Adolescent Brain Cognitive Development®

Teen Brains. Today's Science. Brighter Future.

ABCD - How to structure a big whale research study in REDCap
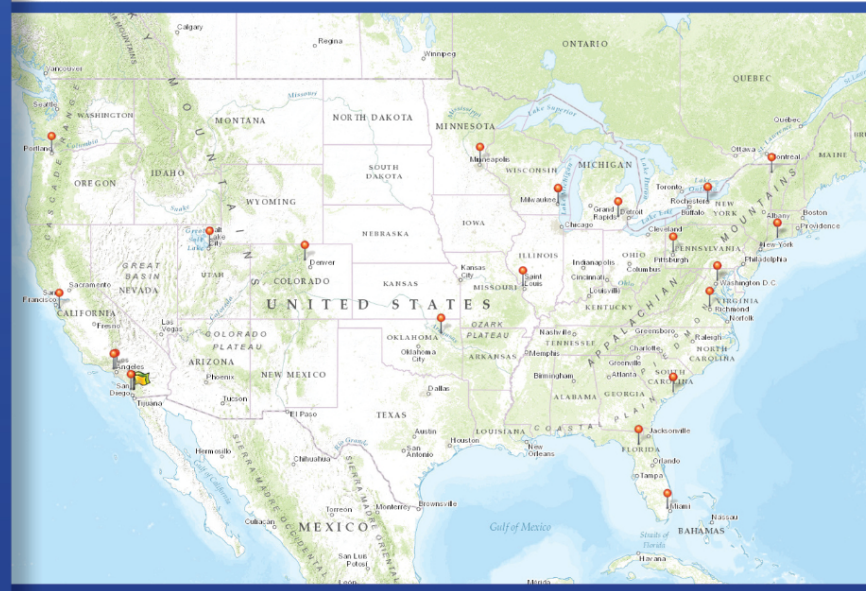über die Forschungslandschaften USA und Europa
Hauke Bartsch, Ph.D.

ABCD Study UC San Diego, MMIV Bergen, Norway

Adolescent Brain Cognitive Development (ABCD)

A longitudinal multi-site study of 11,878 children from ages 9-10 through early adulthood to assess factors that influence individual brain development trajectories and functional outcomes.

Make a Difference!
Be Part of...
The Largest Study on Brain Development and Child Health

Help the **ABCD Study** unlock the secrets of the developing brain.

Scan here for more information or visit
ABCDStudy.org

SCHOOL

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

Who can participate?

ABCD Study sites span the continental U.S. and Hawaii, to ensure that the results will be relevant to people from across races, ethnicities, genders, education and income levels, and living environments.

Qualified twin participants for these sites include:
- Full, Same-Sex Twin Pairs (identical or fraternal)
- Ages 9 & 10 years old
- In good health

While all study sites are inviting non-twin participants, **University of Colorado** is one of only four unique sites also inviting twins.

It's a twins
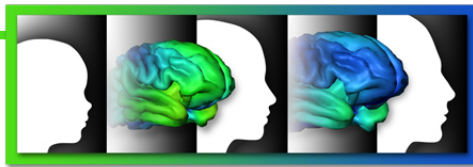
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Federal Partners: *Teen Brains. Today's Science. Brighter Future.*

|				
National Institute on Drug Abuse	National Institute on Alcohol Abuse and Alcoholism	National Cancer Institute	National Institute of Mental Health	*Eunice Kennedy Shriver* National Institute of Child Health and Human Development
National Heart, Lung, and Blood Institute	National Institute of Neurological Disorders and Stroke	National Institute on Minority Health and Health Disparities	NIH Office of Behavioral and Social Sciences Research	NIH Office of Research on Women's Health
Centers for Disease Control and Prevention - Division of Adolescent and School Health	National Institute of Justice	Centers for Disease Control and Prevention - Division of Violence Prevention	National Science Foundation	National Endowment for the Arts

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 mental illnesses.

- Understand the relationship between mental health and substance use.

- Study how use of different substances (caffeine, nicotine, alcohol, marijuana) affects developmental outcomes, and vice versa.
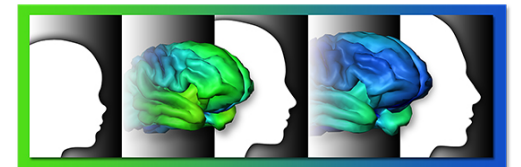
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ABCD Study
TIMELINE OF EVENTS

Adolescent Brain Cognitive Development
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STUDENT AGE	9-10		10-11		11-12
STUDENT TIME	6–7 hours	15 minutes	2–3 hours	15 minutes	6–7 hours
STUDENT ACTIVITY		every 3–6 months		every 3–6 months	
PARENT TIME	3 hours	5 minutes	1 hour	5 minutes	3 hours
PARENT ACTIVITY					

REPEAT ... *until age 19-20*

LEGEND — In-Person Visit — Biosamples — Phone Call — Brain Scan — iPad Tasks — Interview

Physical Health

ABCD Baseline Measure	What it measures:	Youth (min)	Parent (min)
Anthropometrics*	Height, weight, waist circumference	5	
Snellen Vision Screener	Vision screening	2	
Edinburgh Handedness Inventory	Handedness; Laterality quotient	1	
Youth Risk Behavior Survey: Exercise	Physical exercise	2	
Pubertal Development Scale and Menstrual Cycle Survey	Pubertal stage and menstrual phase	2	6
Screen Time Survey	Screen time utilization	3	2
Demographics Survey*	Demographics, race, gender, family structure, SES, education and occupation		5
Medical History Questionnaire	Medical history and health services utilization		10
Developmental History Questionnaire	Prenatal exposure by trimester - medications, drugs, alcohol, tobacco		15
Medications Survey*	Current and past medications		5
Sleep Disturbance Scale for Children	Sleep and sleep disorders		5
Sports and Activities Involvement Questionnaire	Involvement in sports, music, and hobbies, TBI risk		10
Ohio State TBI Screen - Short	Traumatic brain injury of youth		5
Total Minutes		**15**	**63**

*Modified from PhenX

Mental Health

ABCD Baseline Measure	What it measures:	Youth (min)	Parent (min)	Parent 2 (min)
Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5)				
Background Items Survey	**Youth:** school, sexual orientation	2		
Background Items Survey	**Parent:** school, family, social relations		5	
Diagnostic Interview for DSM-5	**Youth:** mood, social anxiety, generalized anxiety disorder, suicide, sleep	13		
Diagnostic Interview for DSM-5	**Parent:** all modules		60	
UPPS-P for Children - Short Form (ABCD version)	Impulsivity	3		
Behavioral Inhibition/Behavioral Approach System (BIS/BAS) Scales*	Inhibition and reward seeking	3		
Prodromal Psychosis Scale	Prodromal psychosis level	8		
Youth Resilience Scale	Resilience (friends)	1		
Child Behavior Checklist	Dimensional psychopathology, adaptive functioning		10	
Parent General Behavior Inventory - Mania	Subsyndromal mania		5	
Adult Self Report	Parent dimensional psychopathology		10	10
Family History Assessment	Family history of psychopathology and substance use (for biological or adoptive parent)		15	
Total Minutes		**30**	**105**	**10**

*Modified from PhenX

Substance Use

ABCD Baseline Measure	What it measures:	Youth (min)	Parent (min)
Participant Last Use Survey (PLUS)	Tobacco/caffeine/medication usage in the last 24 hours	1	1
Parent Rules	Parental substance use approval and rules		3
Community Risk & Protective Factors*	Perceived availability		2
Heard of alcohol, tobacco/nicotine, marijuana, other:			
Peer Group Deviance*	Peer group deviance & influences	1	
PATH Intention to Use Tobacco Survey	Intention to use, susceptibility	1	
Having tried alcohol, tobacco/nicotine, marijuana (e.g., sip or puff):			
Timeline Follow-back Survey	Quantity/frequency of all substance use	3-20	
iSay II Q2 Sipping Items	Early alcohol use	1	
Tobacco Low-Level Use Measure	Early tobacco use	1	
Marijuana Low-Level Use Measure	Early marijuana use	1	
Caffeine intake (only if heard of caffeine)	Caffeine use, type & quantity	1	

