ABCD Human Subject Study Adolescent Brain Cognitive Development – ABCDSTUDY.org

Release Notes: Adolescent Brain Cognitive DevelopmentSM (ABCD) Study Data Release 4.0

COVID Rapid Response Research (RRR) Survey – Release 2

Second data release

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June 2021

Change Log June 2021

- Release of Surveys 4-6
- Extended Fitbit Subsample Data (March July 2020)

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General Information

The Adolescent Brain Cognitive Development StudySM (ABCD Study®), the largest longitudinal study of brain development and child health in the United States, follows over 10 years 11,878 children recruited from 21 U.S. research sites, recruited at ages 9-10 in 2016-18. In March 2020, when our participants were ages 11- to 13-years-old, the world became affected by the COVID-19 pandemic, leading to an upheaval in the economy and the lives of almost every family. The ABCD Study developed brief surveys sent electronically to all ABCD participants and their participating parent/guardian about the impact of the pandemic on their lives. An overview of the ABCD Study is at https://abcdstudy.org.

We sent Survey 1 May 16-22, 2020, Survey 2 June 24-27, 2020, and Survey 3 August 4-5, 2020. Data from these first three surveys constituted the first data release (http://dx.doi.org/10.15154/1520584). Surveys 4, 5, and 6 were sent October 8, 2020, December 13, 2020, and March 2, 2021. In addition, when site and school closures began in March 2020, ABCD participants who had their ABCD-assigned activity tracker agreed to extend protocol wear of the device, contributing valuable objective physical activity, resting heart rate, and sleep data (N=160).

This document describes the contents of the survey instrument and other data available for download and other notes for users of these data.

Youth Assessment

Pet ownership

Youth were asked if they have a pet (pets cv), and if so, what kind:

pet_identify_cv (select all that apply of: Dog, Cat, Horse, Fish, Small animal (e.g., rabbit, hamster, bird), or Other)

On-site or online school attendance and activities

Youth were first asked to respond whether their schooling was like it was before COVID-19: whether they went to school, got school-at-home, or a mix of both. If youth responded that they had any school activities, they were asked to respond to four questions about the average time per day spent on different kinds of school material.

Some outlying responses were observed for a very small number (<0.1%) of participants for the following items:

- online_arts_cv
- online science cv
- online other cv
- school_like_activities_cv

Some children responded taking online classes for more than 24 hours a day, if one combines all mutually exclusive responses, which is not possible and may be due to confusion by respondent between "how many hours a day" and "how many hours a week". Please note that we corrected these items in the next version of the questionnaire to avoid this problem for T4 and onward. There are some longitudinal discrepancies between T1 and T2 & T3 due to the summer period; for instance the correlation between T1 and T2 is moderate for the following items (online_arts_cv; online_science_cv; online_other_cv), due to substantial changes in school activities due to the summer period. Correlation between T2 and T3 is high, suggesting that the pattern was consistent within the summer period.

School activities and parenting

Youth were asked how many days per week they were helped or supervised by a parent (or other adult taking care of them) for schoolwork. If they responded one day or more, they were asked to specify how many days per week they were assisted by an adult for various activities.

School feelings and emotion

Three questions were constructed to ask how they find their schoolwork, whether they are worried about missing school, and whether they are enjoying school.

Sleep timing

Questions about typical sleep behavior in the past week were derived from the Munich Chronotype Questionnaire (Roenneberg et al. Life between clocks: daily temporal patterns of

human chronotypes. *J Biol Rhythms*, 2003, 18: 80-90); however, the time period is for the past week only and no distinction is made for school days and school-free days (e.g., weekends). Time resolution is hours for bedtime and sleep time (night-time hour options only), wake up time and school start time (daytime hour options only). Variables available are:

- Time of going to bed (time resolution in hours; night-time hours only)
- Time of actually starting to fall asleep (time resolution in hours; night-time hour options only)
- Minutes needed to fall asleep
- Number of awakenings during the night (up to 10)
- Total time awake during the night
- Time of waking up (time resolution in hours; daytime hour options only)
- Time of starting schoolwork (time resolution in hours; daytime hour options only)

