Adolescent Brain Cognitive Development

Teen Brains. Today's Science. Brighter Future.

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Director, ABCD Project
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May 16, 2018

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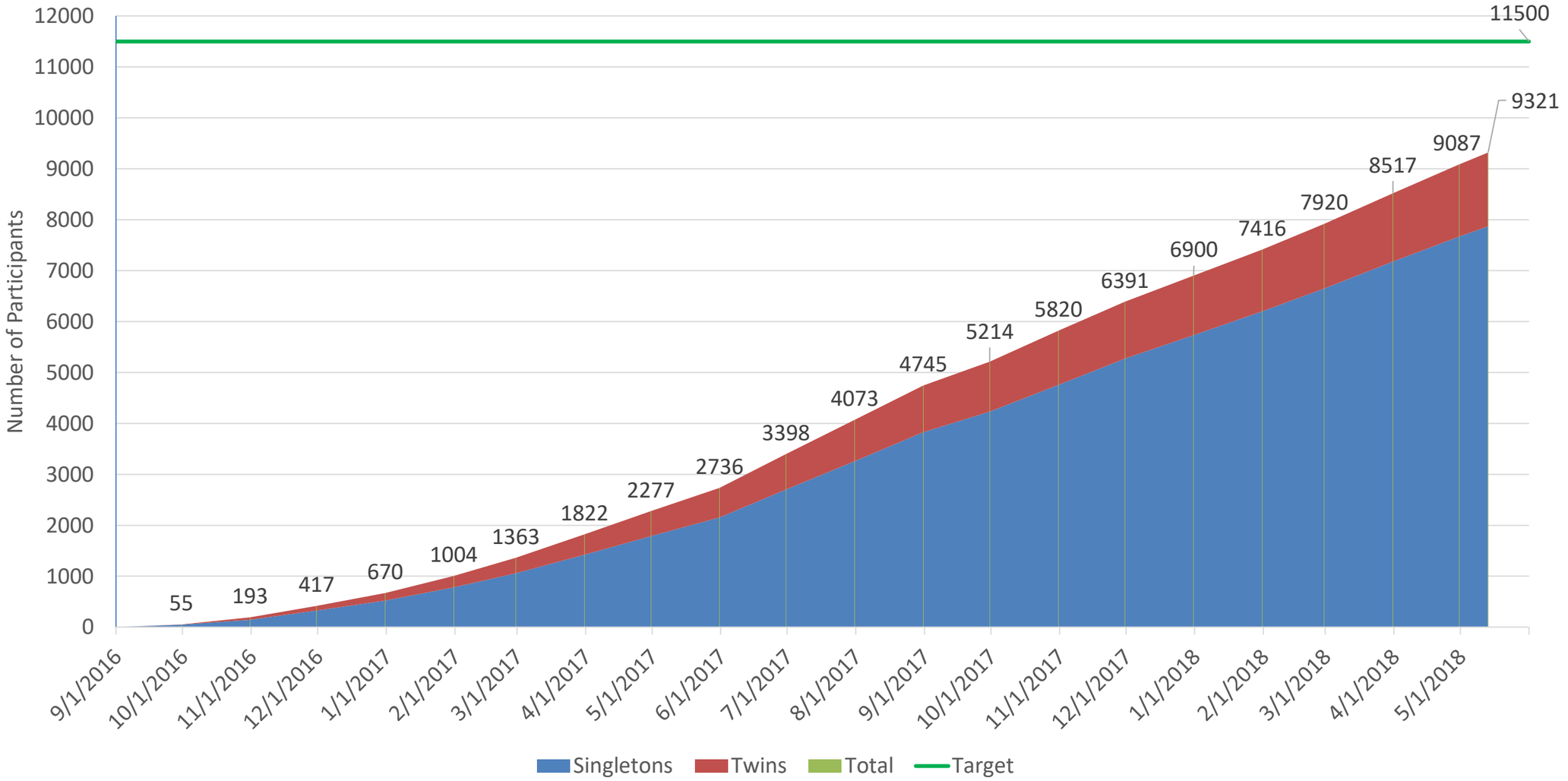
- **Enrollment**
- Preliminary Descriptive Data
- Follow-up Assessments
- ABCD Sub-studies
- Data Sharing

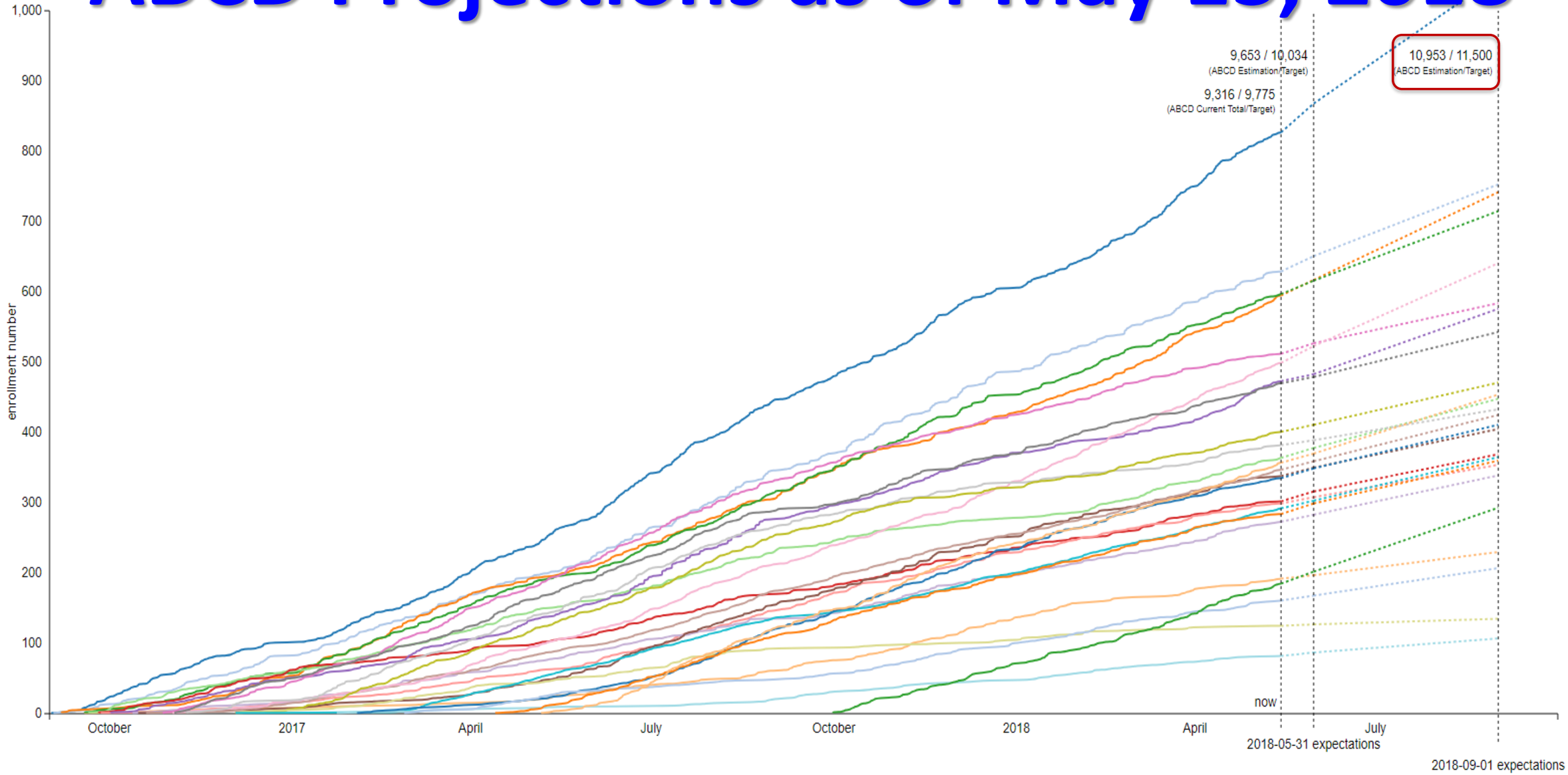
Locations of ABCD Research Sites in the United States

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

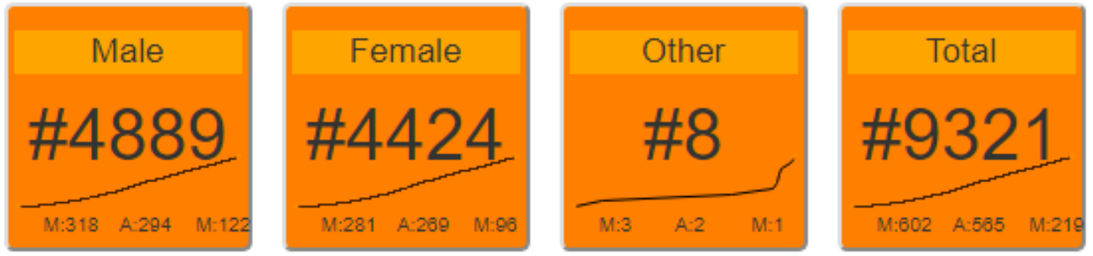
ABCD Enrollment as of May 13, 2018



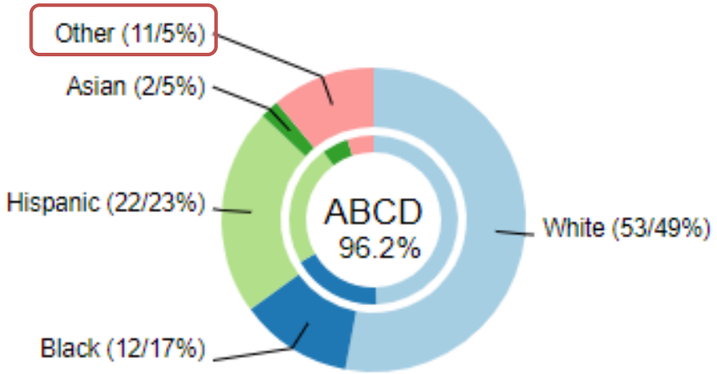
ABCD Projections as of May 13, 2018



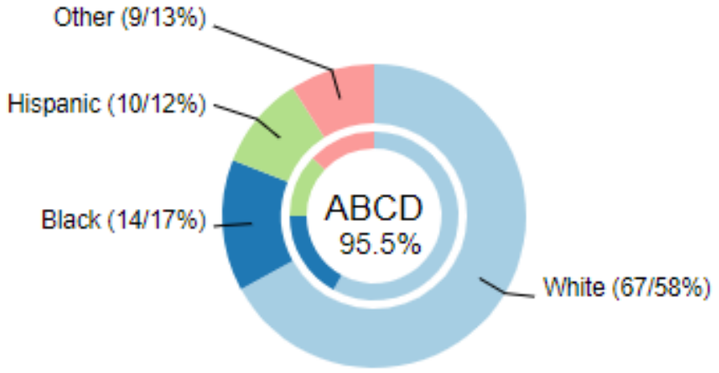
ABCD Demographics as of May 13, 2018



52% 48%



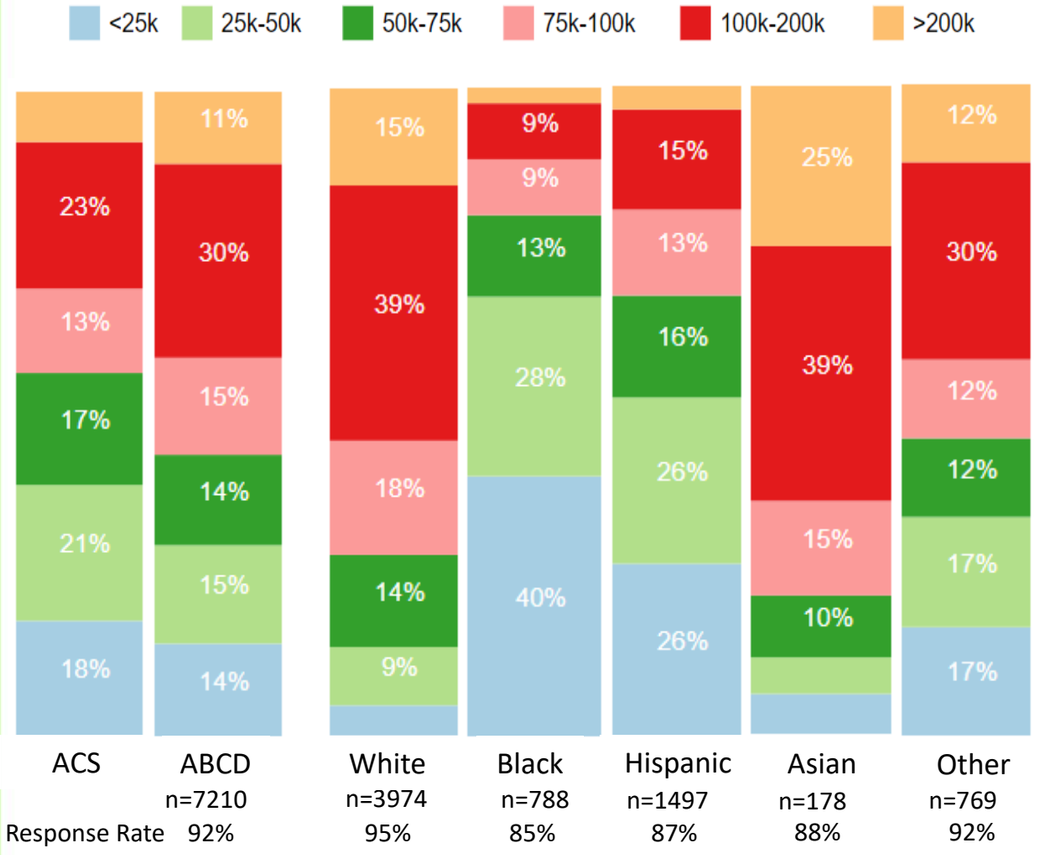
Singletons



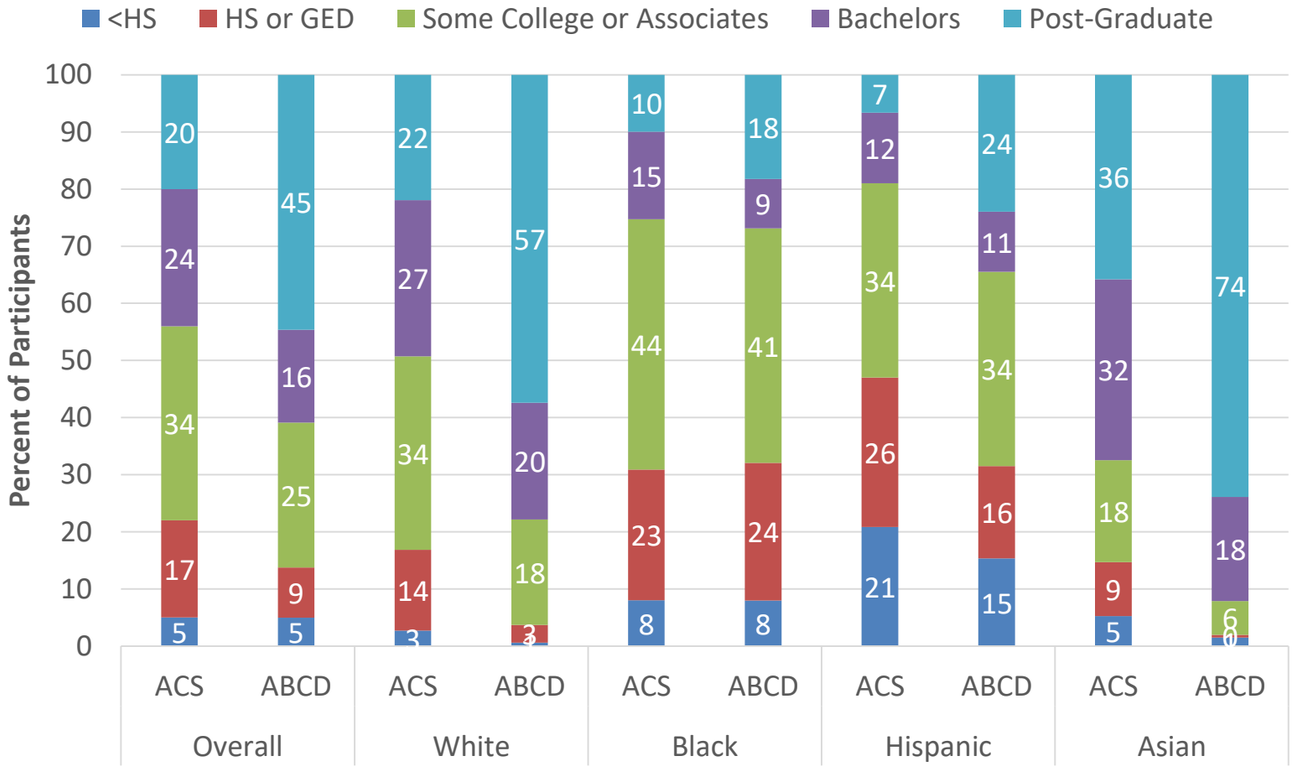
Twins

Socioeconomic Status

Income



Education



Enrolled (n=7872)