ABCD Baseline Measure	What it measures:	Youth (min)	Parent (min)
Having ever used alcohol, tobacco/nicotine, marijuana, other (e.g., full drink, more than just a puff):			
Acute Subjective Response to Alcohol*	Sensitivity to alcohol effects	2	
Acute Subjective Response to Tobacco*	Sensitivity to tobacco effects	1	
Acute Subjective Response to Marijuana	Sensitivity to marijuana effects	1	
Having two or more occasions of the respective substance use in past six months:			
Hangover Symptom Scale	Alcohol use consequences	3	
Rutgers Alcohol Problem Index	Alcohol use consequences	2	
Nicotine Dependence (from PATH)	Nicotine use consequences	2	
Marijuana Problem Index	Marijuana use consequences	2	
Drug Problem Index	Substance use consequences	2	
	Total Minutes	1-42	6

*Modified from PhenX

NeuroCognition

ABCD Baseline Measure	What it measures:	Youth (min)
NIH Toolbox Tasks		
Picture Vocabulary	Language: vocabulary knowledge, estimated verbal IQ	4
Flanker Inhibitory Control and Attention	Attention, cognitive control; executive function; inhibition of automatic response	4
List Sorting Working Memory	Working memory, information processing	8
Dimensional Change Card Sort	Executive function: set shifting, flexible thinking; concept formation	6
Pattern Comparison Processing Speed	Information processing; processing speed	3
Picture Sequence Memory	Episodic memory; sequencing	7
Oral Reading Recognition	Language: oral reading (decoding) skills, academic achievement	3
Rey Auditory Verbal Learning Test	Learning and memory	9
Cash Choice Task	Motivation, disinhibition, risk-taking, impulsivity	1
Little Man Task	Visuospatial processing, flexibility, attention	6
Matrix Reasoning Task	Fluid intelligence; visuospatial reasoning	8
RAVLT Delayed Recall	Memory recall	1
	Total Minutes	60

Culture & Environment

ABCD Baseline Measure	What it measures:	Youth (min)	Parent (min)
Parental Monitoring Survey	Parental monitoring/supervision	1	
Acceptance Subscale from Children's Report of Parental Behavior Inventory (CRPBI) - Short	Environment - Family & Religion	2	
School Risk & Protective Factors Survey*	Risk and protective factors	1	
Prosocial Behavior Survey	Resilience	1	1
Acculturation Survey*	Cultural factors	1	1
Family Environment Scale - Family Conflict Subscale*	Family dynamics, cohesion, expressiveness, conflict	2	2
Neighborhood Safety/Crime Survey*	Risk and protective factors, crime	1	1
Vancouver Index of Acculturation - Short Survey	Acculturation		5
Multi-Group Ethnic Identity - Revised Survey	Cultural affiliation		2
Mexican American Cultural Values Scale	Familism, religion, independence, self-reliance		5
Native American Acculturation Scale	Tribal affiliation (for Native American Parents only)		5
	Total Minutes	9	22

*Modified from PhenX

Biospecimens

ABCD Baseline Bioassay	What It Measures	Method	Youth (min)	Parent (min)
Alcohol Screen*	Past day alcohol use	Breathalyzer	1	
Drug Screen*	Past day drug use	Oral fluid - Drager	1	
Substance Use History	Metabolites of past 3 month substance use	Hair (~100 strands)	5	
Pubertal Hormones	Estradiol, testosterone, and DHEA	Oral fluid	7	
DNA (bank)	Genetic and epigenetic factors	Oral fluid/blood*	8-10	
Baby Teeth	Substance and environmental toxin exposure	Prior/newly shed baby teeth		5
Total Minutes			22-24	5

Other Data Sources

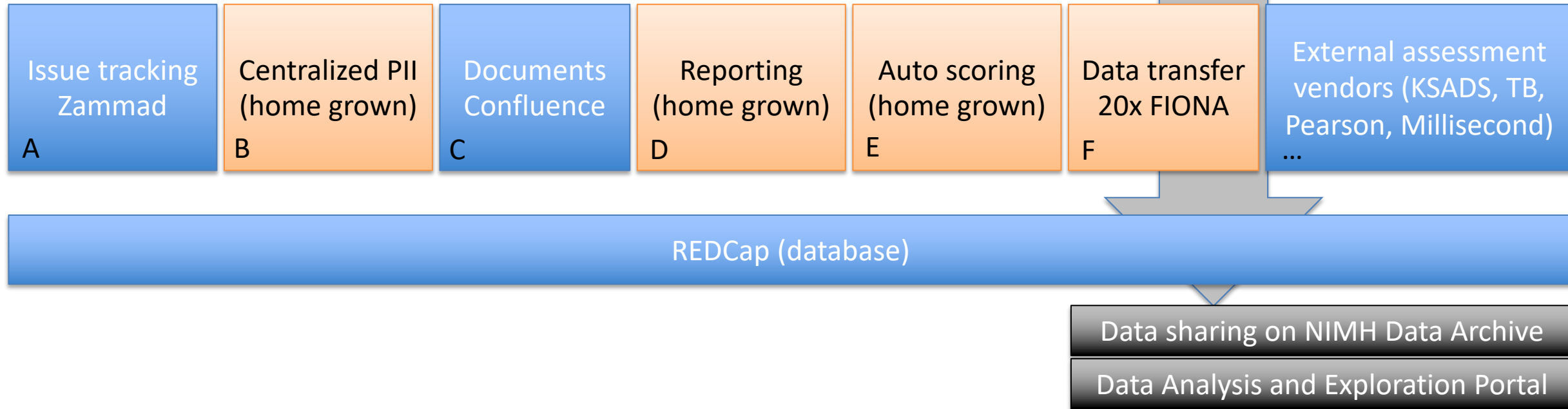| ABCD Baseline Measure	What it measures:	Parent (min)	Teacher (min)
Geocoding from Residential History	Environmental risk	5	
School Records	Educational attainment	3	
Brief Problem Monitor - Teacher Form	Dimensional psychopathology, adaptive functioning		2
Total Minutes		8	2

*Subset of participants

Imaging Protocol (every 2 years)

- Harmonized scanner protocol (Siemens/GE/Philips)
- Derived from HCP with support from all vendors

- Sites announce scan success in REDCap
- Data transfer with FIONA system (outside REDCap) github.com/ABCD–STUDY/FIONASITE
- ABCD-Report system for QC, find missing data

ABCD Imaging

Harmonized imaging protocol
using multi-band acceleration
200,000 brain images per participant

Structural MRI
- [8min] 3D T1 – Weighted
- [7min] 3D T2 - Weighted
- [10min] Diffusion Tensor Imaging

Functional MRI
- [5min] Resting State
- [10min] Monetary Incentive Delay Task
- [11min] Stop Signal Task
- [10min] Emotional N-Back Task

Siemens	Matrix	Slices	FOV	% FOV phase	Resolution (mm)	TR (ms)	TE (ms)	TI (ms)	Flip Angle (deg)	Parallel Imaging	MultiBand Acceleration	Phase partial Fourier	Diffusion Directions	b-values	Acquisition Time
T1	256 x 256	176	256 x 256	100%	1.0 x 1.0 x 1.0	2500	2.88	1060	8	2x	Off	Off	N/A	N/A	7:12
T2	256 x 256	176	256 x 256	100%	1.0 x 1.0 x 1.0	3200	565	N/A	Variable	2x	Off	Off	N/A	N/A	6:35
Diffusion	140 x 140	81	240 x 240	100%	1.7 x 1.7 x 1.7	4100	88	N/A	90	Off	3	6/8	96	500 (6-dirs) 1000 (15-dirs) 2000 (15-dirs) 3000 (60-dirs)	7:31
fMRI	90 x 90	60	216 x 216	100%	2.4 x 2.4 x 2.4	800	30	N/A	52	Off	6	Off	N/A	N/A	