Daily routines

Six questions ask about daily routines with options on a 5-point Likert scale, from 'never' to 'very frequently'. Some items are derived from The Questionnaire of Unpredictability in Childhood (QUIC, Glynn et al., Measuring Novel Antecedents of Mental Illness: The Questionnaire of Unpredictability in Childhood. *Neuropsychopharmacology*, 2019, 44: 876–882), and ask about typical morning and bedtime routines, participation in family activities, and worrying about family not having enough money to pay for necessities.

Physical activity

Questions about physical activity in the past week are modified from the International Physical Activity Questionnaire (IPAQ) short form (Lee et al., Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2011, 8:115. Questions ask about walking and moderate/vigorous activity, first establishing number of days that these activities were performed, following up with the amount of time spent doing the activity on a day. A question is included about daily sedentary (sitting) activity.

Screen Time

Screen Time was measured using self-report of the amount of time on a typical day youth used recreational screen media categories and total time spent (the following instructions were given for this section: Please do NOT include time spent on school related work, but DO include watching TV, shows or videos, texting or chatting, playing games, or visiting social networking sites (Facebook, Twitter, Instagram). On an average day in the past week, how much time do

you). Variables labels coincide with the ABCD 3.0 dataset for typical weekend day screen time use at the youth's annual visits, since during this COVID time many youth are at home throughout the day either without school or engaging in virtual school. Due to the likelihood that many youth would likely be at home throughout most of these assessments, screen time was not captured for both a typical weekday and a typical weekend day independently, as is done in the ABCD annual data collections. There are school variables to account for whether the youth was attending school in person.

For the first 3 Surveys released the response answers were 15 minutes, 30 minutes, 45 mins, 1 hour, 1.5 hours, 2 hours, 2.5 hours, and then each whole hour through 24 hours. It should be noted that depending on the type of device the youth used to complete the survey, there may be errors, particularly at the higher end, due to the way the answer options appeared; for example, if a child chose 1 hour, they may have accidentally spun the wheel to the end and click to try to get out of the answer option, rather than to mean to select 24 hours. This can be seen in instances where a child reports 24 hours of "Play multiplayer video games ..." but only 5 hours of total screen time on a typical day. This will also be true in the future Survey 4 release.

Racism/discrimination in relation to coronavirus

Two questions were constructed to ask about witnessing or experiencing racism or discrimination in relation to coronavirus.

COVID Attitudes and Practices

These items assessed youth attitudes, practices, knowledge, and knowledge sources about COVID-19.

- demo stayed away cv
- · demo avoid news
- demo wash hands cv
- · demo mask coverage cv
- · demo hand sanitizer cv
- demo wipes cv
- · demo touching things cv
- demo_touching_people_cv
- demo_exercise_cv
- demo_stayed_indoors_cv
- · demo schoolwork on comp cv
- demo afraid cv

- demo_affect_life_cv
- coverage_cv
- tv_view_cv
- social_media_cv
- news_update_cv
- social_media_platform_cv

A small subset of missing values occurs not due to branching logic (~229-235 NAs). This is distributed across sites and may be due to youth exiting the survey prior to completion.

Measures beginning with the prefix "demo_" asked about daily routines, with responses on a Likert from 1 to 4. For example,

demo_mask_coverage_cv

I wear a mask over my face or protective gear (e.g., gloves, things to cover my clothes)

- 1. I have not done this in the last week
- 2. I did this some of the time last week
- 3, I did this most of the time last week
- 4. I did this all the time last week

Responses across these 13 measures were available for covid19_cv1_arm_2 and covid19_cv3_arm_2. The measures showed reasonable distributions across the Likert scale. Some measures of daily responses showed substantial change across these first two timepoints (e.g., demo_schoolwork_on_comp_cv), indicating potential sensitivity to changes in local pandemic rules or behaviors. Other measures of attitudes showed similar score distributions across the two time points (e.g., demo_afraid_cv), indicating potentially more stable traits resilient to changes in local pandemic rules or behaviors.