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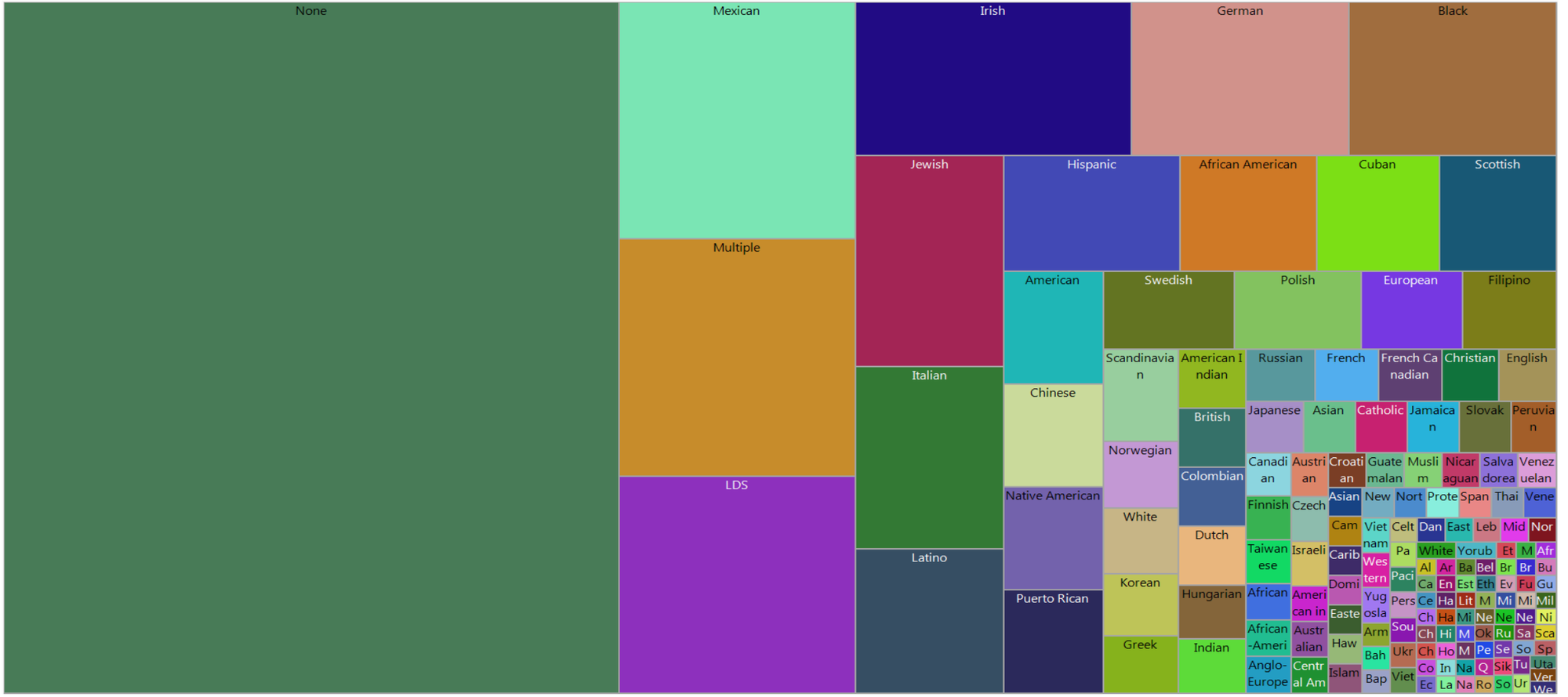
- Enrollment
- **Preliminary Descriptive Data**
- Follow-up Assessments
- ABCD Sub-studies
- Data Sharing

Culture & Environment

- Vancouver Index of Acculturation - Short Survey
- Multi-Group Ethnic Identity Measure-R Survey
- Prosocial Tendencies Survey
- Mexican American Cultural Values Scale
- PhenX Acculturation Survey
- PhenX Family Environment Scale - Family Conflict
- PhenX Neighborhood Safety/Crime Survey
- Native American Acculturation Scale

ABCD Diversity

Your heritage culture (other than mainstream American) is:

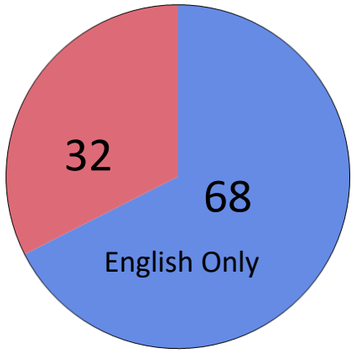
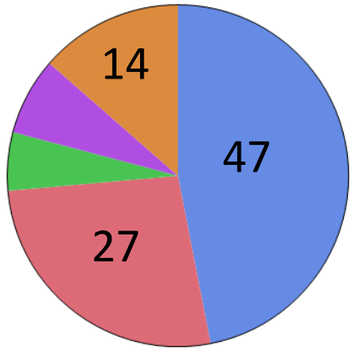
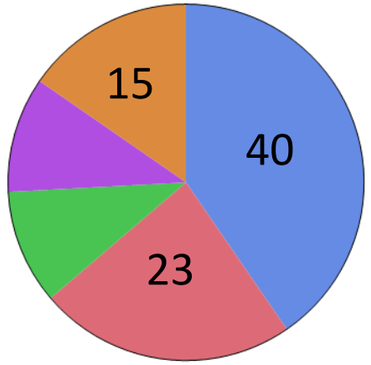
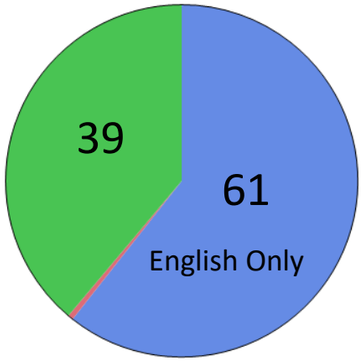
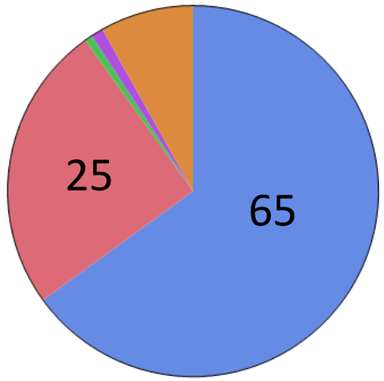
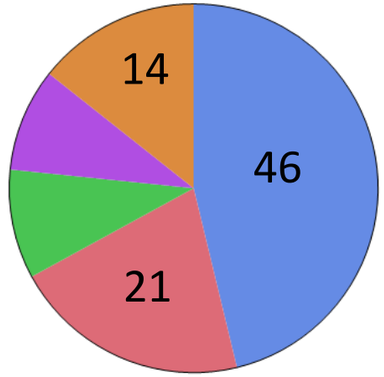


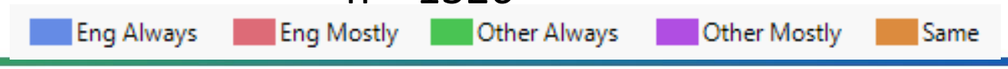
Courtesy of Raul Gonzalez (FIU)

Culture & Environment

- Prosocial Tendencies Survey
- PhenX Acculturation Survey
- Parental Monitoring Survey
- Acceptance Subscale from Children's Report of Parental Behavior Inventory (CRPBI) - Short
- PhenX Family Environment Scale - Family Conflict
- PhenX Neighborhood Safety/Crime Survey
- PhenX School Risk & Protective Factors Survey

Bilingualism

	Speak Language other than English	Spoken with Friends	Spoken with Family
Parent	 n = 3419		 n = 2317
Youth	 n = 3412		 n = 1326

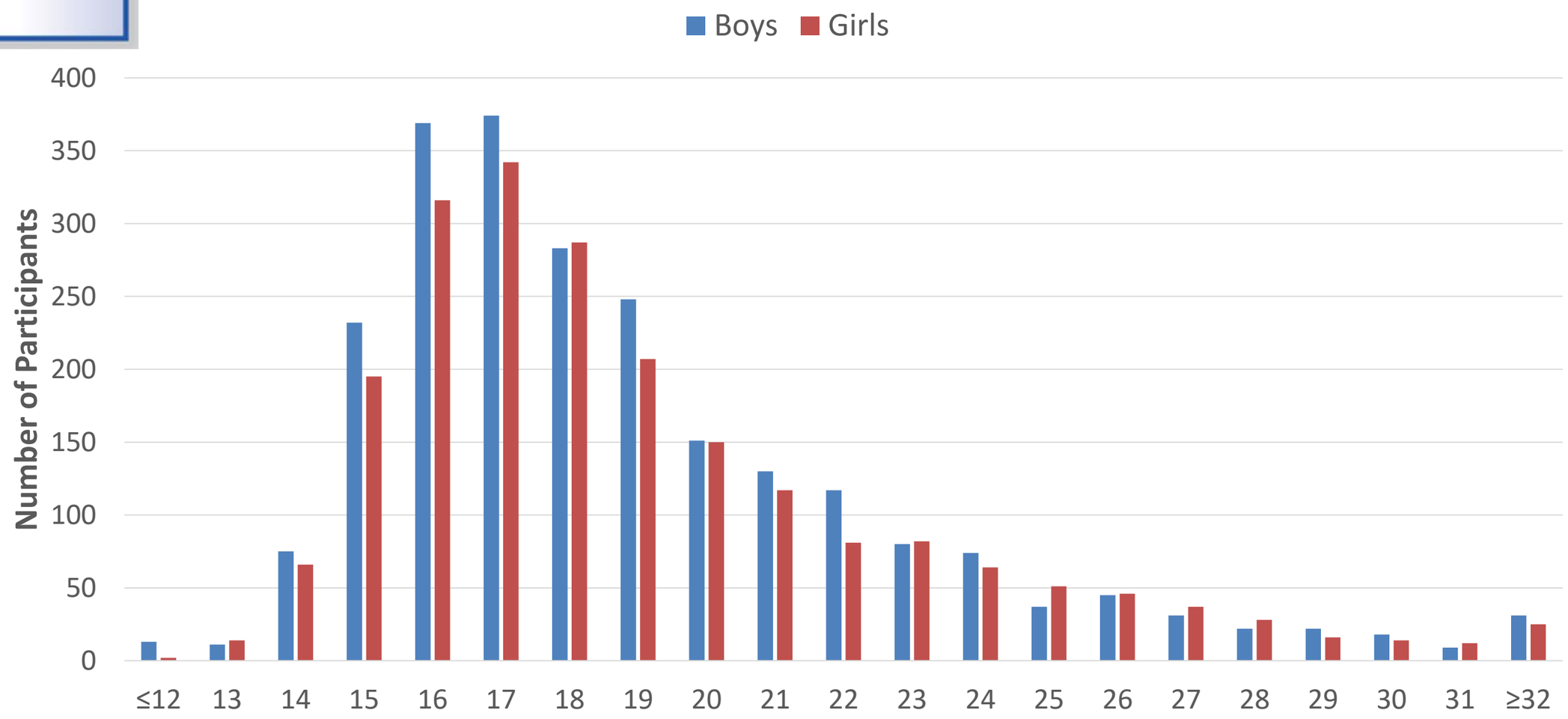


Courtesy of Raul Gonzalez (FIU)

Physical Health

- PhenX Anthropometrics (height/weight/ waist measurements)
- Snellen Vision Screener
- Edinburgh Handedness Inventory
- Youth Risk Behavior Survey: Exercise
- Pubertal Development Scale
- Menstrual Cycle Survey (pubescent girls)
- Screen Time Survey

BMI

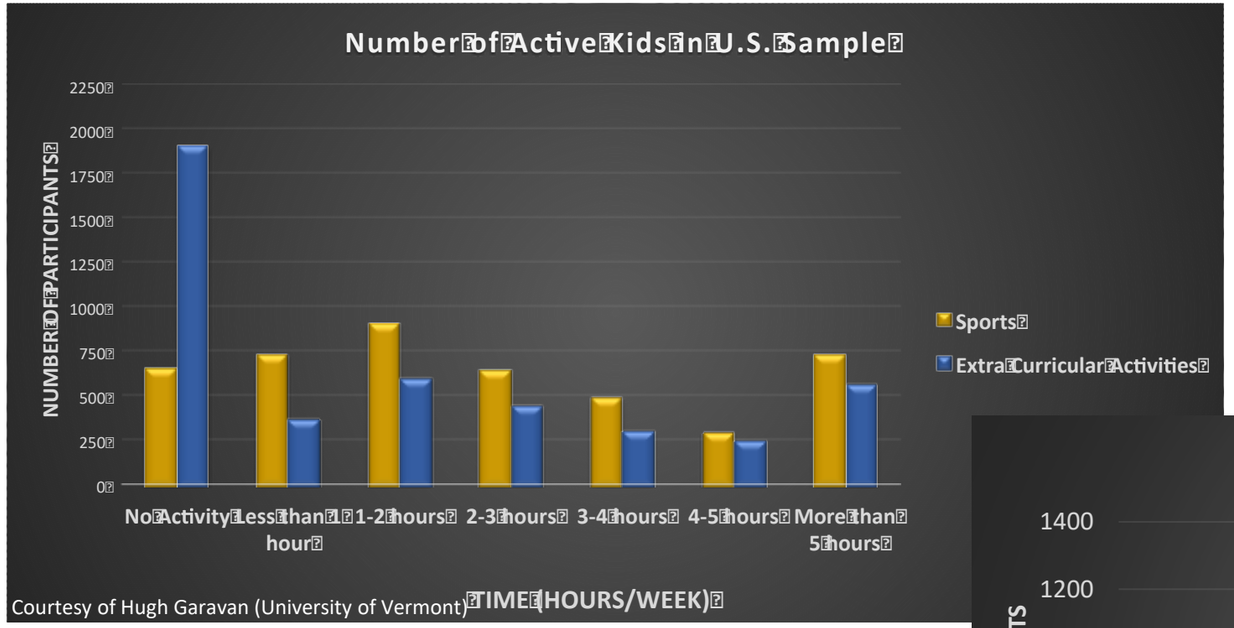


(n=4,524)