Philips	Matrix	Slices	FOV	% FOV phase	Resolution (mm)	TR (ms)	TE (ms)	TI (ms)	Flip Angle (deg)	Parallel Imaging	MultiBand Acceleration	Half Scan Factor	Diffusion Directions	b-values	Acquisition Time
T1	256 x 256	225	256 x 240	93.75%	1.0 x 1.0 x 1.0	6.31	2.9	1060	8	1.5 x 2.2	Off	N/A	N/A	N/A	5:38
T2	256 x 256	256	256 x 256	100%	1.0 x 1.0 x 1.0	2500	251.6	N/A	90	1.5 x 2.0	Off	N/A	N/A	N/A	2:53
Diffusion	140 x 140	81	240 x 240	100%	1.7 x 1.7 x 1.7	5300	89	N/A	78	Off	3	0.6	96	500 (6-dirs) 1000 (15-dirs) 2000 (15-dirs) 3000 (60-dirs)	9:14
fMRI	90 x 90	60	216 x 216	100%	2.4 x 2.4 x 2.4	800	30	N/A	52	Off	6	0.9	N/A	N/A	

GE	Matrix	Slices	FOV	% FOV phase	Resolution (mm)	TR (ms)	TE (ms)	TI (ms)	Flip Angle (deg)	Parallel Imaging	MultiBand Acceleration	Phase partial Fourier	Diffusion Directions	b-values	Acquisition Time
T1	256 x 256	208	256 x 256	100%	1.0 x 1.0 x 1.0	2500	2	1060	8	2x	Off	Off	N/A	N/A	6:09
T2	256 x 256	208	256 x 256	100%	1.0 x 1.0 x 1.0	3200	60	N/A	Variable	2x	Off	Off	N/A	N/A	5:50
Diffusion	140 x 140	81	240 x 240	100%	1.7 x 1.7 x 1.7	4100	81.9	N/A	77	Off	3	5.5/8	96	500 (6-dirs) 1000 (15-dirs) 2000 (15-dirs) 3000 (60-dirs)	7:30
fMRI	90 x 90	60	216 x 216	100%	2.4 x 2.4 x 2.4	800	30	N/A	52	Off	6	Off	N/A	N/A	

Backbone – Data Collection

Systems:

Issue tracking Zammad A	Centralized PII (home grown) B	Documents Confluence C	Reporting (home grown) D	Auto scoring (home grown) E	Data transfer 20x FIONA F	External assessment vendors (KSADS, TB, Pearson, Millisecond) …

REDCap (database)

Data sharing on NIMH Data Archive

Data Analysis and Exploration Portal

All data for capture, scoring and sharing reside in ABCD-REDCap
Participant IDs are predefined (Centralized PII)
Longitudinal/multi-site (single arm)
Protocol changes are encouraged (10year study) and require curation of already captured data in REDCap
Auto-Scoring for <u>continuous</u> data transformations and derived scores

Reporting - Study Tracking - Enrollment - Retention
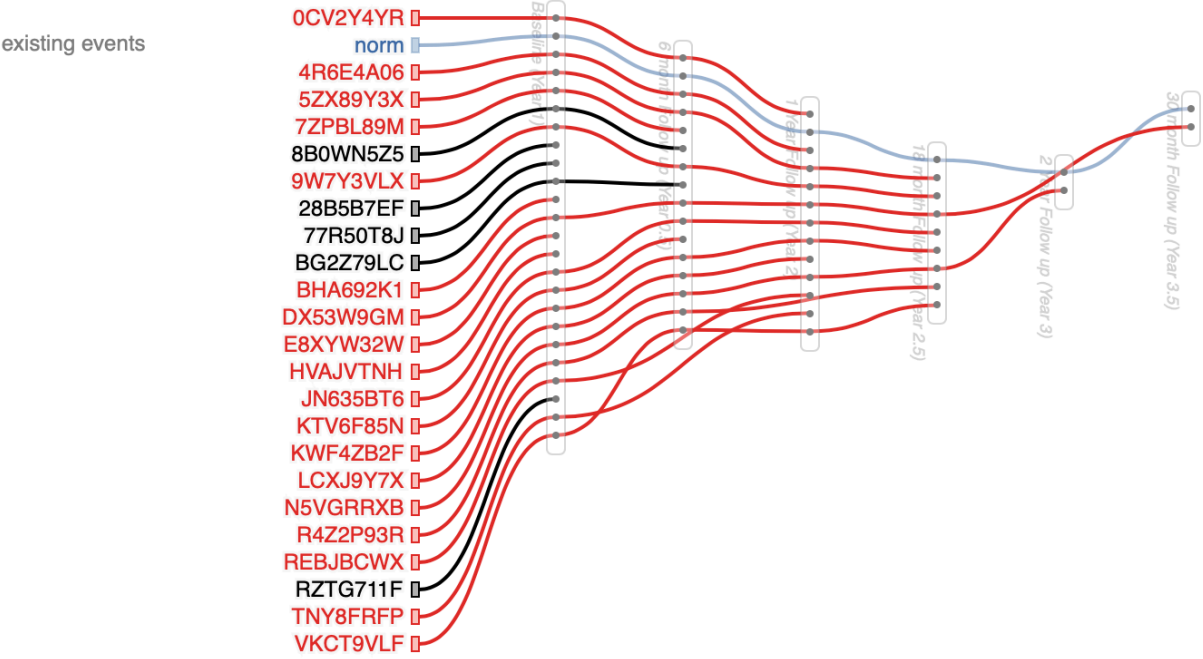
existing events

missing events
15 missed 1 event
5 missed 2 events
2 missed 3 events
1 missed 4 events
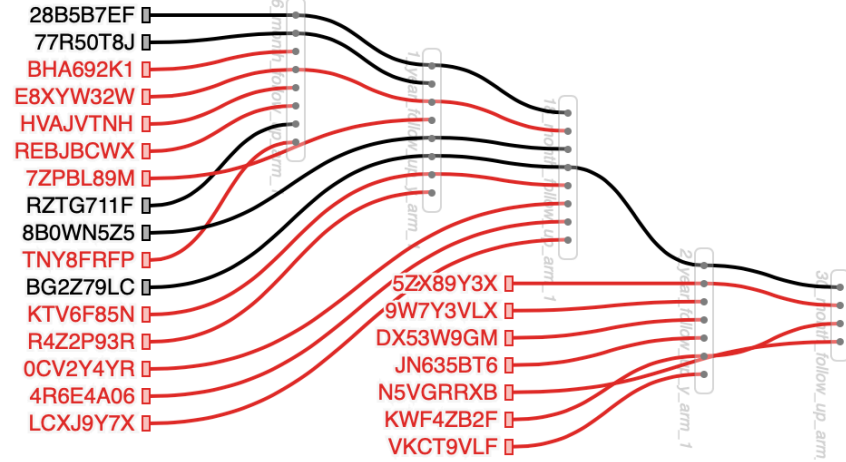
Reporting - Study Tracking - Enrollment - Retention

Scheduling Status

Scheduling status of enrolled participants. Based on participants position on the time interval, they are classified into these categories:
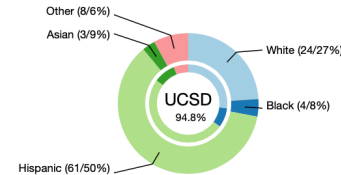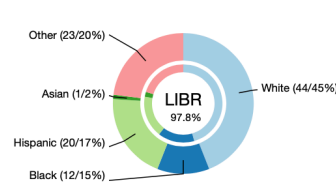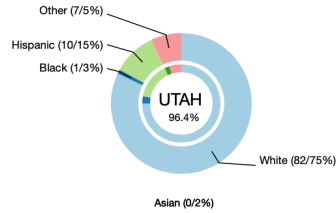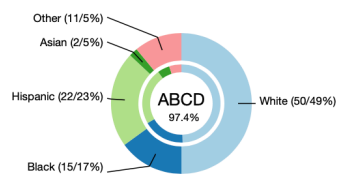
Eligible Now - The participant is eligible for the next visit now. Please schedule as soon as possible (days left, event name, date range).