Five measures used a five-point Likert asking about media usage, at each of the three time points. For example,

How often did you view television media coverage (e.g., news stations) of coronavirus?

- 0, Not at all
- 1, Less than 1 hour per day
- 2, About an hour per day
- 3, 1 to 2 hours per day

- 4, More than 2 hours per day
- coverage_cv
- tv_view_cv
- social media cv
- news update cv
- social_media_platform_cv

These responses were reasonably distributed, except for news_update_cv, which was skewed toward "0, Once per day or less", indicating youth were not reporting checking for news updates. Similarly, youth overwhelmingly endorsed "None" for the question:

social media platform cv:

Which platform did you use the most when checking for news related to coronavirus?

1, Twitter | 2, Instagram | 3, TikTok | 4, Snapchat | 5, YouTube | 6, Reddit | 7, Facebook | 8, Other | 9, None

Coping behaviors

A new question was constructed asking about activities done in the past week such as learning a new hobby. Participants could check those activities that applied.

NIH Toolbox Emotion Measures

Youth-reported measures of sadness (8 items), fear (8 items), and positive affect (9 items) were measured using instruments from the NIH Emotion Battery (Gershon et al., 2013). Youth were asked on a scale from "Never" to "Almost Always" how often they had felt a particular emotional experience.

COVID-Related Worry

Five questions were constructed to measure worry and cognitions about the coronavirus. These included asking youth how worried they have been about the coronavirus; how worried others have been; how much life has changed as a result of coronavirus; how hopeful youth are that the coronavirus crisis will end soon; and how stressful the uncertainty of COVID-19 has been on their lives. Response options ranged from "Not at all" to "Extremely."

Perceived Stress

Perceived stress was measured using the 4-item version of the Perceived Stress scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). Youth were asked to indicate how often they

experienced stressful cognitions in the past month. Response options ranged from "Never" to "Very Often".

<u>Additional Mental Health Items</u>

One additional item was added, "I felt angry or frustrated", to measure anger emotion, with identical response options to the NIH Toolbox emotion measures. A second item was constructed to measure how much a youth's perceived mental well-being has changed in the past week, ranging from "much worse" to "much better".

Parental Knowledge / Monitoring

In Surveys 1, 2, 3, 4, 5, and 6, youth completed four items measuring parental knowledge / monitoring:

- parent_monitor_q1_y_cv
- parent monitor q3 y cv
- parent monitor q4 y cv
- parent_monitor_q5_y_cv

These are four of the five items included on the ABCD study's measure of parental monitoring at the main study visits. See Zucker et al. (2018, *Developmental Cognitive Neuroscience*, 32, 107-120) for a description of the measure.

Schedule of Questions

The following questions were asked only on a subset of surveys (e.g., odd number surveys). A subset of participants erroneously may have received questions of the incorrect survey. Any data present for surveys at which the question was NOT administered is invalid. All other questions not listed below were asked at all surveys.

Question	Survey Number							
Question	# 1	# 2	# 3	# 4	# 5	#6		
felt_cv	х		х		х			
felt_life_went_wrong_cv	х		х		х			
felt_unhappy_cv	х		х		х			
felt_lonely_cv	х		х		х			

felt_sad_cv	х		х		х	
felt_alone_cv	х		х		х	
felt_always_sad	х		Х		х	
felt_no_fun_cv	х		Х		х	
felt_angry_cv	х		х		х	
attentive_y_cv		х		х		х
delighted_y_cv		х		х		х
calm_y_cv		х		Х		х
ease_y_cv		х		Х		х
enthusiastic_y_cv		х		Х		х
interested_y_cv		х		Х		х
confident_y_cv		х		Х		х
energetic_y_cv		х		х		х
concentrate_y_cv		х		Х		х
felt_scared_cv		х				
worried_about_me_cv		х				
worried_cv		х				
something_awful_cv		х				
worried_at_night_cv		х				
felt_nervous_cv		х				
worried_at_home_cv		х				
scared_easily_cv		х				