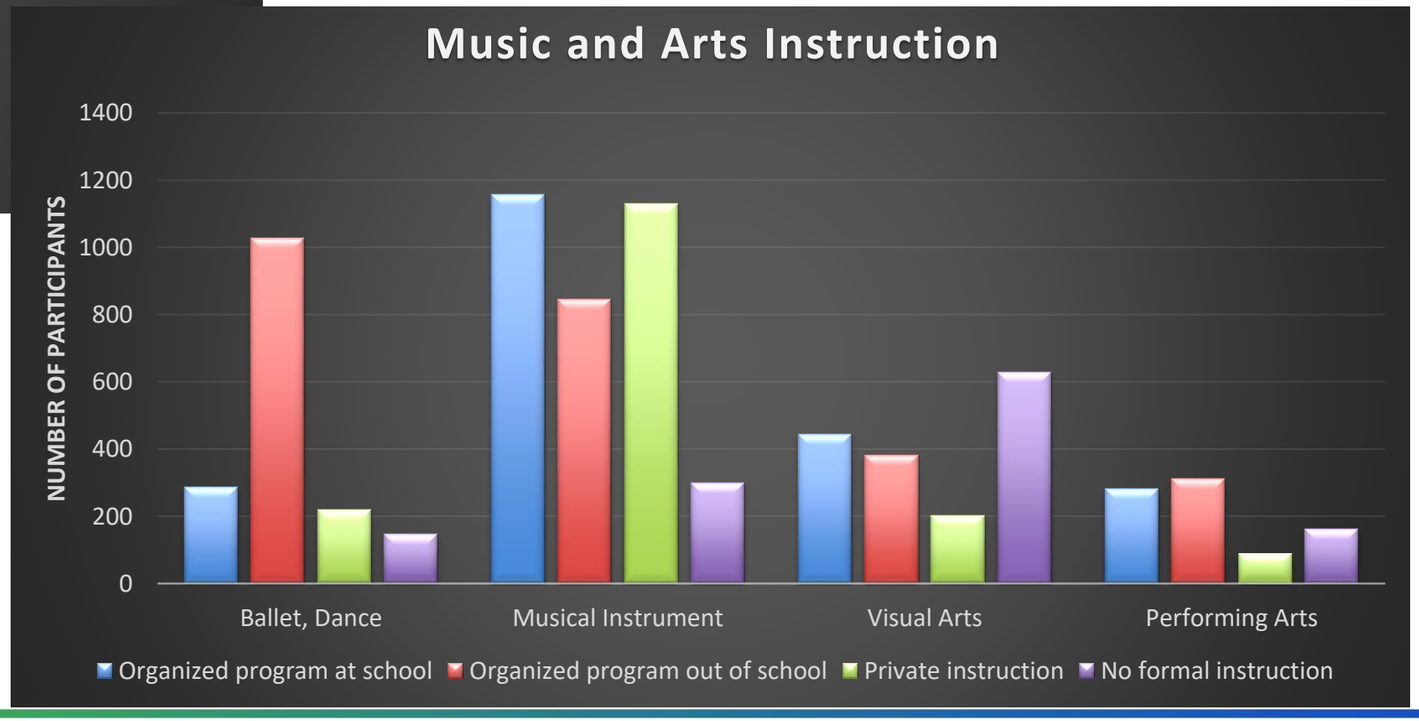
Extracurricular Activities

Physical Health

- PhenX Demographics Survey
- Medical History Questionnaire
- Developmental History Questionnaire
- PhenX Medications Survey
- Menstrual Cycle Survey
- Sleep Disturbances Scale for Children
- Sports and Activities Involvement Questionnaire
- Screen Time Survey
- Ohio State TBI Screen - Short



Courtesy of Hugh Garavan (University of Vermont)



(n=4,524)

Physical Health

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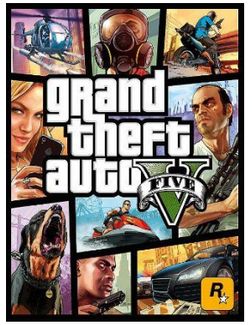
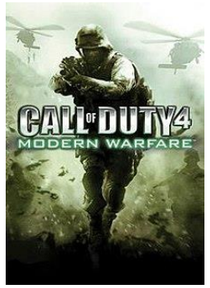
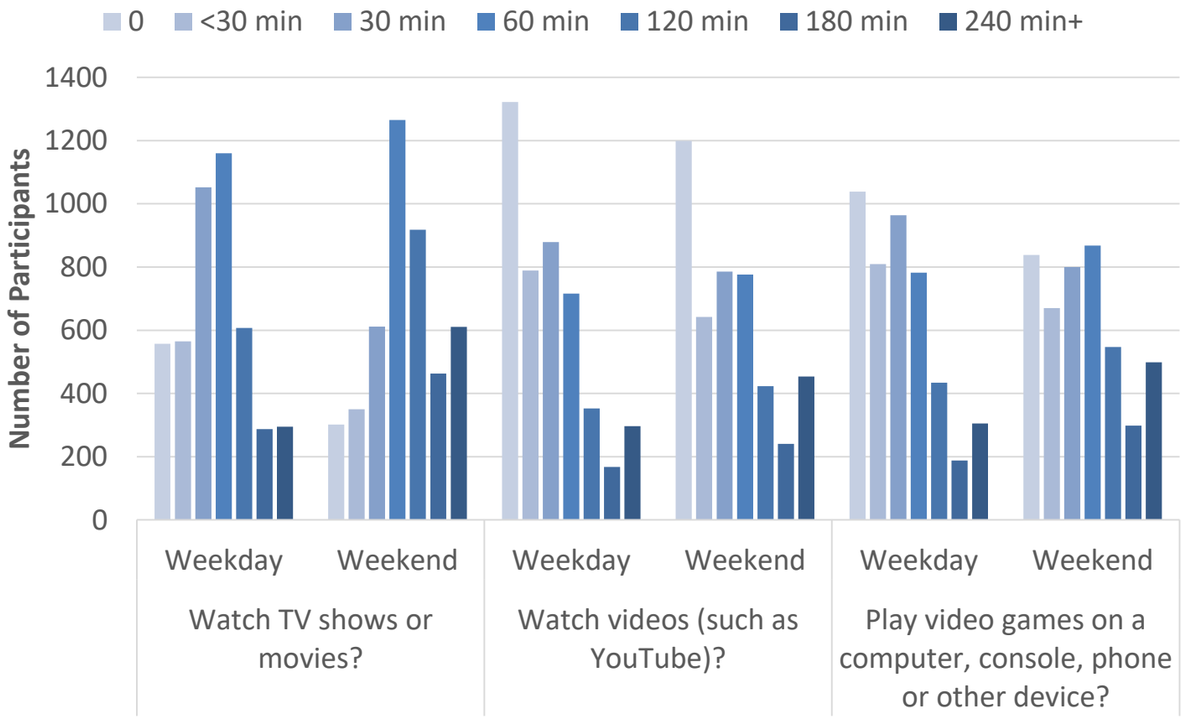
Screen Time Survey

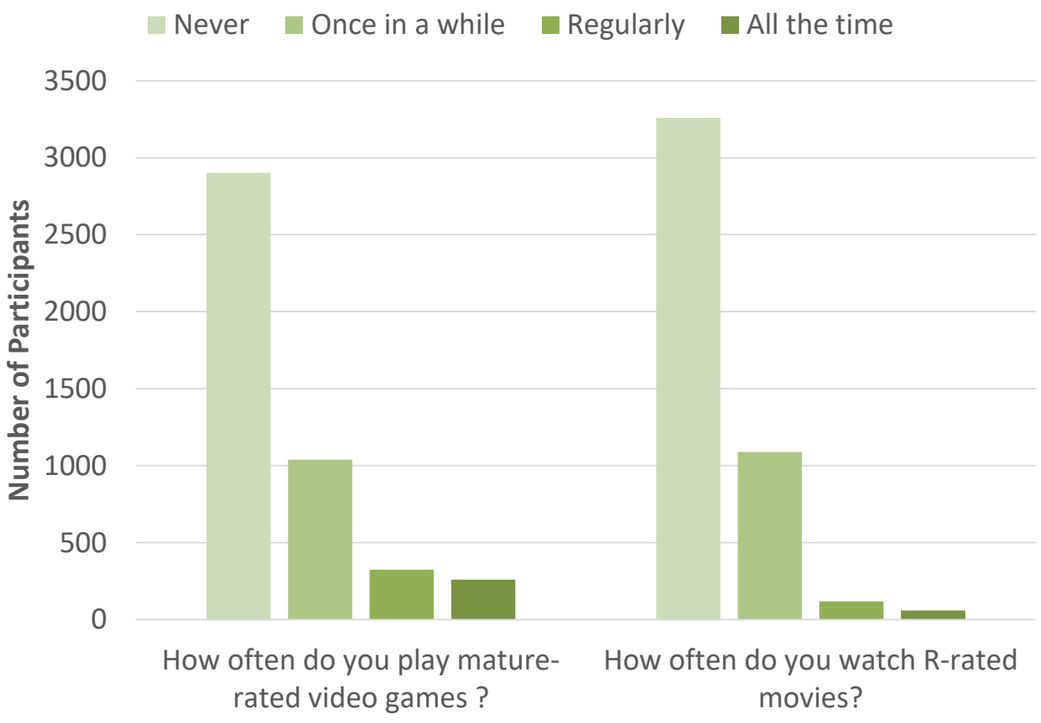
Screen Time





RESTRICTED
R
VIOLENCE, CRUDE AND SEXUAL CONTENT, DRUG USE AND PERVASIVE LANGUAGE
Under 17 Requires Accompanying Parent or Adult Guardian





(n=4,524)

Physical Health

PhenX Anthropometrics (height/weight/ waist measurements)
Snellen Vision Screener
Edinburgh Handedness Inventory
Youth Risk Behavior Survey: Exercise
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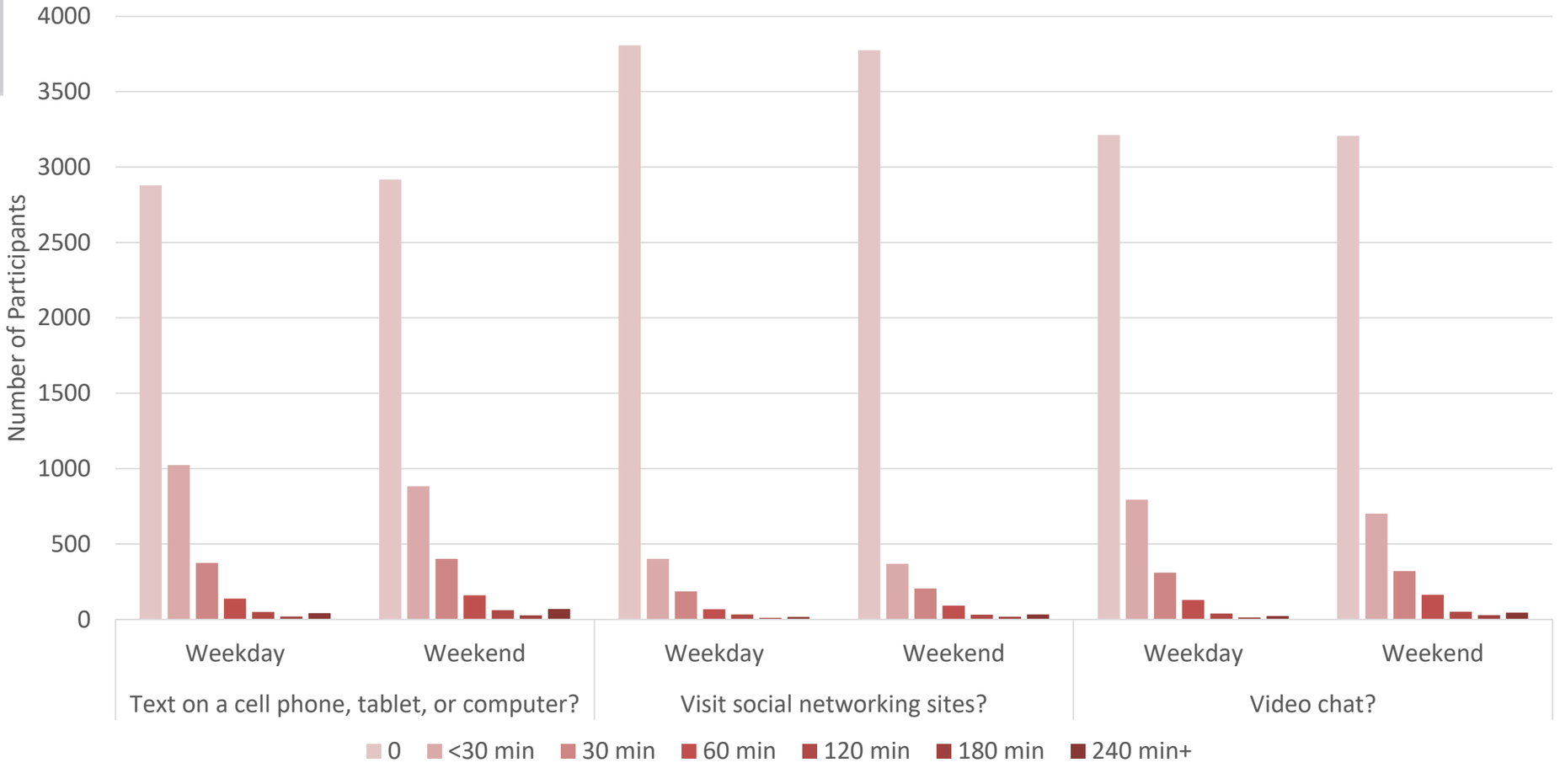
Menstrual Cycle Survey (pubescent girls)
Screen Time Survey

Social Media



(n=4,524)

Substance Use

For most participants*:

Timeline Follow-Back Survey

PhenX Peer Group Deviance Survey

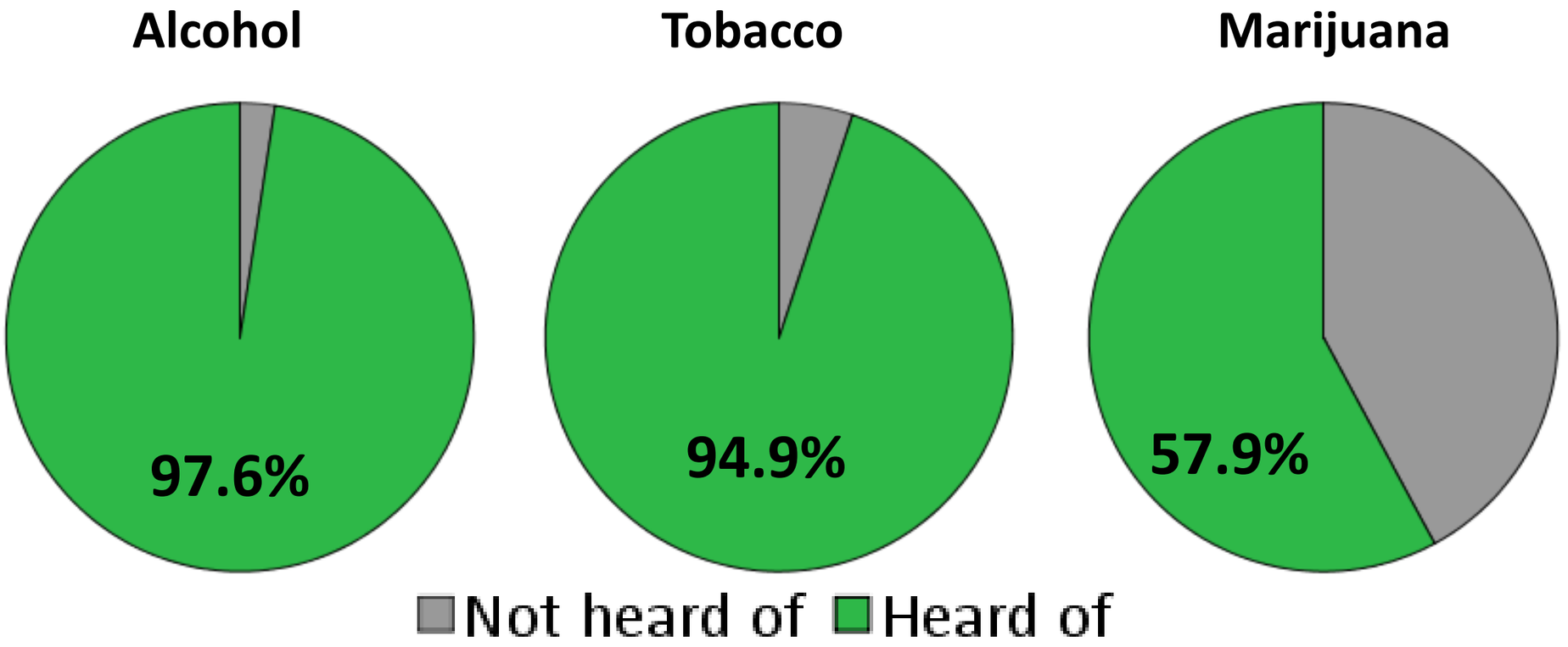
PATH Intention to Use Tobacco Survey

Caffeine Intake Survey

Participant Last Use Survey (PLUS) for substance use within the last 24 hrs

Substance Use

Heard of…

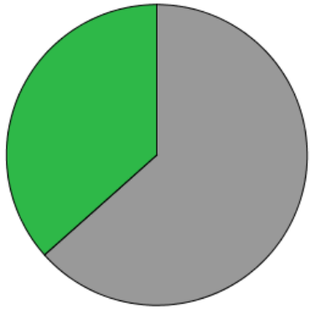


1.7% “heard of” fake drug – “Bittamugen or byphoditin?”

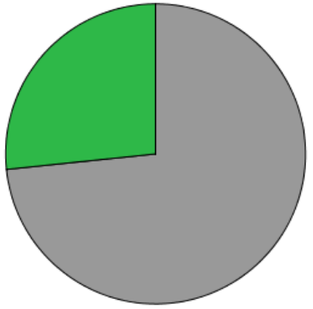
Courtesy of Mary Heitzeg (University of Michigan)

(n=4,524)

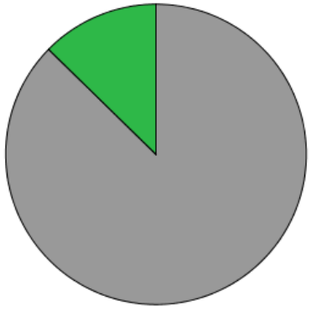
Substance Use: Heard of…



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?



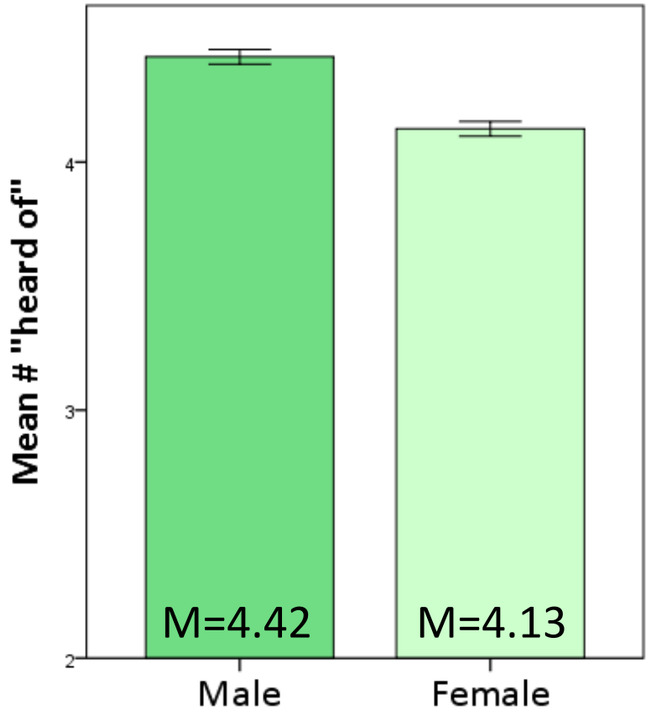
Inhalants (26.6%) - Sniffing liquids, sprays and or other products to get high?



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%)

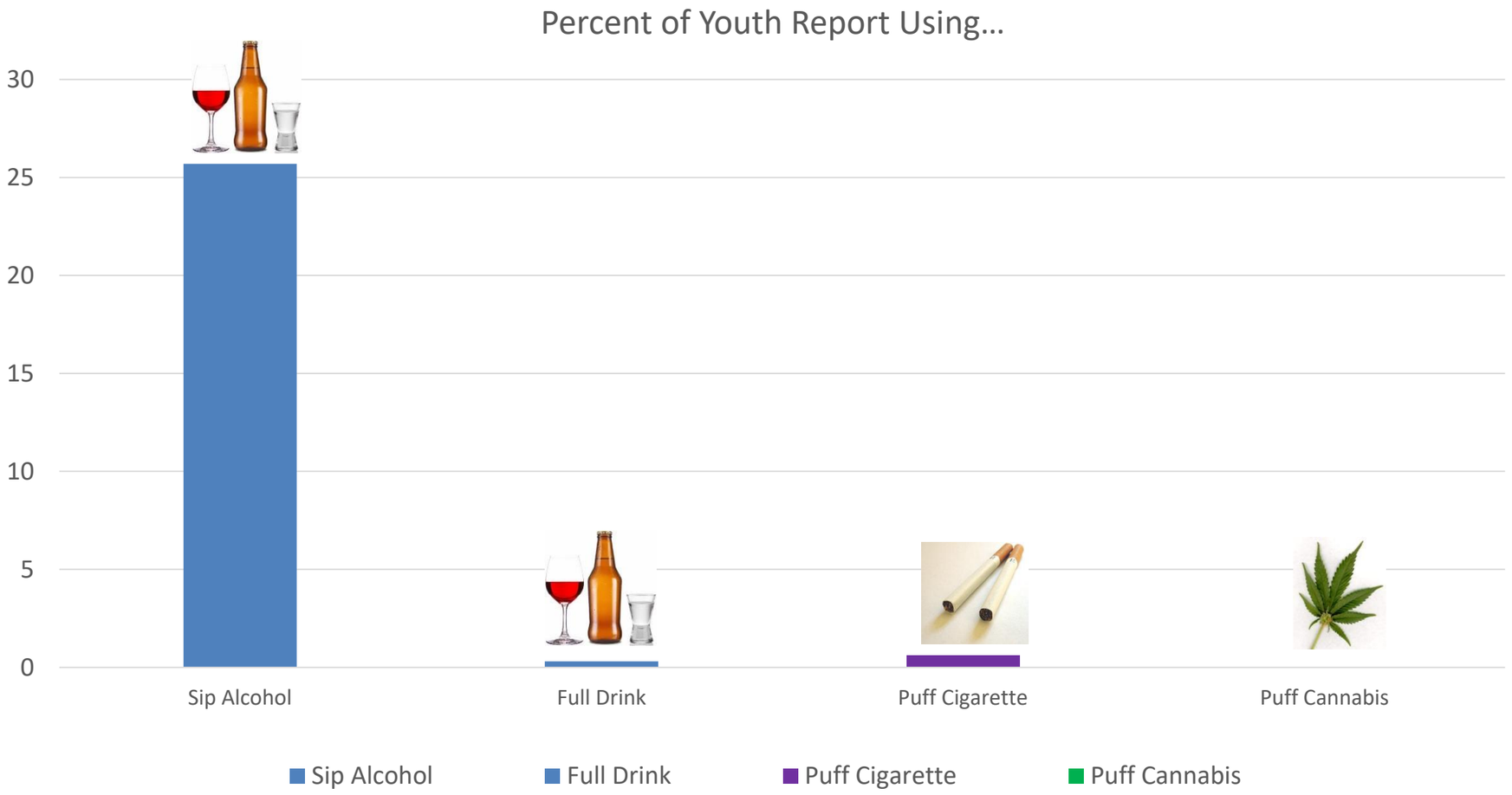
Total # - M > F; *p*<.001



Courtesy of Mary Heitzeg (University of Michigan)

Substance Use

Majority have <u>not tried</u> 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)

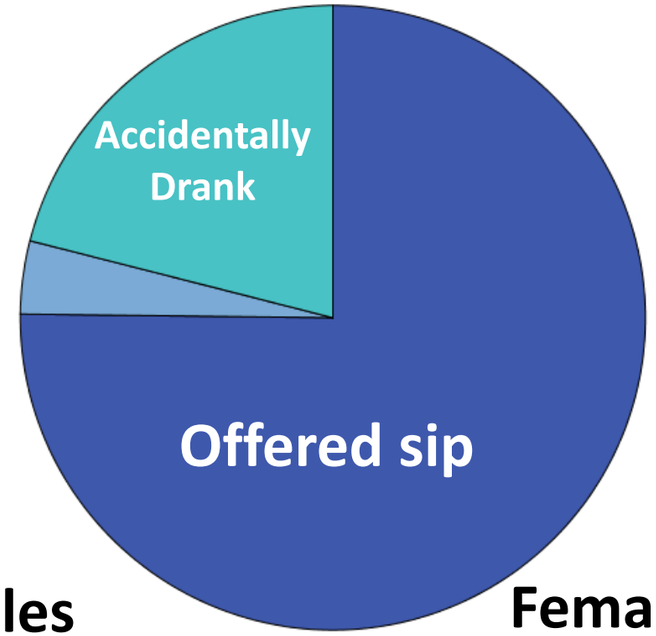
Intention to Use

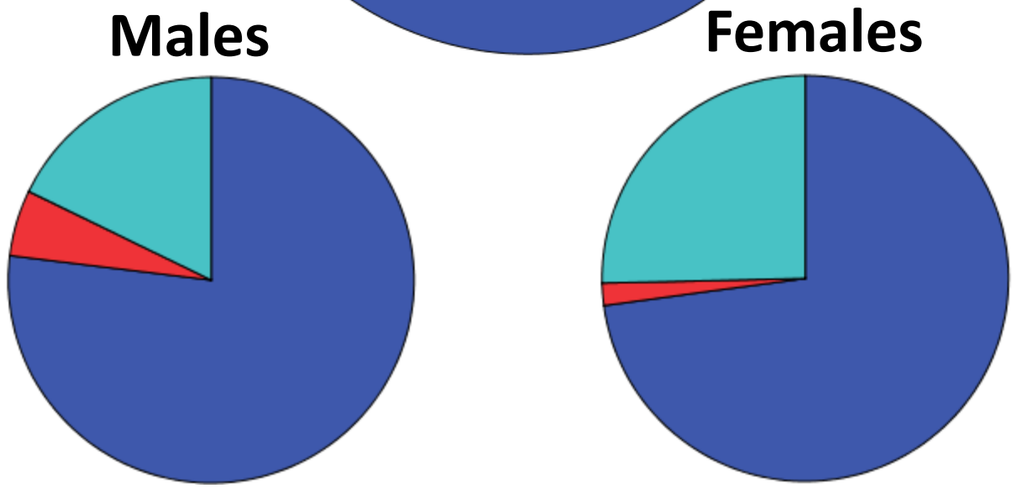
- Vast majority do not want to try alcohol (91%), tobacco (93%) or marijuana (98%)
- **Male > Female** to be a little to very likely to try:
  - Alcohol (11.6% vs. 8.1%; p=.001)
  - Nicotine (8.3% vs. 4.9%; p<.001)

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



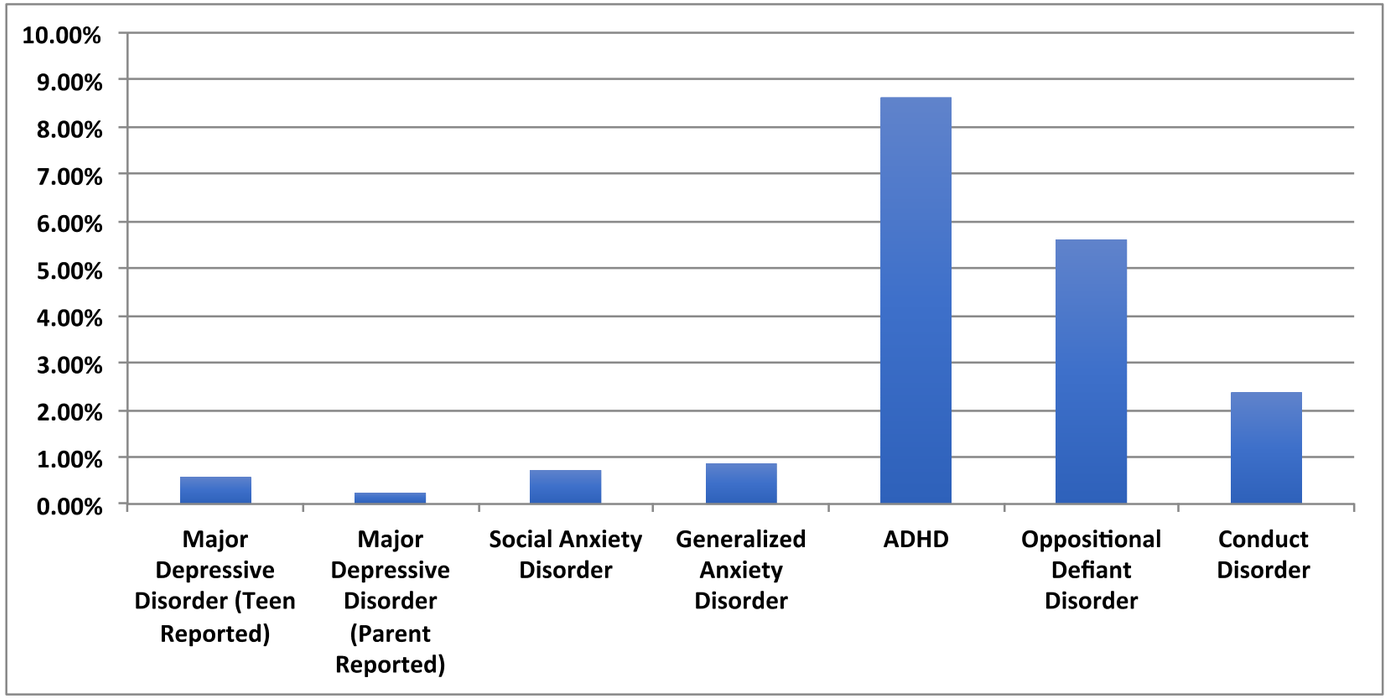


Courtesy of Mary Heitzeg (University of Michigan)