Eligible Soon - The participant will reach the next visit period soon, and it is OK for RAs to make appointments with this participant (days left, event name, date range).

Just Scheduled - The participant just scheduled or finished a visit. Nothing needs to be done recently (Done/Scheduled, event name, date range).

Reporting - Study Tracking - Enrollment - Retention

Done Early	Done Late	Overdue	Never Done	Extended	Disposition Pending	Not Due Yet	Due Now	Done
209	1164	310	1014	27	344	10847	4009	11871
A:3 S:5 O:5	A:23 S:12 O:10	A:0 S:0 O:0	A:33 S:24 O:27	A:0 S:0 O:0	A:3 S:1 O:2	A:562 S:396 O:276	A:54 S:79 O:78	A:562 S:401 O:275
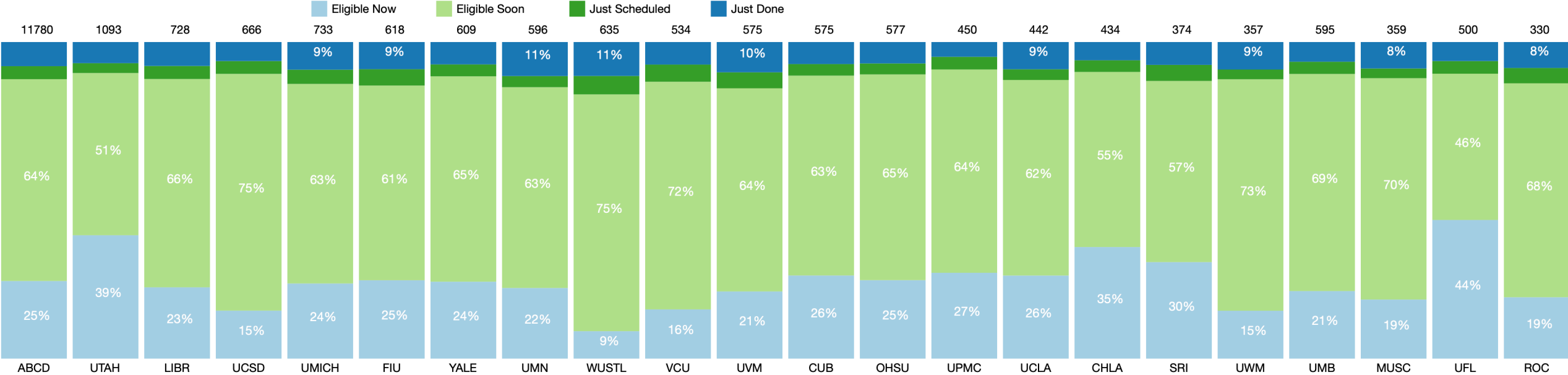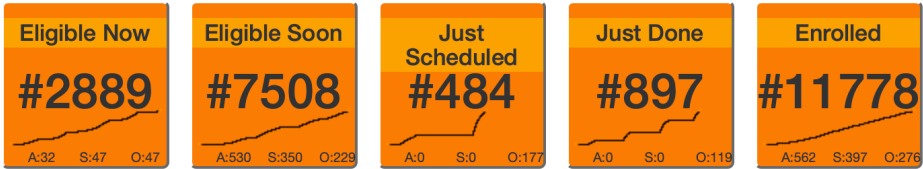
Reporting - Study Tracking - Enrollment - Retention

The data below shows the ethnicity of enrolled ABCD participants in five categories calculated from the self-assigned ethnicity variables *demo_race_a_p*, *demo_race_ax_v2*, *demo_ethnx_v2*, and *demo_ethn_v2b*. Only valid ABCD participants are counted based on the value of the *enroll_total* variable that includes information about the signed consent for the parent and assent of the child as well as pilot status and exclusion information.
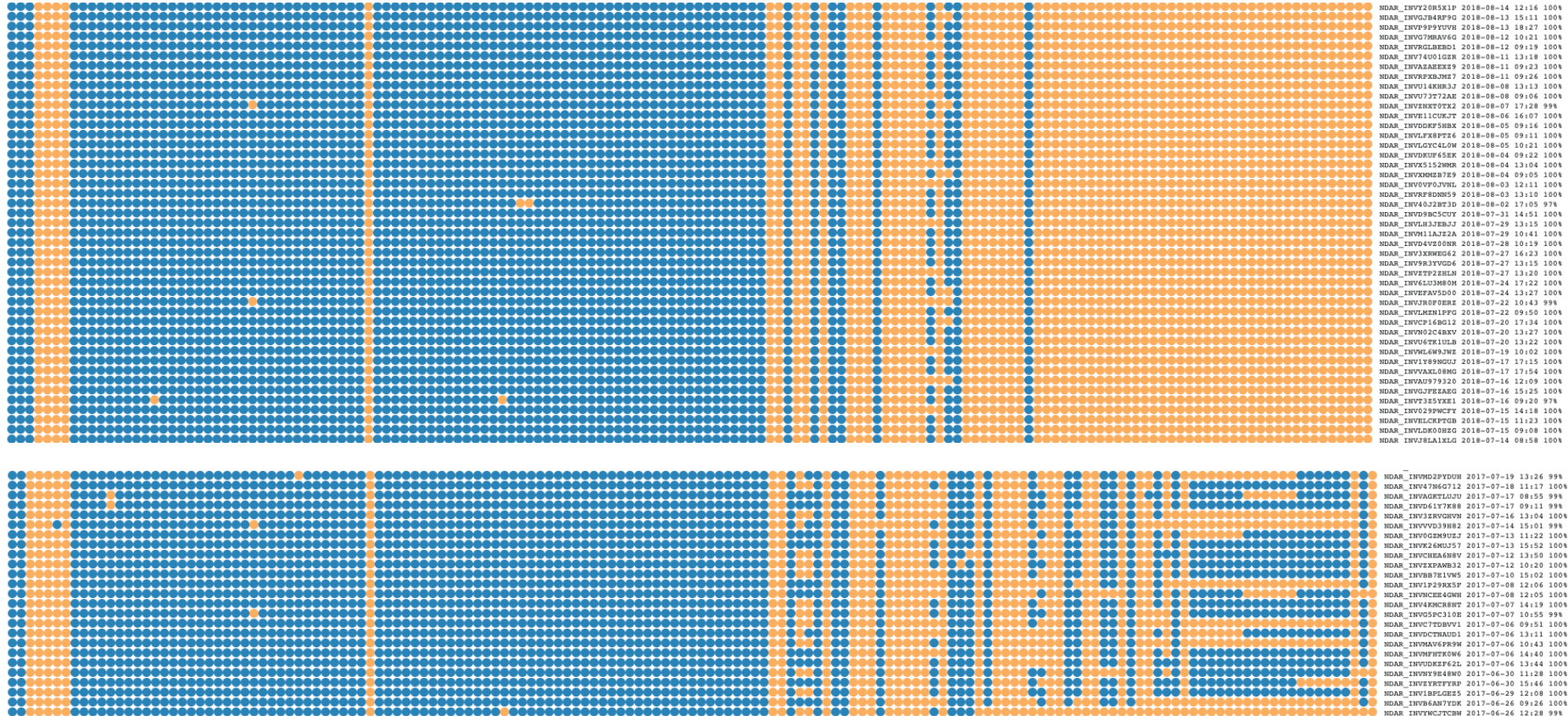
The circle charts display ethnicity information by site. The inner annulus depicts the target ethnicity. The number below the site's name is a composite of the differences across all ethnicities (100% equates perfect matching ethnicities).