	_	_		_	_	
demo_online_cv		Х				
demo_friends_cv		х				
demo_parents_cv		х				
demo_siblings_cv		х				
demo_tone_friends_cv		х				
demo_tone_parents_cv		х				
demo_tone_siblings_cv		х				
demo_stayed_away_cv	х		х		х	
demo_avoid_news	х		Х		х	
demo_wash_hands_cv	х		Х		х	
demo_mask_coverage_cv	х		х		х	
demo_hand_sanitizer_cv	х		х		х	
demo_wipes_cv	х		х		х	
demo_touching_things_cv	х		х		х	
demo_touching_people_cv	х		Х		х	
demo_exercise_cv	х		х		х	
demo_stayed_indoors_cv	х		Х		х	
demo_schoolwork_on_comp_cv	х		х		х	
demo_afraid_cv	х		Х		х	
demo_affect_life_cv	х		х		х	

Parent Assessment

Family Actions

A question was constructed asking about activities the family engaged in or avoided in the past week by choice, rather than because of closures. In Surveys 1 and 2, participants had the option of checking up to 13 boxes with different COVID related activities. A checkbox corresponding to "None of the above" was option 14. On Survey 3, an additional checkbox was added (item 15 in the data) corresponding to the item "Wore Masks". Data for item 15 should be disregarded for Surveys 1 and 2 as only a few participants who took the survey later on had the item 15 checkbox as an available option. NOTE: The label for item 15 is missing from the data dictionary. Each checkbox is a separate variable with the item number appended to the end of the name (e.g., fam_actions_cv___15 corresponds to the checkbox item 15).

Family Coping Activities

A question was constructed asking about activities the parent engaged in the past week to cope. Participants had the option of checking up to 8 checkboxes. Item number 9 corresponds to the checkbox "None of the above". Each checkbox is a separate variable with the item number appended to the end of the name (e.g., p_cope_cv___2 corresponds to the checkbox item 2).

Schooling

Parents were asked about school closure and school attendance of their children. The parents who reported being the primary (or co-primary) person responsible for child's care during the day were asked questions about how much those activities interfered with their professional and household duties. Further questions addressed how much time they spent in helping the children in their school activities along with other questions regarding the continuity of schooling. Note that the surveys #2 and #3 covered at least partially schools' summer break for a large number of participants.

Routines, Physical Activity, and Sleep

Questions about moderate-vigorous physical activity in the past week are modified from the International Physical Activity Questionnaire (IPAQ) short form (Lee et al., Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*. 2011, 8:115. Seven questions about sleep are from the Sleep Disturbance Scale (Bruni et al., The Sleep Disturbance Scale for Children (SDSC) construction and validation of an instrument to evaluate

sleep disturbances in childhood and adolescence. *J Sleep Res.* 1996, 5:251-261), specifically from the Disorders of initiating and maintaining sleep subscale. The period has been modified to the past week. Two questions that quantify sleep duration and sleep onset latency are asked at each time point whereas the remaining 5 questions about difficulties initiating and maintaining sleep (responses range from Never to Always on a 5-point Likert scale) are asked on Survey 2. The 7 items (each scored between 1 and 5) can be added to obtain a total score for difficulty initiating and maintaining sleep, with higher scores reflecting greater difficulty.

Note that the Sleep Disturbance Scale is included in the main ABCD Study assessment protocol (abcd_sds01) allowing users to compare pre- and post-COVID patterns.

COVID Attitudes and Practices

Parents were asked about youth exposure to news about COVID-19 and whether the virus has elicited strong emotions or gotten in the way of child's enjoyment of life.