Mental Health

ABCD Baseline Measure	REDCap Abbreviation	What it measures:	Youth (min)	Parent (min)	Parent 2 (min)
Kiddie Schedule for Affective Disorders and Schizophrenia					
Background Items Survey	KBI	School, sexual orientation (youth) School, family, social relations (parent)	2	5	
Diagnostic Interview for DSM-5 (full for parents; 5 modules for youth)	KSAD	Mental health diagnoses	13	60	
UPPS-P for Children*	UPPS	Impulsivity	3		
Behavioral Inhibition/ Behavioral Approach System (BIS/BAS) Scales*	BIS	Inhibition and reward seeking	3		
Prodromal Psychosis Scale	PPS	Prodromal psychosis level	8		
Youth Resilience Scale	YRS	Resilience (religiosity, friends)	1		
Child Behavior Checklist	CBCL	Dimensional psychopathology, adaptive functioning		10	
Parent General Behavior Inventory - Mania	PGBI	Subsyndromal mania		5	
Adult Self Report	ASR	Parent dimensional psychopathology		10	10
Family History Assessment	FHX	Family history of psychopathology and substance use (for biological or adoptive parent)		15	
		Total Minutes	30	105	10

*Modified from PhenX



Courtesy of Hugh Garavan (University of Vermont)

(n=4,524)

Mental Health

Kiddie Schedule for Affective Disorders and Schizophrenia

- Background Items Survey
- Diagnostic Interview for DSM-5

Child Behavior Checklist
General Behavior Inventory - Mania
Adult Self Report Survey
Family History Assessment Survey

Suicidal Ideation

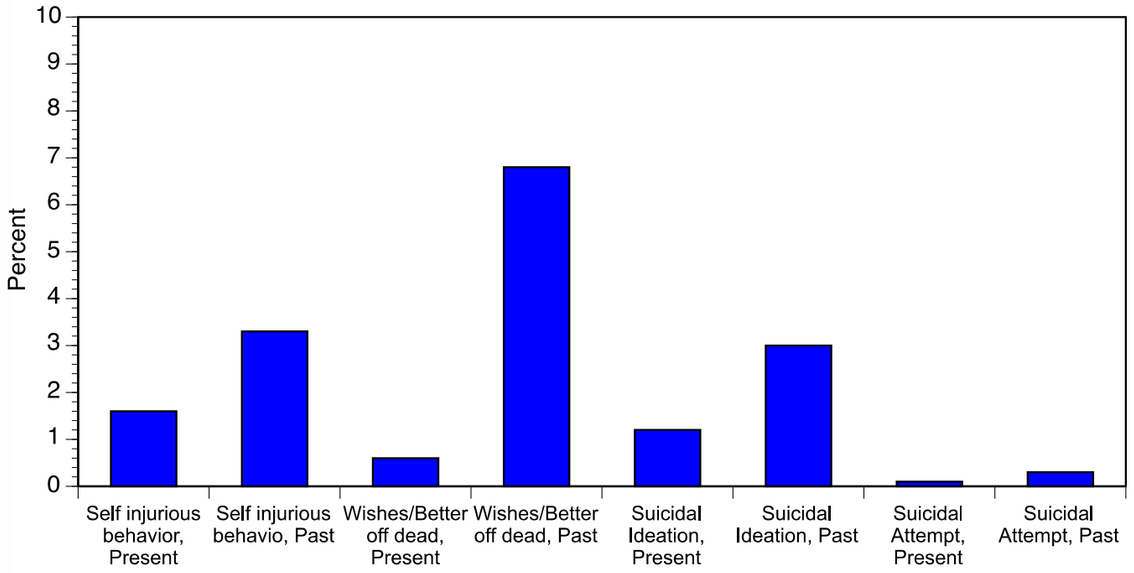
Mental Health

Kiddie Schedule for Affective Disorders and Schizophrenia

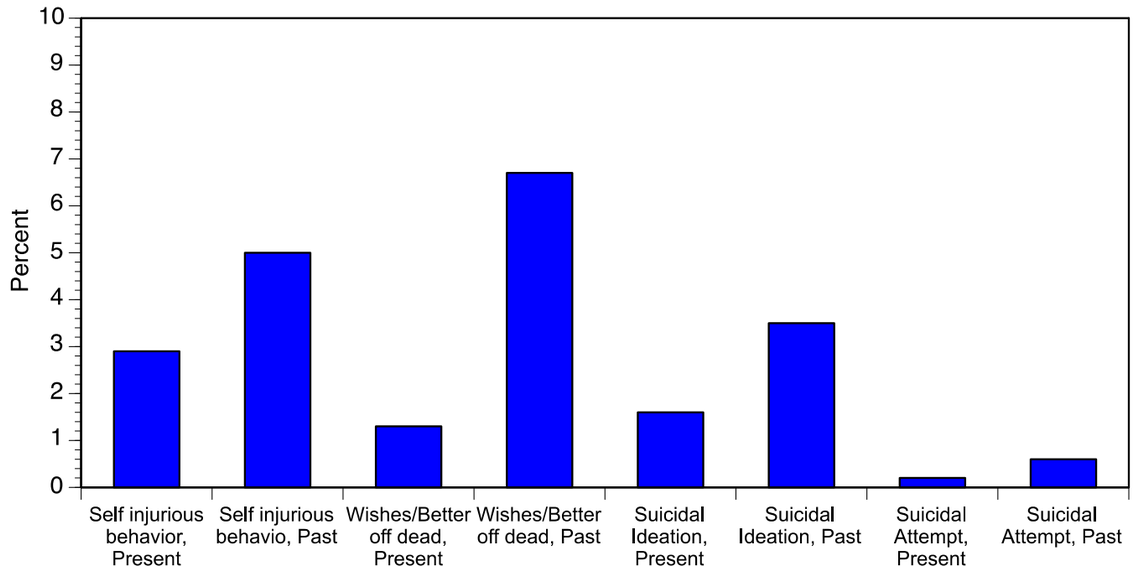
- Background Items Survey
- Diagnostic Interview for DSM-5 (5 modules)

PhenX UPPS-P for Children Survey
PhenX Behavioral Inhibition/Behavioral Approach System (BIS/BAS) Scales
Prodromal Psychosis Scale
Youth Resilience Scale

Parent Report



Child Report



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

(n=4,741)

Familial Depression

Mental Health

Kiddie Schedule for Affective Disorders and Schizophrenia

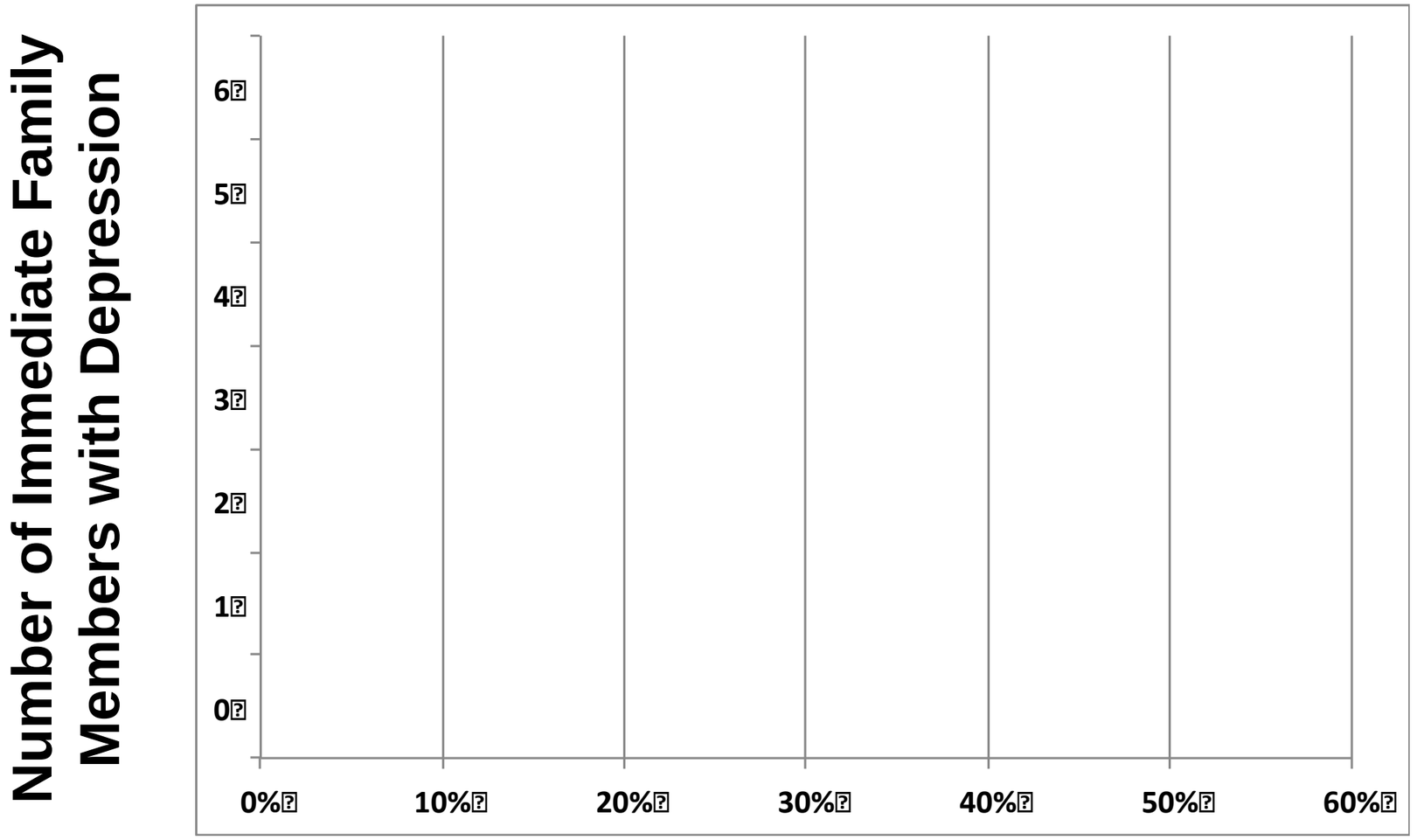
- Background Items Survey
- Diagnostic Interview for DSM-5

Child Behavior Checklist

General Behavior Inventory - Mania

Adult Self Report Survey

Family History Assessment Survey



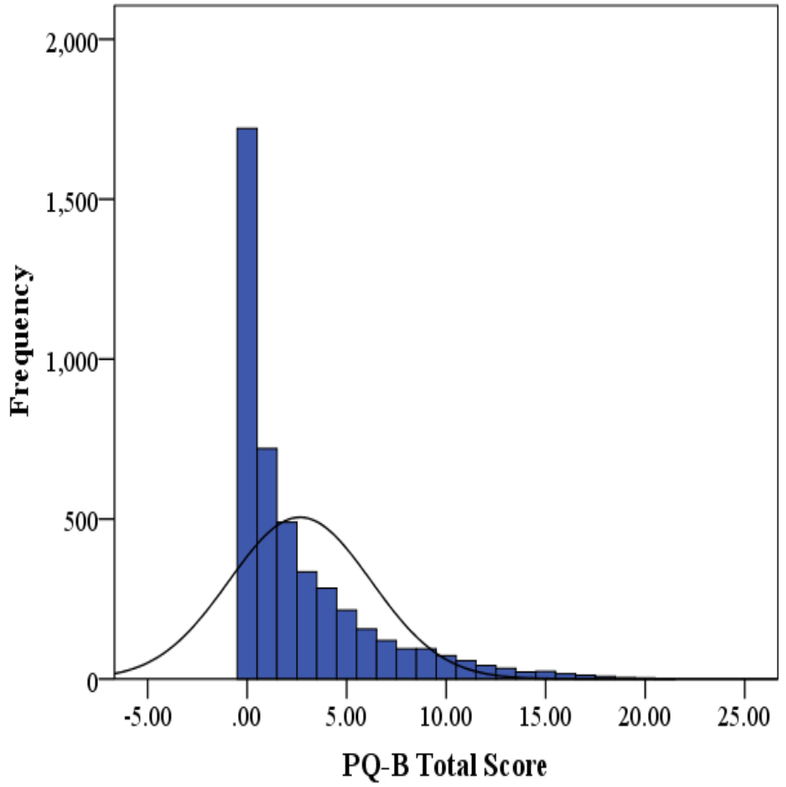
Courtesy of Hugh Garavan (University of Vermont)

(n=4,524)

Psychosis Proneness Questionnaire

PQ-B Total Score

62% had score >= 1 (range = 0-21)



Mental Health

Kiddie Schedule for Affective Disorders and Schizophrenia

- Background Items Survey
- Diagnostic Interview for DSM-5 (5 modules)

PhenX UPPS-P for Children Survey

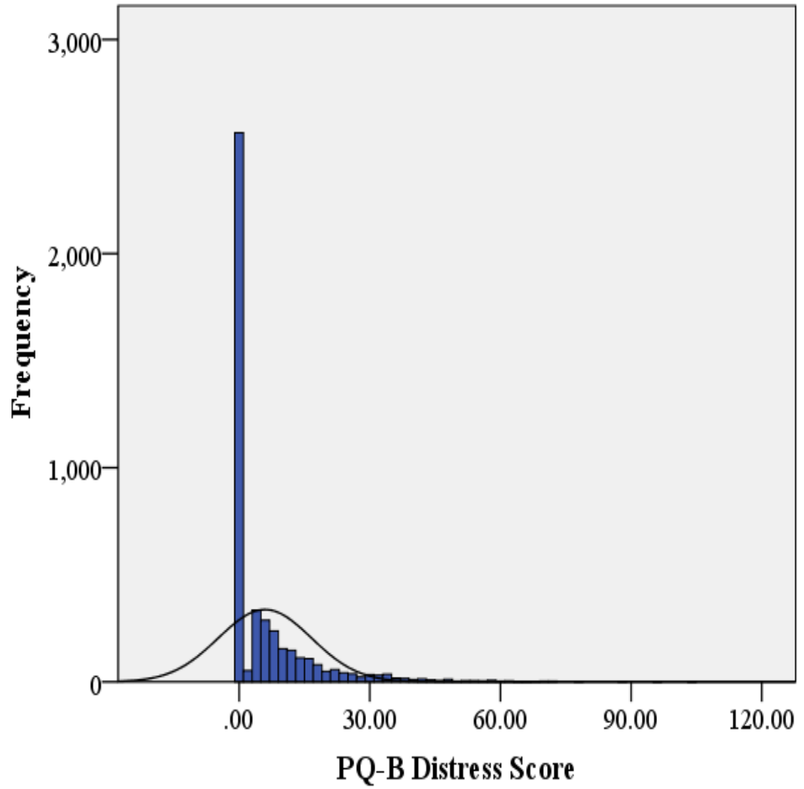
PhenX Behavioral Inhibition/Behavioral Approach System (BIS/BAS) Scales