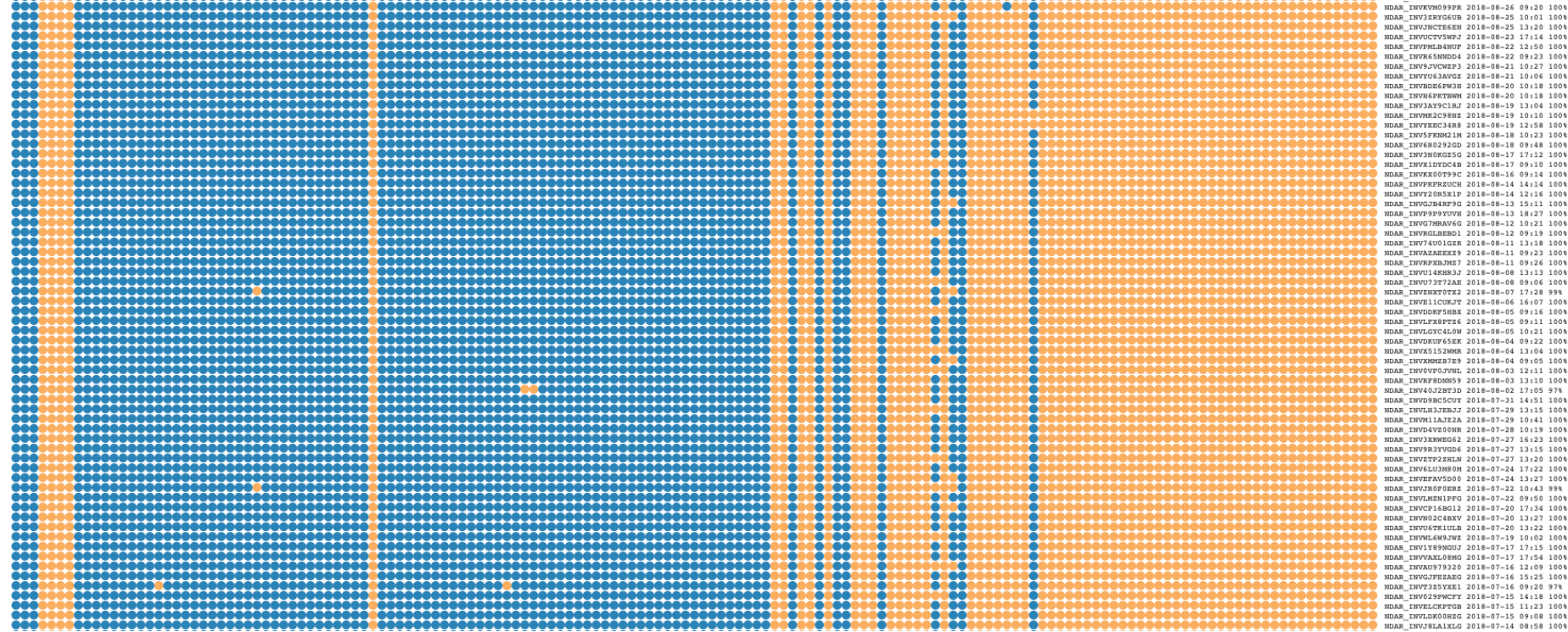| White	Black	Hispanic	Asian	Other	Missing	Total
#5037	#1537	#2232	#249	#1079	#12	#10146
A:170 S:100 O:93	A:139 S:152 O:102	A:110 S:83 O:42	A:5 S:9 O:3	A:61 S:46 O:32	A:1 S:0 O:1	A:486 S:390 O:273
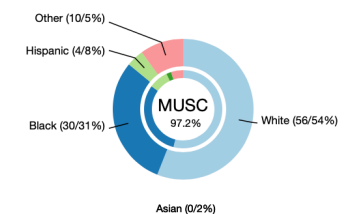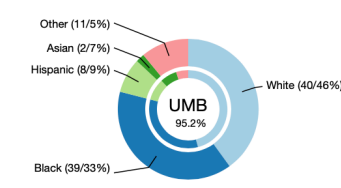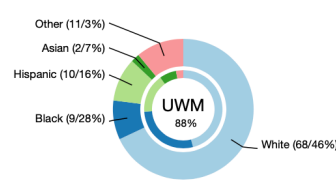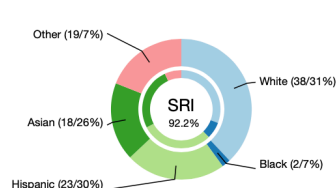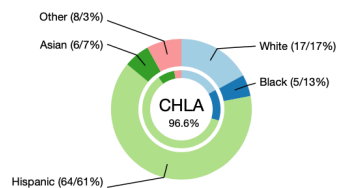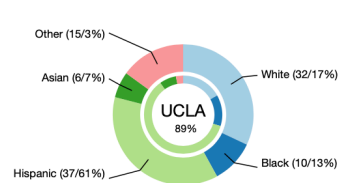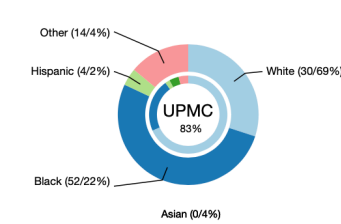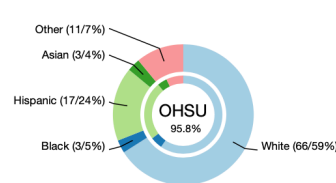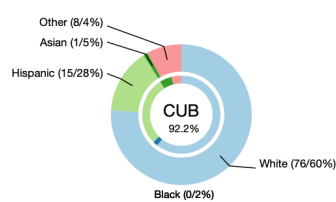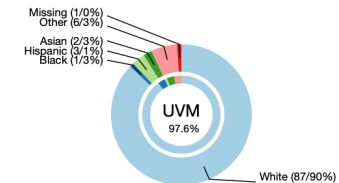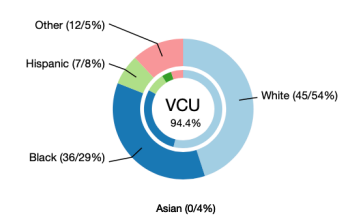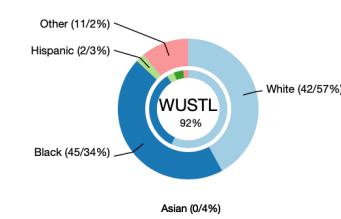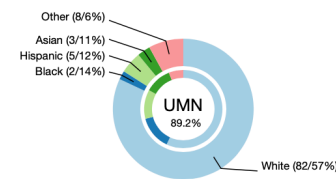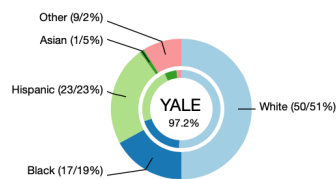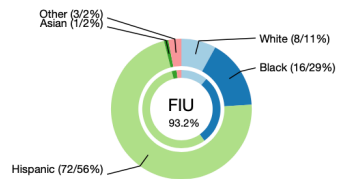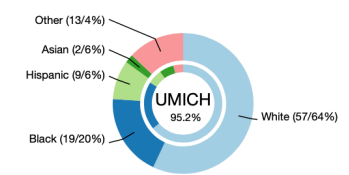
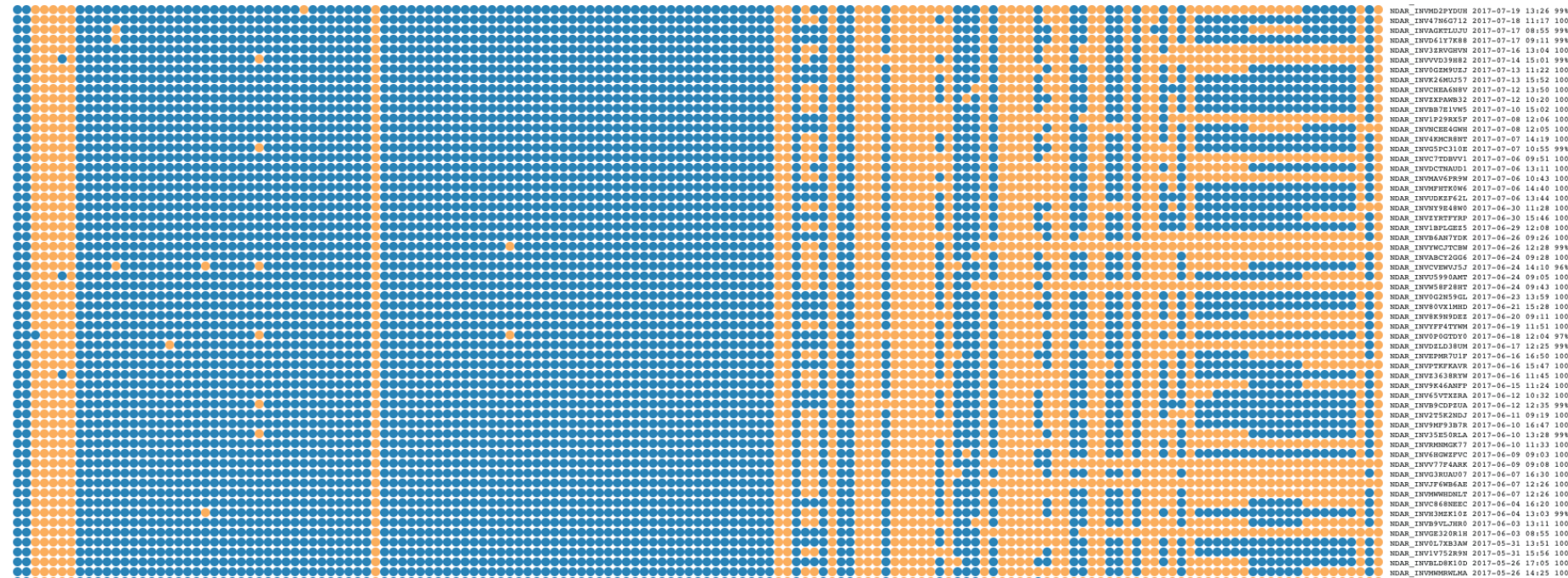# Reporting - Study Tracking - Enrollment - Retention

