Development Study (ABCD) Data Release 2.0

Other Non-Imaging Instruments

<http://dx.doi.org/10.15154/1503209>

March 2019

Change Log

March 2019

- Initial release

June 2019

- ACS Post Stratification Weights: Deleted "missing values for the key demographic and socio-economic constructs were imputed with a single multivariate imputation".

List of Instruments

Name of Instrument	Short Name
ABCD Screener	abcd_screen01
ACS Post Stratification Weights	acspsw01
Residential History Derived Scores	abcd_rhds01
ABCD Longitudinal Tracking	abcd_lt_01

General Information

The following information refers to the Adolescent Brain Cognitive Development (ABCD) Study Data Release 2.0 available from <https://data-archive.nimh.nih.gov/abcd>. An overview of the

ABCD Study is at <https://abcdstudy.org> and detailed descriptions of elements of the study are listed in <https://abcdstudy.org/scientists/protocols>.

This document describes the contents of various instruments available for download. To understand the context of this information, see *Release Notes ABCD README FIRST* and *Release Notes ABCD Imaging Instruments*.

ABCD Screener: Eligibility screener and screener risk measures. These risk measures are preliminary and not necessarily predictive of risk.

As the ABCD Study aims to recruit a sample that reflects the diversity of the US population of nine and ten year olds, its philosophy is to be as inclusive as possible.

ABCD Inclusion/Exclusion criteria

Some exclusions are necessary, however, which include the following criteria:

- Any condition that might render the assessment procedures dangerous to participants (e.g., MRI contra-indications);
- The presence of a medical or psychiatric condition that would affect the participant's capability to complete the assessments (e.g., schizophrenia; severe autism) or other circumstances that would affect the ability to complete the assessments such as poor English skills or sensorimotor impairments;
- Existing alcohol or substance use disorders in order to obtain a baseline assessment unaffected by exposure effects;
- Intention to move away from an ABCD site in the coming years;
- Extreme prematurity or low birth weight are exclusionary;
- The presence of focal brain abnormalities that might impact the automated processing pipelines.

In addition to the specific exclusionary criteria listed below, an expert group adjudicates on unusual cases such as those presenting with uncommon medical conditions.

Youth Criteria at Study Entry

Inclusion Criteria:

- Age 9.00 to 10.99 years at time of baseline assessments;
- Able to validly complete baseline assessments including MRI scanning;
- Fluent in English.

Exclusion Criteria:

- MRI contraindications such as orthodontic braces or irremovable dental appliances containing ferromagnetic materials, claustrophobia that cannot be overcome with repeated attempts, non-removable ferromagnetic metal implants that may distort the images, or youth is pregnant on day of scanning based on urine pregnancy test in postmenarcheal girls;
- Youth is not fluent in English (all youth materials are in English, but parents can be assessed in Spanish at some sites);
- Non-correctable vision, hearing or sensorimotor impairments that may confound the child's responses on the assessments;
- A history of persistent major neurological disorders such as cerebral palsy, brain tumor, stroke, brain aneurysm, brain hemorrhage, or subdural hematoma. Other exclusionary medical or neurological conditions include multiple sclerosis, sickle cell disease, and the following seizure disorder diagnoses: Lennox-Gastaut syndrome, Dravet syndrome, and Landau Kleffner syndrome;
- Gestational age less than 28 weeks or birthweight less than 1,200 grams (2 lb 10 oz). Birth complications that resulted in hospitalization for more than a month are exclusionary (but not if the hospitalization was due to prematurity alone);
- A current diagnosis of schizophrenia, autism spectrum disorder (moderate or severe), mental retardation/intellectual disability, or alcohol/substance use disorder. (A past diagnosis that has remitted is not exclusionary);
- A history of traumatic brain injury (TBI): TBI with loss of consciousness >30 minutes, or Amnesia >24 hours, or positive neuroimaging findings (e.g., symptomatic hemorrhage) secondary to TBI;
- A parent/guardian's report that the child would be unable to complete the baseline assessments (i.e., answer questions, solve puzzles on an iPad, follow directions, and lie still in the MRI scanner).

Parent/Legal Guardian Criteria at Study Entry

Inclusion Criteria:

- Serve as the primary custodial parent or legal guardian with child in home for the majority of the year.

Exclusion Criteria:

- Unwilling to attend annual visits and complete the parental assessments.