Prodromal Psychosis Scale

Youth Resilience Scale

PQ-B Distress Score

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



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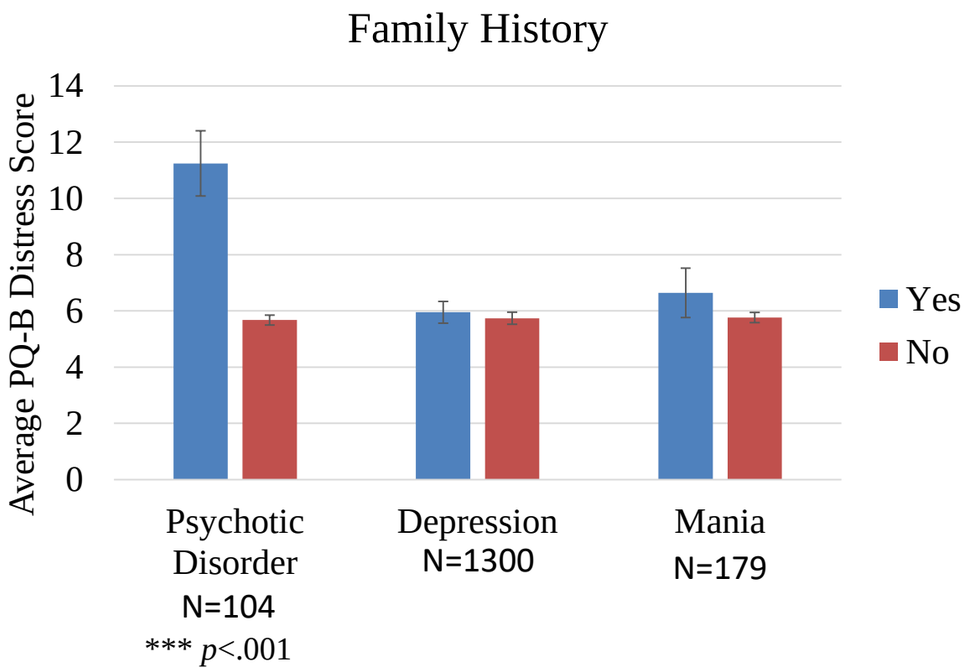
(n=4,524)

Psychosis Proneness Questionnaire



Linear Regression Estimates for NIH Toolbox Tests for PQ-B Distress Score			
	β	t	p
Step 1: Covariates			
African American	0.010	0.347	0.728
Hispanic	0.040	1.462	0.144
Other	0.015	0.507	0.612
Gender	0.003	0.183	0.855
Income to Needs	-0.024	-1.327	0.185
Family History of Psychotic Disorder	**0.064**	**3.904**	**0.000**
Step 2: NIH Toolbox			
Card Sort Test	-0.018	-0.976	0.329
Flanker Test	0.010	0.552	0.581
Picture Sequence Test	-0.007	-0.409	0.682
Pattern Comparison Test	**-0.044**	**-2.444**	**0.015**
List Sorting Test	**-0.047**	**-2.588**	**0.010**
Picture Vocabulary Test	**-0.044**	**-2.213**	**0.027**
Reading Recognition Test	**-0.042**	**-2.199**	**0.028**

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

Biospecimens

Biospecimens

Breathalyzer and Oral Fluids (subset)

Saliva Samples for DNA, Puberty

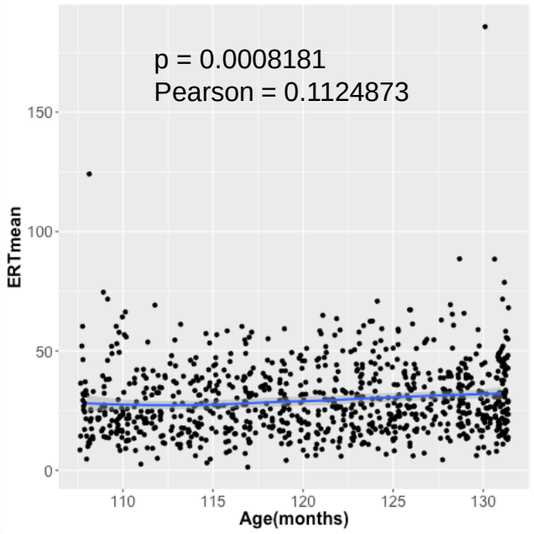
Blood Samples (subset)

Hair Sample

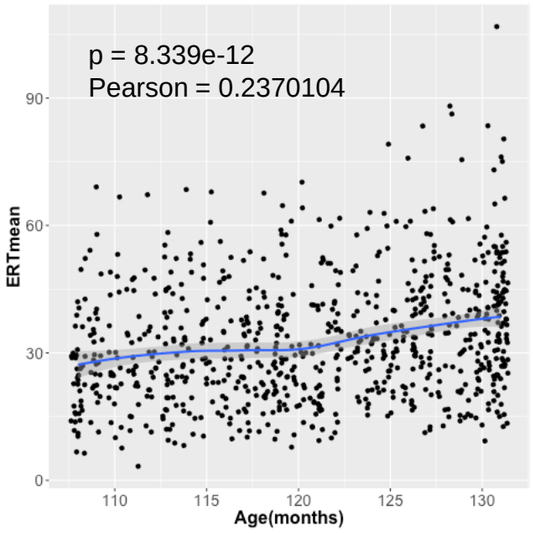
Baby Teeth

Testosterone

Male

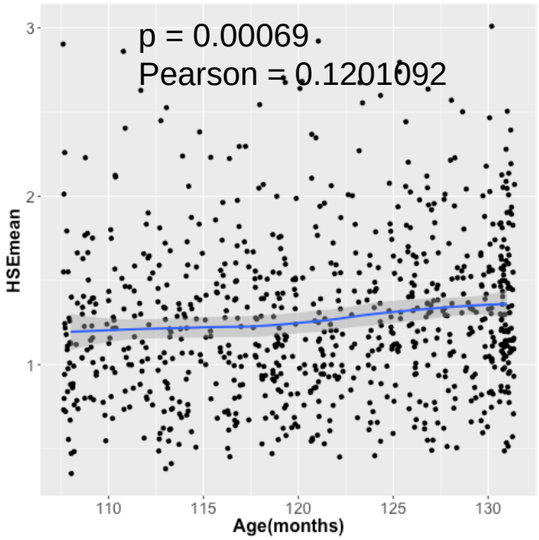


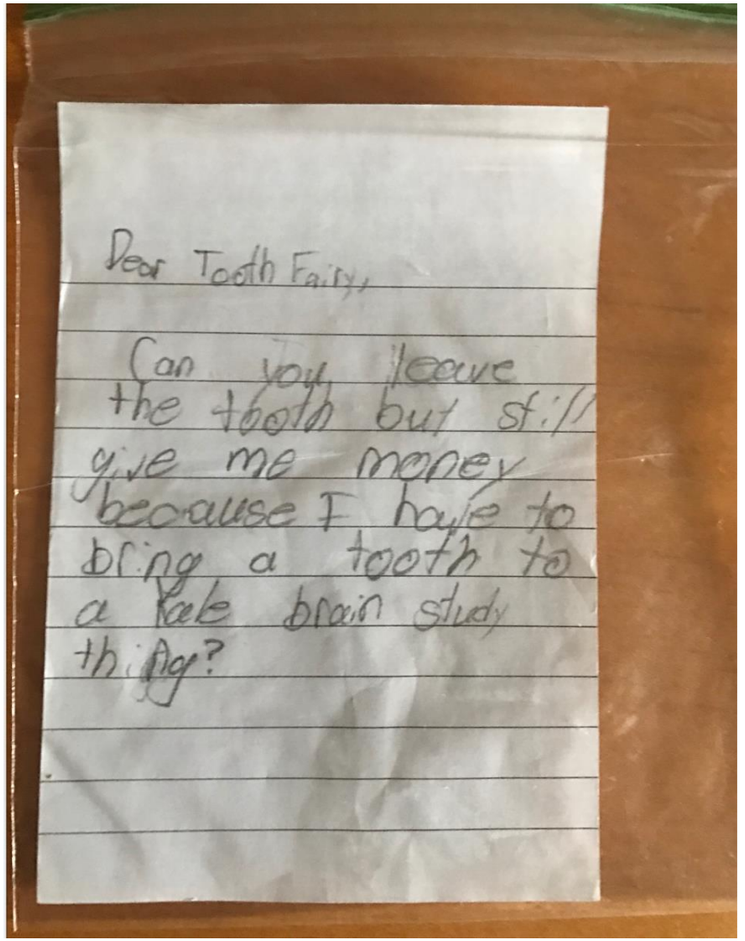
Female



Estradiol

Female





Imaging

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

Brain Imaging

Structural MRI

- 3D T1 - Weighted
- 3D T2 - Weighted
- Diffusion Tensor Imaging

Functional MRI (fMRI)

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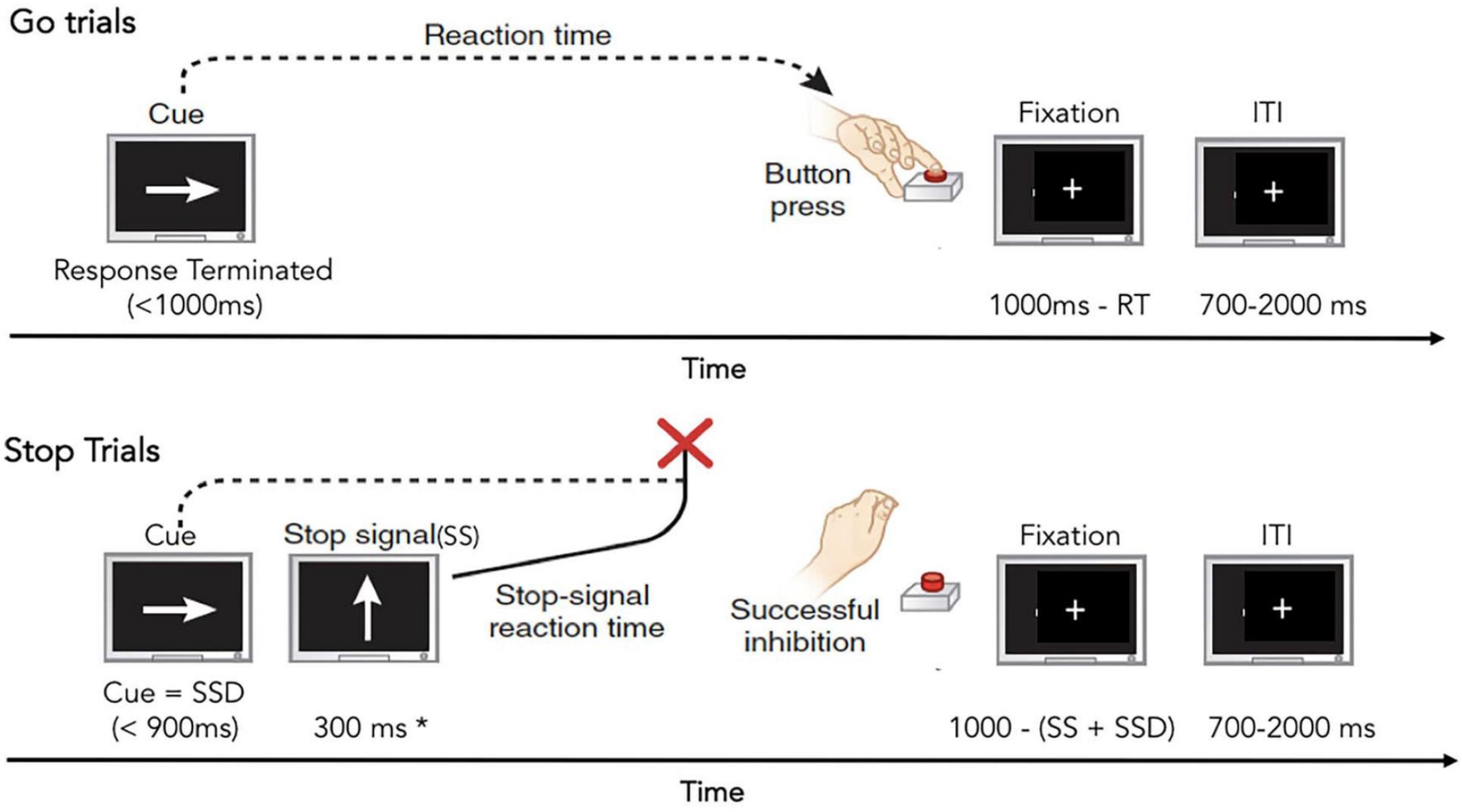
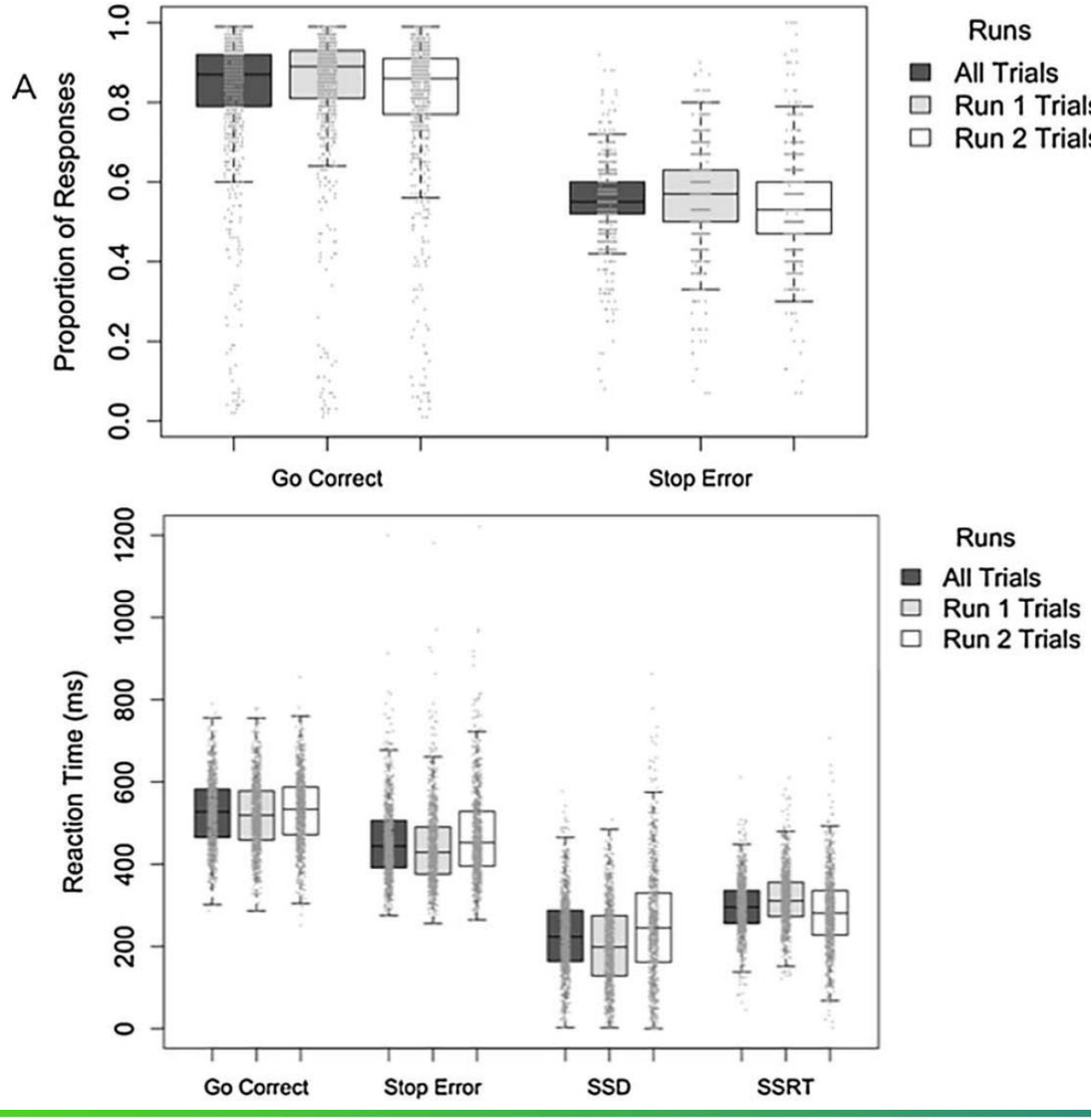
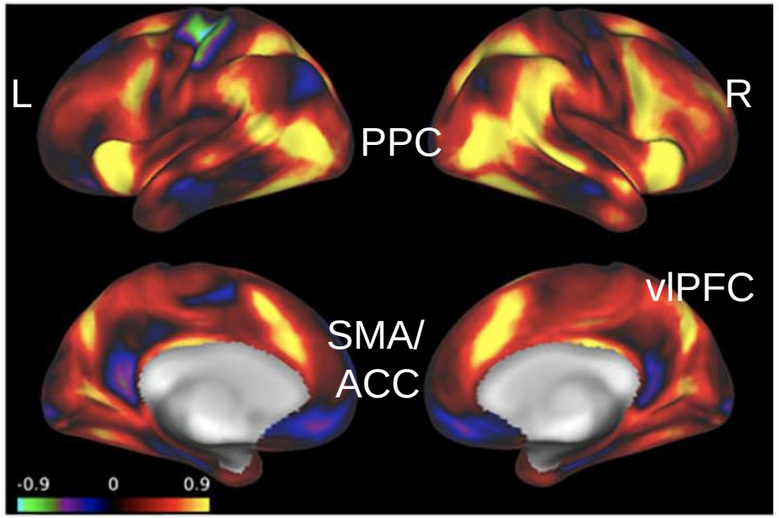
Stop Signal Task



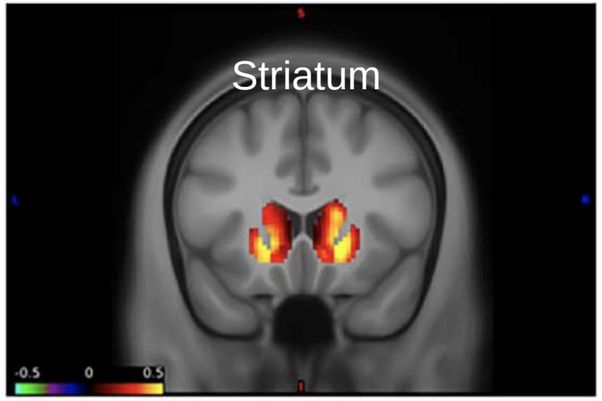
* If the SSD > 700 ms then the SS duration = 1000-SSD.