Redefine instrument completion:
Every answer is required (percentage complete by site = data access group)

NDAR_INVKVM099PR 2018-08-26 09:20 100%
NDAR_INV3ZRYG6UB 2018-08-25 10:01 100%
NDAR_INVJNCTE6EN 2018-08-25 13:20 100%
NDAR_INVUCTV5WPJ 2018-08-23 17:14 100%
NDAR_INVPMLB4NUF 2018-08-22 12:50 100%
NDAR_INVR65NNDD4 2018-08-21 09:23 100%
NDAR_INV9JVCWZP3 2018-08-21 10:27 100%
NDAR_INVYU63AVGZ 2018-08-21 10:06 100%
NDAR_INVBDE6FW3H 2018-08-20 10:18 100%
NDAR_INVH6PKTBWM 2018-08-20 10:18 100%
NDAR_INV3AY9C1RJ 2018-08-19 13:04 100%
NDAR_INVMM2C98NZ 2018-08-19 10:10 100%
NDAR_INVYEEC34R8 2018-08-19 12:58 100%
NDAR_INV5FKNM21M 2018-08-18 10:23 100%
NDAR_INV6R0292GD 2018-08-18 09:48 100%
NDAR_INV3H0KG25G 2018-08-17 17:12 100%
NDAR_INVX1DYDC4B 2018-08-17 09:10 100%
NDAR_INVKX00T99C 2018-08-16 09:14 100%
NDAR_INVPKFRZUCH 2018-08-14 14:14 100%
NDAR_INVY20R5X1P 2018-08-14 12:16 100%
NDAR_INVGJB4RF9G 2018-08-13 15:11 100%
NDAR_INVP9P9YUVH 2018-08-13 18:27 100%
NDAR_INVG7MRAV6G 2018-08-12 10:21 100%
NDAR_INVRGLBEBD1 2018-08-12 09:19 100%
NDAR_INV74U01GZR 2018-08-11 13:18 100%
NDAR_INVAZAEEXZ9 2018-08-11 09:23 100%
NDAR_INVRFXBJNK7 2018-08-11 09:26 100%
NDAR_INVU14KHRJJ 2018-08-08 13:13 100%
NDAR_INVU73T72AE 2018-08-08 09:06 100%
NDAR_INVZNXT0TX2 2018-08-07 17:28 99%
NDAR_INVE11CUKJT 2018-08-06 16:07 100%
NDAR_INVDDKF5HBX 2018-08-05 09:16 100%
NDAR_INVLFX8PTZ6 2018-08-05 09:11 100%
NDAR_INVLGYC4L0W 2018-08-05 10:21 100%
NDAR_INVDKUF65EK 2018-08-04 09:22 100%
NDAR_INVX5152WMR 2018-08-04 13:04 100%
NDAR_INVXMMZB7E9 2018-08-04 09:05 100%
NDAR_INV0VF0JVNL 2018-08-03 12:11 100%
NDAR_INVRF8DNN59 2018-08-03 13:10 100%
NDAR_INV40J2BT3D 2018-08-02 17:05 97%
NDAR_INVD9BC5CUY 2018-07-31 14:51 100%
NDAR_INVLH3JEBJJ 2018-07-29 13:15 100%
NDAR_INVM11AJE2A 2018-07-29 10:41 100%
NDAR_INVD4VZ00NR 2018-07-28 10:19 100%
NDAR_INV3XRWEG62 2018-07-27 16:23 100%
NDAR_INV9B3YVGD6 2018-07-27 13:15 100%
NDAR_INVZTP2ZHLN 2018-07-27 13:20 100%
NDAR_INV6LU3M80M 2018-07-24 17:22 100%
NDAR_INVEFAV5D00 2018-07-24 13:27 100%
NDAR_INVJR8F0ERZ 2018-07-22 10:43 99%
NDAR_INVLMZN1PFG 2018-07-22 09:50 100%
NDAR_INVCP16BG12 2018-07-20 17:34 100%
NDAR_INVN02C4BKV 2018-07-20 13:27 100%
NDAR_INVU6TK1ULB 2018-07-20 13:22 100%
NDAR_INVWL6W9JWZ 2018-07-19 10:02 100%
NDAR_INV1Y89NGUJ 2018-07-17 17:15 100%
NDAR_INVVAXL08MG 2018-07-17 17:54 100%
NDAR_INVAUU979320 2018-07-16 12:09 100%
NDAR_INVGJFEZAEG 2018-07-16 15:25 100%
NDAR_INVT3E5YXE1 2018-07-16 09:20 97%
NDAR_INV029PWCFY 2018-07-15 14:18 100%
NDAR_INVELCKPTGB 2018-07-15 11:23 100%
NDAR_INVLDK00HZG 2018-07-15 09:08 100%
NDAR_INVJ8LA1XLG 2018-07-14 08:58 100%