ACS Post Stratification Weights: The NDA2 release of the ABCD baseline data includes a propensity-based weight that analysts can employ to compute descriptive estimates for the U.S. population of children age 9 and 10. The methodology used to develop this weight variable is

described in Elliott, M.R. and Richard L. Valliant. 2017 “Inference for nonprobability samples.” *Statistical Science*, 32(2):249-264.

The American Community Survey 2011-2015 Public Use Microsample File with selected demographic and socio-economic status variables was used to create the benchmark data for the ABCD population propensity weights. Key ACS individual and household variables were recoded to make them consistent with ABCD demographic and SES constructs. In both the ACS benchmark and the ABCD baseline data sets.

With all preliminary data management steps complete, the ACS and ABCD file were concatenated into a single data set with common variables, distinguished only by a binary code (1=ABCD, 0=ACS). A logistic regression model and appropriate inverse logit transformation was then used to estimate the probability that each case in this concatenated file belonged to the ABCD data set. Initial values of the propensity weight for all ABCD cases were then computed as the inverse of these estimated probabilities. Extreme weight values (<2% tile, >98% tile) were then trimmed to attenuate variance in the weights. The trimmed propensity weight values were then rescaled to account for the trimming and raked by iterative proportional fitting to exact 2011-2015 ACS population control totals for gender, age and race/ethnicity.

The final raked, propensity weight is named “acs_raked_propensity_score” in Data Release 2.0. The R code to execute all data management and weight production as well as the ACS benchmark data set (ACS2011_15_1.Rds) can be found at <https://github.com/ABCD-STUDY>.

Note: the construction of this pooled propensity weight does not differentiate between single births and twins, however investigation of the impact of twin/single birth "exchangeability" is ongoing with results to be reported at a later date.

ABCD Longitudinal Tracking: Includes site ID (site_id_1) of subject at each visit to facilitate identification of the site ID associated with each scan.

Residential History Derived Scores: The residential history is established according to the parents' report on where they lived. The variables were then retrieved based on the coordinates of their address. The query database was built based on digital archives from federal government, which we described as the following:

1. Smart location database from EPA.

The description for the smart location database can be found at: <https://www.epa.gov/smartgrowth/smart-location-mapping#walkability>. We used estimates based on 2010 census. The resulting variables include gross residential density and walkability index. The resolution of this database is at the census tract level.

2. Uniform crime report from FBI, compiled by ICPSR.

The description for this database can be found at: <http://www.icpsr.umich.edu/icpsrweb/NACJD/studies/33523>. To maintain a stability on the crime estimates, here we used three year averages, 2010 to 2012. The resolution of this database is at the county level.

3. Area deprivation index, calculated from American Community Survey.

The area deprivation index (ADI) is calculated based on a published study for the socioeconomic inequality impact on health (<http://annals.org/aim/fullarticle/1983380/neighborhood-socioeconomic-disadvantage-30-day-rehospitalization-retrospective-cohort-study>). The database we used here for query is the 2011 - 2015 American Community Survey 5-year summary. Although the area deprivation index has 18 different sub-scores, the recommendation is to use the national percentiles. The resolution of this is at the census tract level.

4. Population density, UN adjusted, from SEDAC.

The estimation is based on the 2010 census tract while adjusted based on potential under-reporting across the world.

5. Satellite based pollution measures (PM 2.5 and NO2 levels).

Both were obtained from NASA SEDAC. The resolution is at 100 km². Both were 3 year average estimates, spanning from 2010 to 2012.

One year annual averages of daily PM2.5 estimates from 2016 were also derived using spatio-temporal models at the 1 km² (<https://www.ncbi.nlm.nih.gov/pubmed/27023334>).

6. Elevation.

This is based on direct query to the Google map, which contains elevations given where participants live.

All variables are truncated to avoid potential identification while maintain overall variations for analytical purposes.

7. Estimated risk of lead (Pb) exposure

All participants' primary, secondary, and tertiary addresses were, if valid, geocoded at the census tract level with respect to an estimated risk of lead (Pb) exposure. These data are from Vox.com (<https://www.vox.com/a/lead-exposure-risk-map>). These risk scores (deciles, 1-10, 10 being the most at risk) were calculated for each census tract and reflect a weighted sum between two summary measures of that census tract: the age of homes and the rate of poverty. The housing age and poverty rate subcomponents of the lead risk score generally reflect an estimated probability of lead exposure given the age of homes (i.e., older homes are more likely to contain lead hazards) and the proportion of individuals living in poverty (-125% of poverty level). The housing-age and poverty-rate scores for valid primary, second, and tertiary addresses are also included.