Stop Signal Task





Contrast: Correct Stop vs Correct Go



(n=750)

Adolescent Brain Cognitive Development℠

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- ABCD Sub-studies
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ABCD Study

TIMELINE OF EVENTS

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

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

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

Substance Use - ~15-30min
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
If ever used alcohol, marijuana, or tobacco (sip or puff):
Alcohol Expectancies Questionnaire - Adolescent, Brief
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

One-year Follow-up – Parents

Physical Health
Puberty & Menstrual
Gender Identity Questionnaire
Demographics Survey*
Ohio State TBI Screen-Short
Medications Survey*
Sleep Disturbance Scale for Children
Sports and Activities Involvement Questionnaire
Screen Time Survey
Child Nutrition Assessment

Biospecimens
Baby Teeth

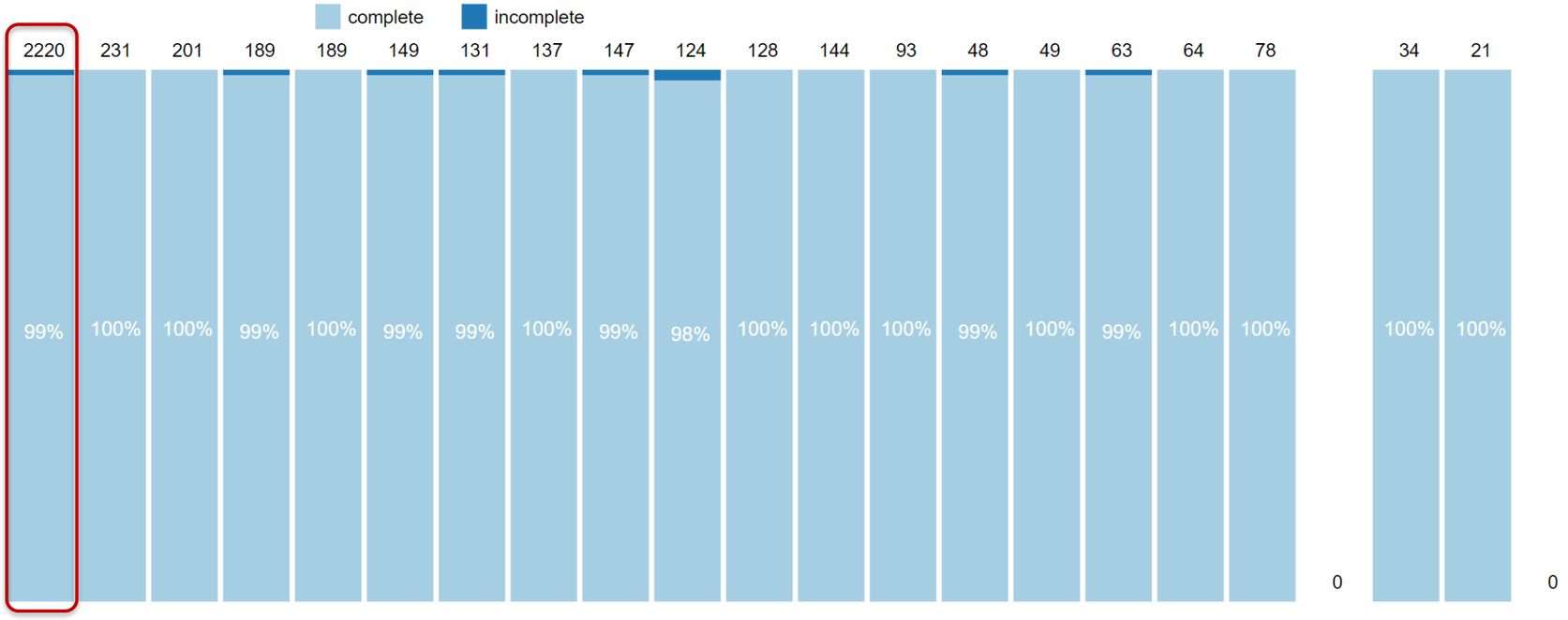
Mental Health
Kiddie Schedule for Affective Disorders and Schizophrenia
KSADS Background Items
Life Events Scale
Child Behavior Checklist
Parent General Behavior Inventory - Mania
Short Social Responsiveness Scale

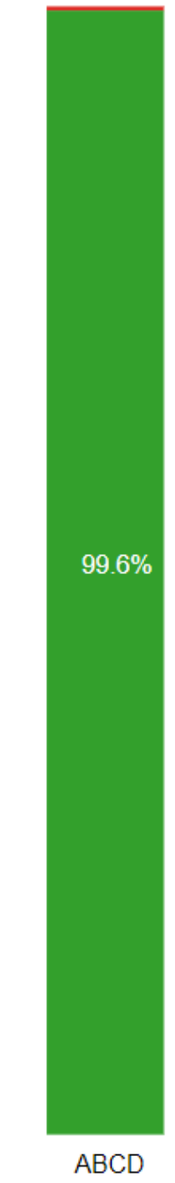
Substance Use
Participant Last Use Survey But at baseline this was in "heard of" section
Parent Rules
Community Risk & Protective Factors

Culture and Environment’
Acculturation Survey*
Prosocial Tendencies Survey
Family Environment Scale: Family Conflict Subscale*
Neighborhood Safety/Crime Survey*
Mexican American Cultural Values Scale

Domain	Youth	Parent
Substance Use	14-30	6
Mental & Physical Health	33	45
Culture & Environment	15	10
Neurocognition	12	N/A
Biospecimens	10	5
Imaging	N/A	N/A
Other (consent, locator, residential history, school & teacher permissions, breaks)	15	20
TOTAL (minutes)	**99-115**	**86**

Monitoring Follow-Up Visits





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National Institute on Alcohol Abuse and Alcoholism

National Cancer Institute

National Institute of Mental Health

NIH Office of Behavioral and Social Sciences Research

Eunice Kennedy Shriver National Institute of Child Health and Human Development

National Institute of Neurological Disorders and Stroke

National Institute on Minority Health and Health Disparities

NIH Office of Research on Women's Health

National Science Foundation

Centers for Disease Control and Prevention - Division of Violence Prevention

Centers for Disease Control and Prevention - Division of Adolescent and School Health

National Institute of Justice

National Endowment for the Arts

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?

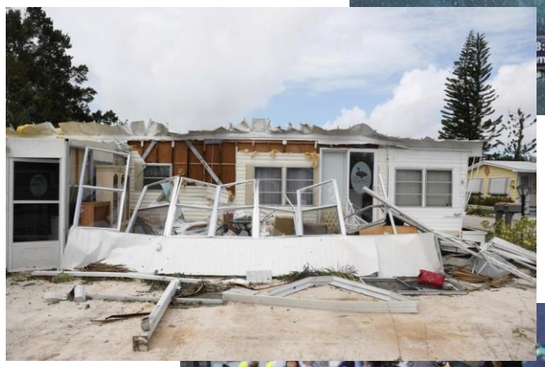
OFFICE OF JUSTICE PROGRAMS
NIJ | National Institute of Justice

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Violence Prevention

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



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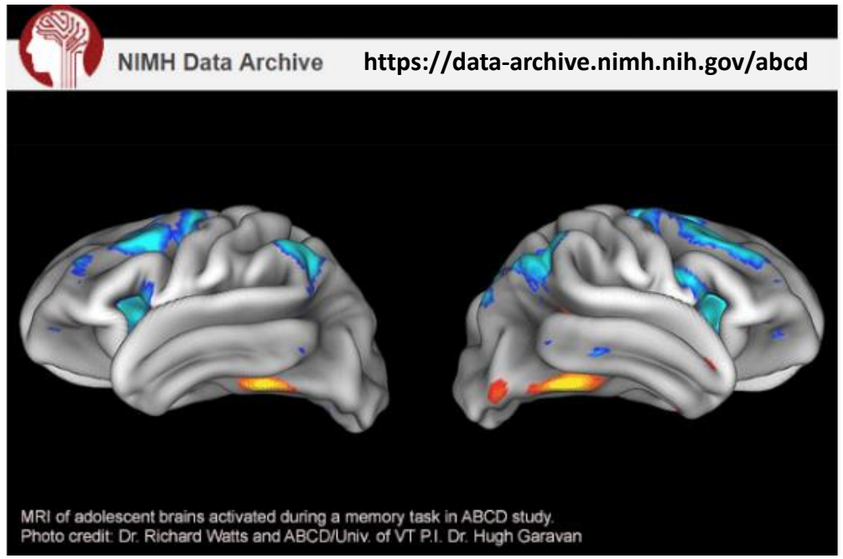
ABCD Open Science –

A Unique Resource for the Entire Scientific Community

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



ABCD Data Access:

- 531 NDA accounts with ABCD access
- 3,440 ABCD data packages (includes testing by NDA)
  - 143 distinct users
  - Not including prepackaged release data available to all approved users

Annual Curated Data Release – Includes:

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

DCN Special Issue

- **Recruiting the ABCD Sample: Design Considerations and Procedures** - https://www.sciencedirect.com/science/article/pii/S1878929317301809
- **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
- **Adolescent brain cognitive development (ABCD) study: Overview of substance use assessment methods** - https://www.sciencedirect.com/science/article/pii/S1878929317300890?via%3Dihub
- **Assessment of culture and environment in the Adolescent Brain and Cognitive Development Study: Rationale, description of measures, and early data** - https://www.sciencedirect.com/science/article/pii/S1878929317301226
- **Adolescent neurocognitive development and impacts of substance use: Overview of the adolescent brain cognitive development (ABCD) baseline neurocognition battery** - https://www.sciencedirect.com/science/article/pii/S1878929317302384?via%3Dihub
- **The Adolescent Brain Cognitive Development (ABCD) study: Imaging acquisition across 21 sites** - https://www.sciencedirect.com/science/article/pii/S1878929317301214?via%3Dihub
- **Biospecimens and the ABCD study: Rationale, methods of collection, measurement and early data** - https://www.sciencedirect.com/science/article/pii/S1878929317301822?via%3Dihub
- **The utility of twins in developmental cognitive neuroscience research: How twins strengthen the ABCD research design** - https://www.sciencedirect.com/science/article/pii/S1878929317301135?via%3Dihub

Funding Opportunities

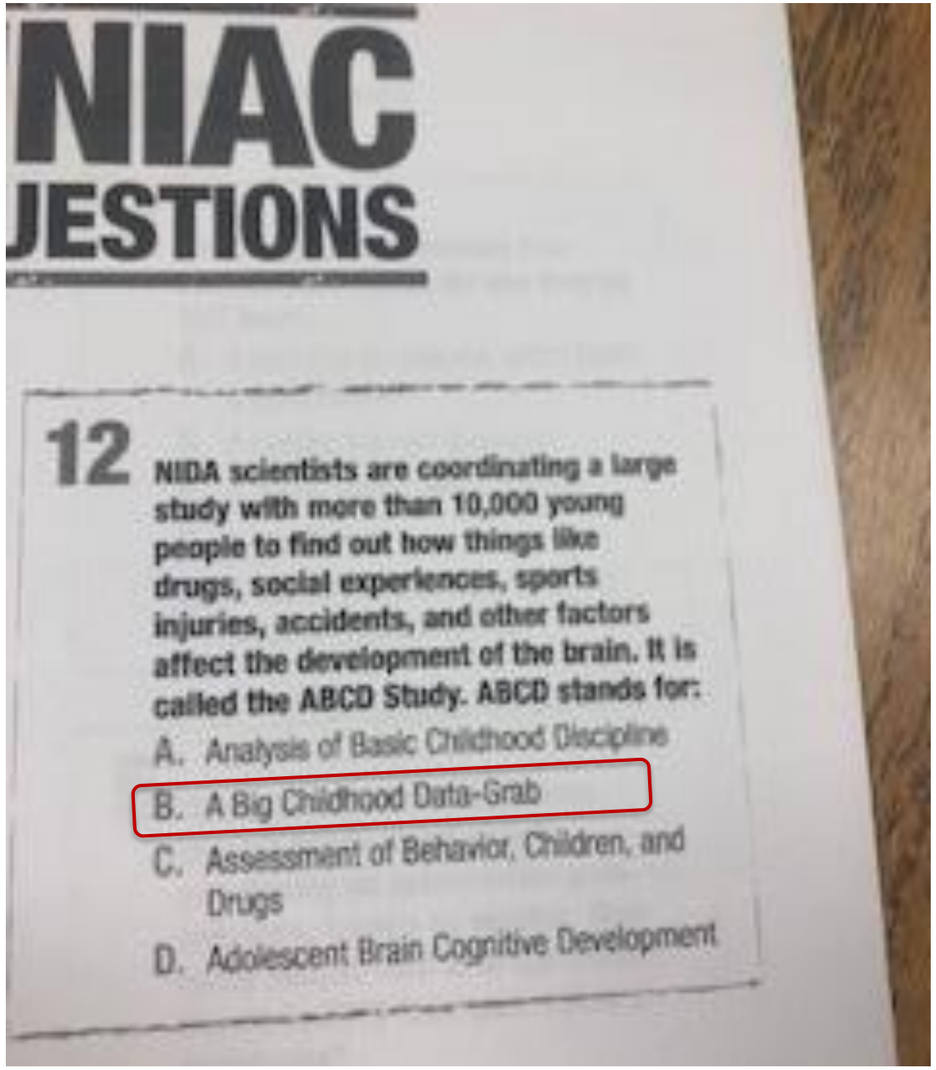
PAR-18-062 — Accelerating the Pace of Drug Abuse Research Using Existing Data

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, 201

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)