NDAR_INVMD2PYDUH 2017-07-19 13:26 99%
NDAR_INV47N6G712 2017-07-18 11:17 100%
NDAR_INVAGKTLUJU 2017-07-17 08:55 99%
NDAR_INVD61Y7K88 2017-07-17 09:11 99%
NDAR_INV3ZRVGHVN 2017-07-16 13:04 100%
NDAR_INVVVD39H82 2017-07-14 15:01 99%
NDAR_INV0GZM9UZJ 2017-07-13 11:22 100%
NDAR_INVK26MUJ57 2017-07-13 15:52 100%
NDAR_INVCHEA6N8V 2017-07-12 13:50 100%
NDAR_INVZXPAWB32 2017-07-12 10:20 100%
NDAR_INVBB7E1VW5 2017-07-10 15:02 100%
NDAR_INV1P29RX5F 2017-07-08 12:06 100%
NDAR_INVNCEE4GWH 2017-07-08 12:05 100%
NDAR_INV4KMCR8NT 2017-07-07 14:19 100%
NDAR_INVG5PC310E 2017-07-07 10:55 99%
NDAR_INVC7TDBVV1 2017-07-06 09:51 100%
NDAR_INVDCTNAUD1 2017-07-06 13:11 100%
NDAR_INVMAV6PR9W 2017-07-06 10:43 100%
NDAR_INVMFHTK0W6 2017-07-06 14:40 100%
NDAR_INVUDKEF62L 2017-07-06 13:44 100%
NDAR_INVNY9E48W0 2017-06-30 11:28 100%
NDAR_INVEYRTFYRP 2017-06-30 15:46 100%
NDAR_INV1BPLGEZ5 2017-06-29 12:08 100%
NDAR_INVB6AN7YDK 2017-06-26 09:26 100%
NDAR_INVYWCJ7CBW 2017-06-26 12:28 99%
NDAR_INVABCY2GG6 2017-06-24 09:28 100%
NDAR_INVCVEWVJ5J 2017-06-24 14:10 96%
NDAR_INVU5990AMT 2017-06-24 09:05 100%
NDAR_INVW58F28HT 2017-06-24 09:43 100%
NDAR_INV0G2N59GL 2017-06-23 13:59 100%
NDAR_INV80VX1MHD 2017-06-21 15:28 100%
NDAR_INV8K9N9DEZ 2017-06-20 09:11 100%
NDAR_INVYFP4TYWM 2017-06-19 11:51 100%
NDAR_INV0P0GTDY0 2017-06-18 12:04 97%
NDAR_INVDZLDJ8UM 2017-06-17 12:25 99%
NDAR_INVEPMR7U1F 2017-06-16 16:50 100%
NDAR_INVPTKFKAVR 2017-06-16 15:47 100%
NDAR_INV2363HRYW 2017-06-16 11:45 100%
NDAR_INV9K46ANFP 2017-06-15 11:24 100%
NDAR_INV65VTXERA 2017-06-12 10:32 100%
NDAR_INVB9CDPZUA 2017-06-12 12:35 99%
NDAR_INV2T5K2NDJ 2017-06-11 09:19 100%
NDAR_INV9MF93B7R 2017-06-10 16:47 100%
NDAR_INV35E59RLA 2017-06-10 13:28 99%
NDAR_INVRMRMGK77 2017-06-10 11:33 100%
NDAR_INV6HGWZFVC 2017-06-09 09:03 100%
NDAR_INVV77F4ARK 2017-06-09 09:08 100%
NDAR_INVGJ8UAU07 2017-06-07 16:30 100%
NDAR_INVJF6WB6AE 2017-06-07 12:26 100%
NDAR_INVMWWHDNLT 2017-06-07 12:26 100%
NDAR_INVC868NEEC 2017-06-04 16:20 100%
NDAR_INVH3MZK10Z 2017-06-04 13:03 99%
NDAR_INVB9VLJHR0 2017-06-03 13:11 100%
NDAR_INVGEJ2OR1H 2017-06-03 08:55 100%
NDAR_INV0L7XB3AW 2017-05-31 13:51 100%
NDAR_INV1V752R9N 2017-05-31 15:56 100%
NDAR_INVBLD8K10D 2017-05-26 17:05 100%
NDAR_INVMWMRWLMA 2017-05-26 14:25 100%

No-Code system for scoring suitable for non-programmers
github.com/ABCD-STUDY/auto-scoring

BL 11,873

65,854 measures

6m 8,623
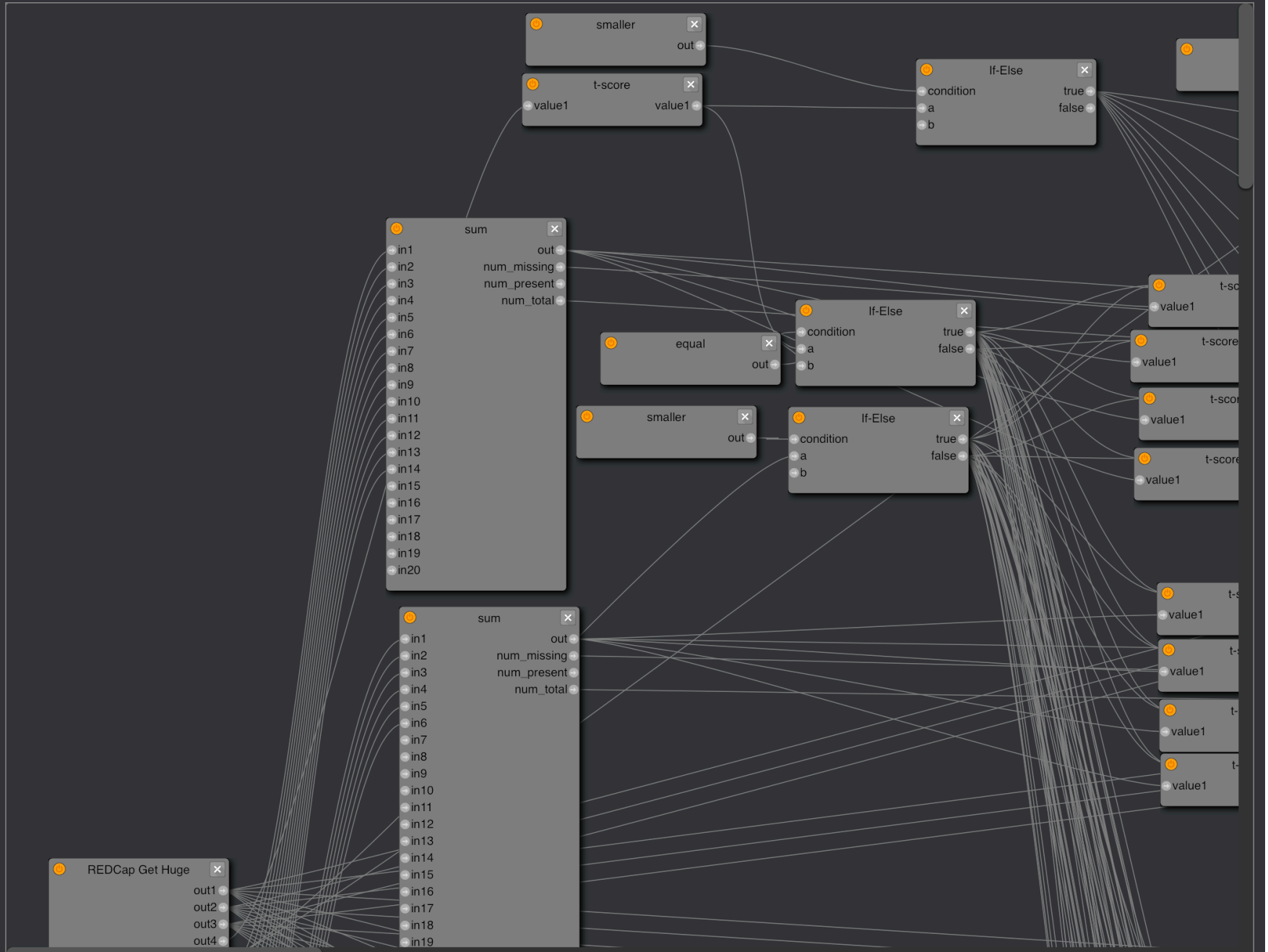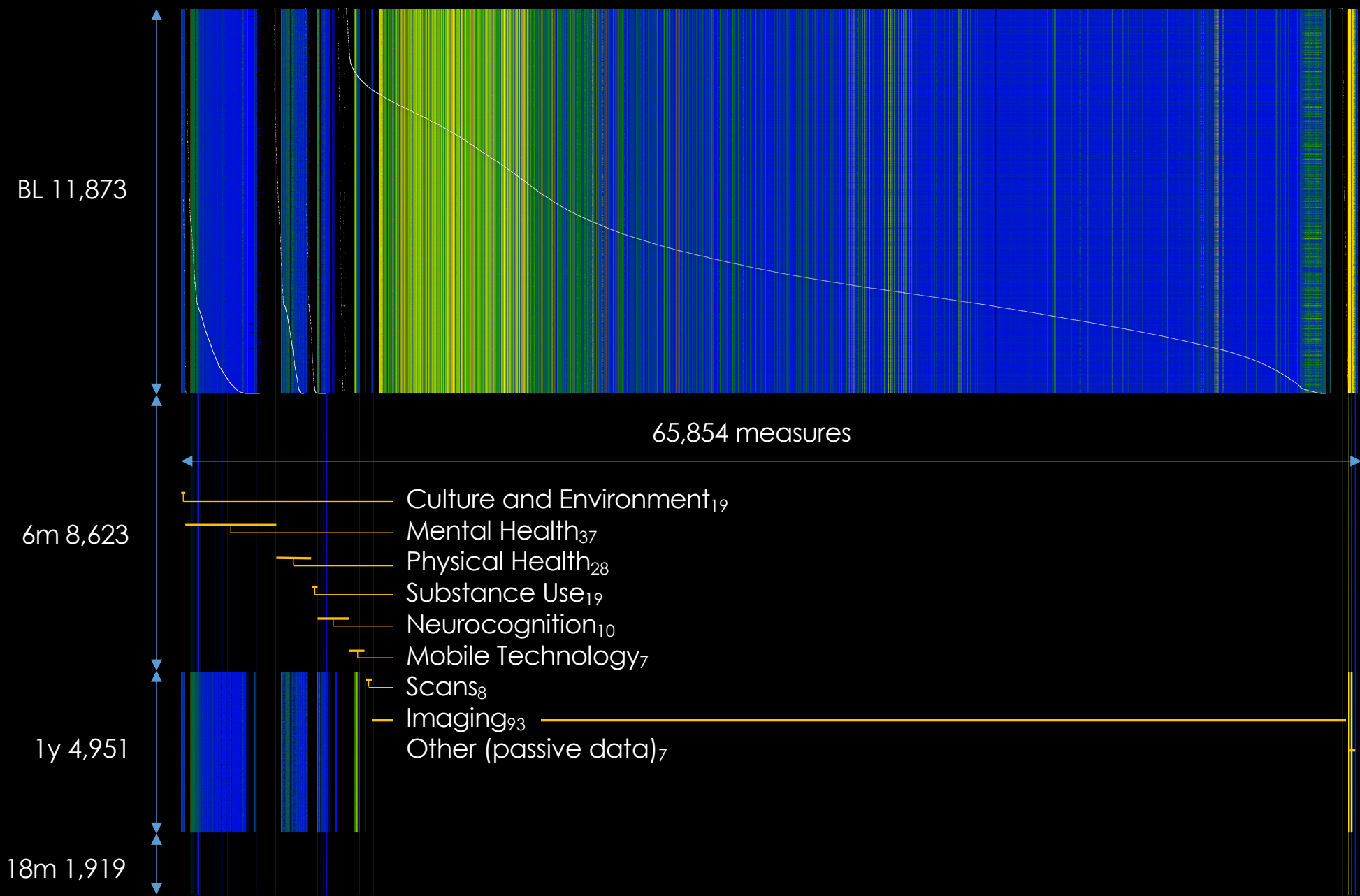
Culture and Environment$_{19}$
Mental Health$_{37}$
Physical Health$_{28}$
Substance Use$_{19}$
Neurocognition$_{10}$
Mobile Technology$_{7}$
Scans$_{8}$
Imaging$_{93}$
Other (passive data)$_{7}$