For youth news exposure at the first time point, for 16 participants there was a potential branching logic glitch, resulting in 16 missing data points for:

- child_news_time_cv
- child news source cv

Four-point Likert scale items given at these three time points asked whether the virus has elicited strong emotions or gotten in the way of the youth's enjoyment of life; NAs were T1: 334; T2: 181; T3: 133:

- child fear cv
- child_enjoy_cv

Parental Involvement (Talked About X) items asked about behaviors in the PAST WEEK at each timepoint. A five-point Likert (1, Never; 2, Rarely; 3, Occasionally; 4, Frequently; 5, Very Frequently). Missing data were minimal as a percentage of responses (335, 178, 131) and distributions were reasonable.

- talk_wash_cv
- talk social distance cv
- talk cancel cv
- talk isolate cv
- · talk symptoms cv
- talk_vuln_cv

- talk_race_cv
- talk_conserve_cv

Note that the **talk_mask_cv** question was added at Survey 3 and is not in the data dictionary; this will be corrected in the next release.

Remaining measures assessing parent involvement, using 5-point "Strongly Disagree-Strongly Agree" Likert were asked at two timepoints (Surveys 1 and 3) and showed reasonable distributions.

- assure child cv
- prepared child cv
- · child sched cv
- child_worry_cv
- p_feeling_cv
- p safety cv
- encouraged cv
- · avoid discussing cv
- avoid_talking_about_cv
- child_frustrated_cv
- child_breaking_rules_cv
- child_serious_cv
- child_worried_about_cv

Schedule of Questions

The following questions were asked only on either Survey 1 & 3 or only on Survey 2. A subset of participants erroneously may have received questions on the incorrect survey. Any data present for surveys on which the question was NOT administered is invalid. All other questions not listed below were asked at Surveys 1, 2, and 3.

Question	Survey Number					
Question	#1	# 2	# 3	# 4	# 5	# 6
fam_exp_racism_cv	х		х		х	

<u> </u>	1					
increased_conflict_cv	Х		Х		Х	
worry_about_cv	Х		Х		Х	
get_coronavirus_cv	х		Х		Х	
think_will_hospitalized_cv	х		х		х	
think_will_get_cv	х		х		х	
think_someone_close_get_cv	х		х		х	
All parent substance use questions (e.g. "su_p_xx_xx_cv")		х		х		х
fam_rout_cv		х		х		х
fam_hc_acc_cv		х		х		х
fam_ht_acc_cv		х		х		х
fam_supp_acc_cv		х		х		х
fam_stress_cv		х		х		х
fam_discord_cv		х		х		х
ext_fam_diag_cv		х		х		х
ext_fam_severity_cv		х		х		х
child_reluc_cv		х		х	х	х
child_sleep_difficult_cv		Х		Х	Х	х
child_sleep_anxiety_cv		х		х	Х	х
child_wake_up		х		х	х	х
child_sleep_again		х		х	х	х
assure_child_cv	х		х			
	-					

prepared_child_cv	х	х		
child_sched_cv	х	х		
child_worry_cv	х	х		
p_feeling_cv	х	Х		
p_safety_cv	х	х		
encouraged_cv	х	х		
avoid_discussing_cv	х	х		
avoid_talking_about_cv	х	х		
child_frustrated_cv	х	х		
child_breaking_rules_cv	х	х		
child_serious_cv	х	х		
child_worried_about_cv	х	х		

COVID-19 Geocoded Metrics

Geocoding Resolution

Geocoded data are presented per participant. These data describe the local environment for each participant. The resolution of these data are as follows:

- John Hopkins University (JHU) = county level
- SafeGraph = census block level
- U.S. Bureau of Labor Statistics (Unemployment data) = county level
- U.S. Census = county level

Johns Hopkins University (JHU) COVID-19 Prevalence

COVID-19 prevalence (i.e., case and death counts) were obtained from a publicly available Github repository maintained by the Center of Systems Science and Engineering at Johns Hopkins University. Data sources are cited on their README.md found at https://github.com/CSSEGISandData/COVID-19. These data have county-level resolution.

Raw case and death counts (cumulative) were used to calculate new case/death counts as well as aggregated rolling 7-day averages. Metrics were population adjusted by **US Census** measures per county: https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-total.html

JHU fields have the following prefixes:

- covidgeo jhu cases
- · covidgeo jhu deaths
- covidgeo jhu newcases
- · covidgeo jhu newdeaths

Known issues: Case/death counts used were not adjusted to confirmed counts. Therefore, some negative values in new case/death count fields exist.

For prevalence data, along with the other geocoded metrics (described below), these data were geocoded with respect to the date that the survey was disseminated to the participants, not the date that the participants returned their surveys. This may be changed in future releases.

SafeGraph COVID-19 Social Distancing Metrics

Daily metrics for mobile device behaviors were made publicly available by SafeGraph at the census block level from 2019 through Dec 2020.

Their website (https://docs.safegraph.com/v4.0/docs/social-distancing-metrics) provides the following description:

This product is delivered daily (3 days delayed from actual). Daily data is available going back to January 1, 2019. We used v2.1 to create the historical data from Jan 1, 2019 - Dec 31, 2019 (the backfill) as well as the data from May 10, 2020 forwards. However, the Jan 1-May 9, 2020 data is on v2.0. Apologies for any inconvenience, please see Release Notes below for more information.

The data was generated using a panel of GPS pings from anonymous mobile devices. We determine the common nighttime location of each mobile device over a 6 week period to a Geohash-7 granularity (\sim 153m x \sim 153m). For ease of reference, we call this common nighttime location, the device's "home". We then aggregate the devices by home census block group and provide the metrics set out below for each census block group.

SafeGraph fields have the following prefixes:

- covidgeo_sg_disttravel
- covidgeo_sg_homedwell
- · covidgeo sg devathome
- covidgeo sg ftwork
- covidgeo sg ptwork

Across devices, "disttravel" refers to median distance traveled from home (with "home" defined as described above), and "homedwell" refers to the average amount of time (in minutes) at home. "devathome" refers to the proportion of devices completely at home. "ftwork" and "ptwork" refer to the proportion of devices exhibiting full-time and part-time, respectively, work behavior. Full-time work is defined as the ratio of devices polled that spent greater than 6 hours at a location other than their geohash-7 home during the period of 8am - 6pm in local time. Part-time work is defined as the ratio of devices polled that spent one period of between 3 and 6 hours at one location other than their geohash-7 home during the period of 8am - 6pm in local time. This does not include any device that spent 6 or more hours at a location other than home.

U.S. Bureau of Labor Statistics (BLS)

Unemployment rates are provided at the county level at monthly rate by the U.S. Bureau of Labor Statistics: https://www.bls.gov/lau/. The rates are not seasonally adjusted. These county-level unemployment data are also available for 2019 (i.e., pre-pandemic) for comparison to 2020/2021.

BLS fields have the following prefix:

covidgeo bls

Known Issues

Parent Substance Use Questions in Survey 2, 4, and 6

In Surveys 2, 4, and 6, the $su_p_vape_use_cv$, $su_p_mj_vape_use_cv$, $su_p_mj_smoke_cv$, and $su_p_cig_use_cv$ variables may not have been presented due to branching logic. If a question was not asked due to branching logic, the $su_p_cig_loc_cv__888$, $su_p_vape_loc_cv__888$, $su_p_mj_vape_loc_cv__888$, and $su_p_mj_smoke_loc_cv__888$ will be coded as "1" to indicate this. We refer users to the data dictionary for additional details.

Variable Descriptions in Data Dictionary

The values in the variables child_test_1_cv - child_test_3_cv are the <u>dates</u> of testing for COVID-19.

Thus, the DESCRIPTION field for these variables in the NIMH Data Archive (NDA) dictionary should read as follows:

Variable	Incorrect DESCRIPTION	Correct DESCRIPTION
child_test_1_cv	Results of child's COVID-19	Date of child's COVID-19 Test 1
	Test 1	
child_test_2_cv	Results of child's COVID-19	Date of child's COVID-19 Test 2
	Test 2	
child_test_3_cv	Results of child's COVID-19	Date of child's COVID-19 Test 3
	Test 3	

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