ABCD Data Release 2.0

1y 4,951

18m 1,919

4GB of shared spreadsheet data (year2) + 100TB of MR imaging data (DICOM/BIDS)

Release Year	Baseline	6 month	1 year	18 month	2 year	36 month	3 year	48 month	4 year	60 month	5 year	72 month	6 year	84 month	7 year	96 month	8 year	108 month	9 year	120 month	10 year	132 month	11 year	144 month	12 year
1	4,951	0																							
2	11,873	8,623	4,951	1,919	0																				
3	11,873	11,873	11,873	8,905	5,937	2,968	0																		
4	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0																
5	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0														
6	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0												
7	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0										
8	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0								
9	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0						
10	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0				
11	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0		
12	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937	2,968	0
13	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	8,905	5,937
14	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873	11,873
Collection year	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12

Yearly (rolling) release schedule

Baseline · Year 2 · Year 4 · Year 6 · Year 8 · Year 10

Year 1 · Year 3 · Year 5 · Year 7 · Year 9

Spreadsheet data (year 12)
21 visits, 11,873 participants,
65,000 measures = $16 \cdot 10^9$
values (16Billion) = 24GB
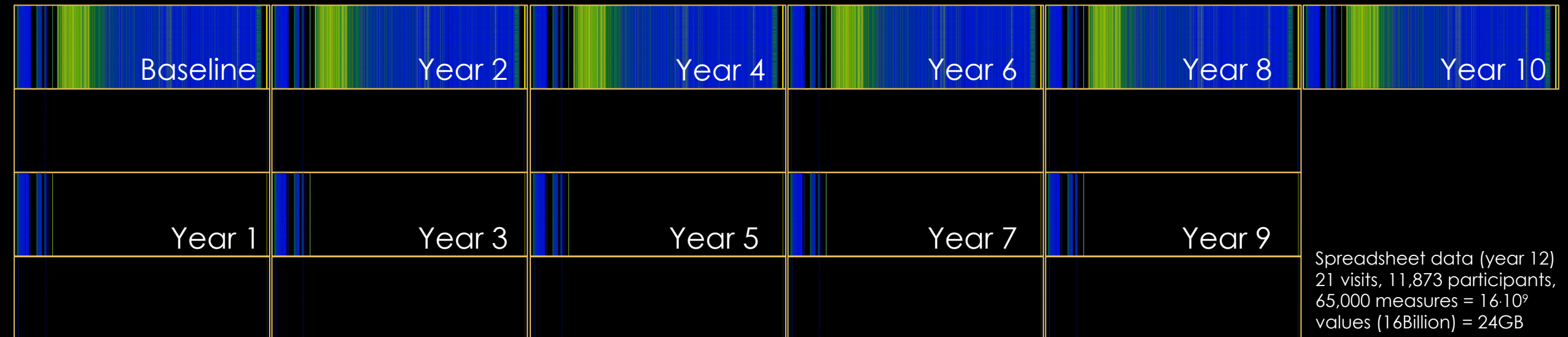
Data Exploration and Analysis Portal (DEAP)

Web-based interface, cloud deployment on NIMHDA

NIMH's NDA data sharing platform as data source

Access to all ABCD measures shared in NDA17

Build-in nesting for multi-level covariates of choice

Access to visualizations and statistical model summary

abcdstudy.org
github.com/ABCD-STUDY

Medical Imaging (MRI/MRS), AI/ML, Visualization (MMIV.no)

MMIV CONFERENCE 2019

Bergen, 9-11 December 2019

Venue: Bikuben, Jonas Liesvei 72c Bergen

Conference Program

Monday December 9th

10:00 – 10:05 Welcome address by Eivind Hansen, Chief Executive Officer of the Haukeland University Hospital
10:05 – 10:20 Rector Dag Rune Olsen, University of Bergen: Convergence of Sciences
10:20 – 11:00 Keynote Prof. Bradley J. Erickson, Mayo Clinic Rochester: Seeing is Believing: Can We Trust AI?
11:00 – 12:00 Poster Speed Presentations

12:00 – 13:00 Lunch

13:00 - 14:30 Artificial intelligence and computational medicine in the clinic
• **Arvid Lundervold – Artificial intelligence and computational medicine**
• **Alexander S. Lundervold – Perspectives on deep learning in medical imaging @ MMIV**
• **Hauke Bartsch – Designing a research environment for imaging-based ML methods – How AI shapes the future of hospital IT**
• **Helga M. Brøgger – AI in the radiology clinic. Perspectives from the Norwegian Society of Radiology.**

14:30 – 15:30 Coffee break

15:30 – 16:10 Keynote Prof. Anders Persson, Linköping University: Benefits, barriers and opinions on multidisciplinary team building: CMIV a case study

16:30 – 18:30 Reception at the MMIV centre