ABCDSTUDY
Annual Meeting 2017

Adolescent Brain Cognitive Development

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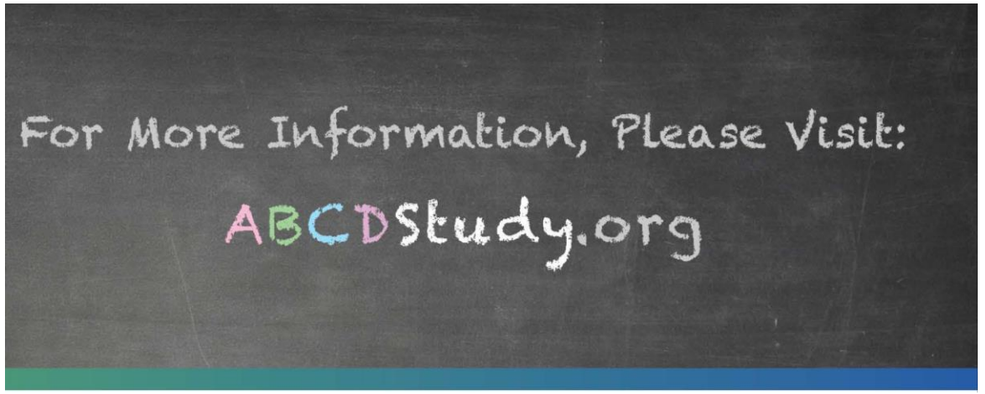

Proposed Additions to Two-year Follow-up

- 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

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National Cancer Institute

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National Institute of Neurological Disorders and Stroke

National Institute on Minority Health and Health Disparities

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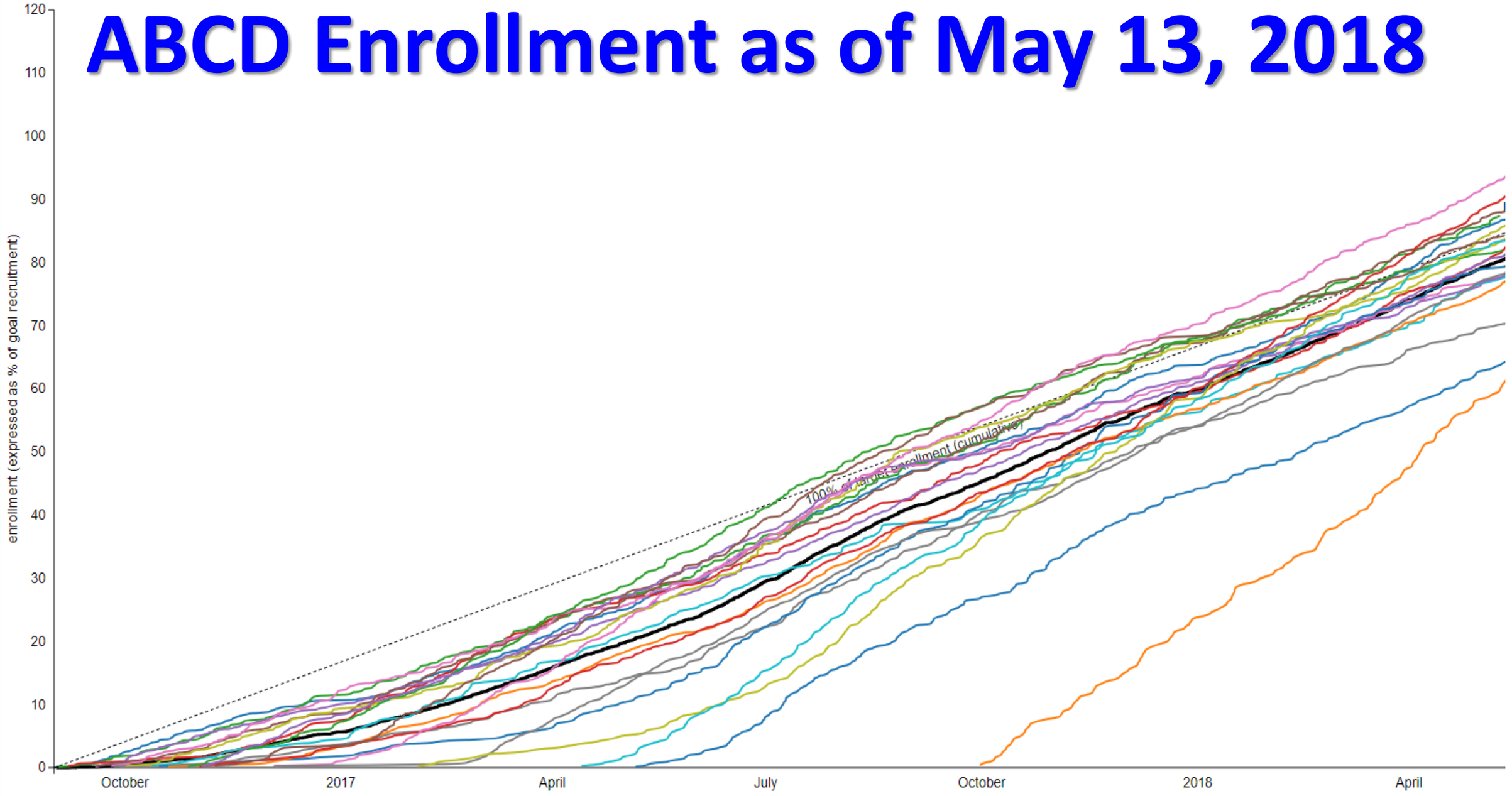
ABCD Enrollment as of May 13, 2018



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- **Data Quality Monitoring**
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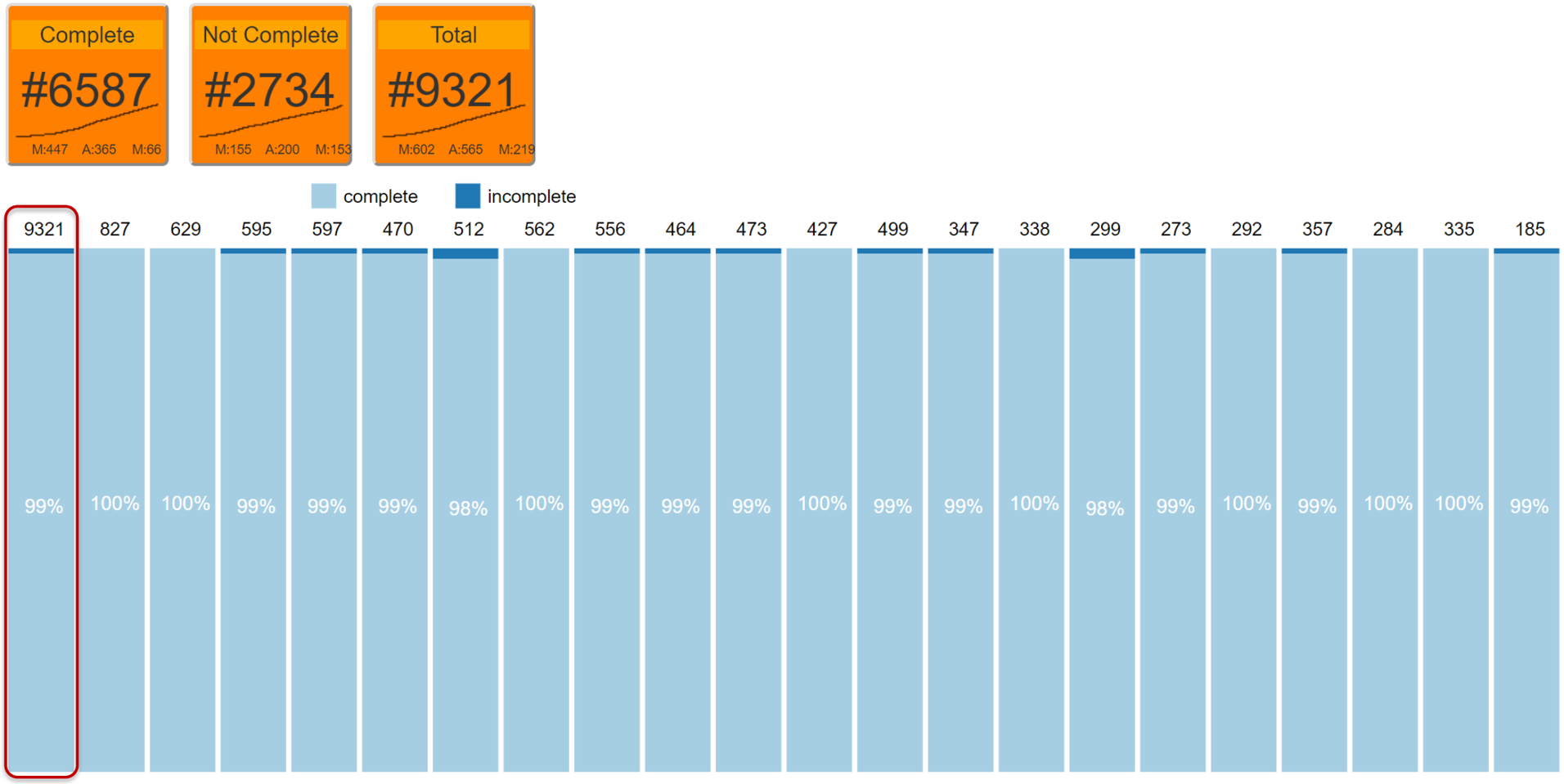
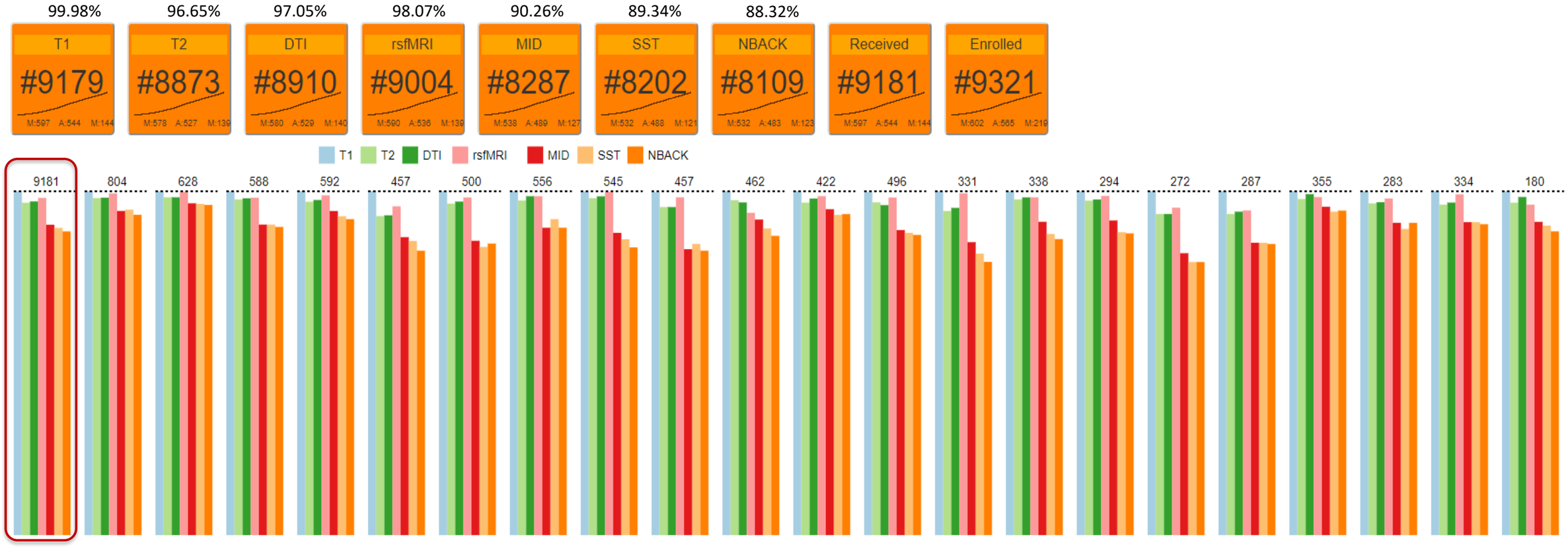
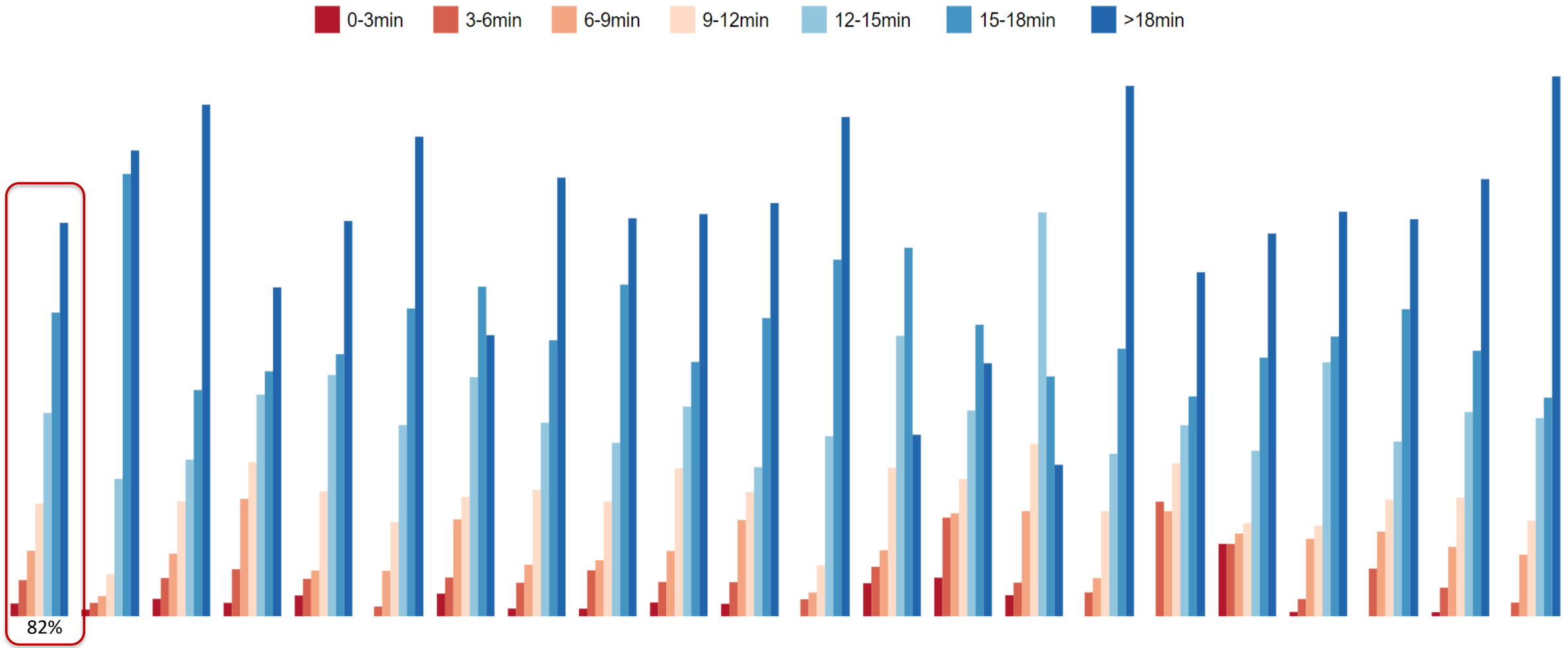
Non-imaging Assessment Completeness as of May 13, 2018



Imaging Completeness as of May 13, 2018



Resting State Motion



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 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

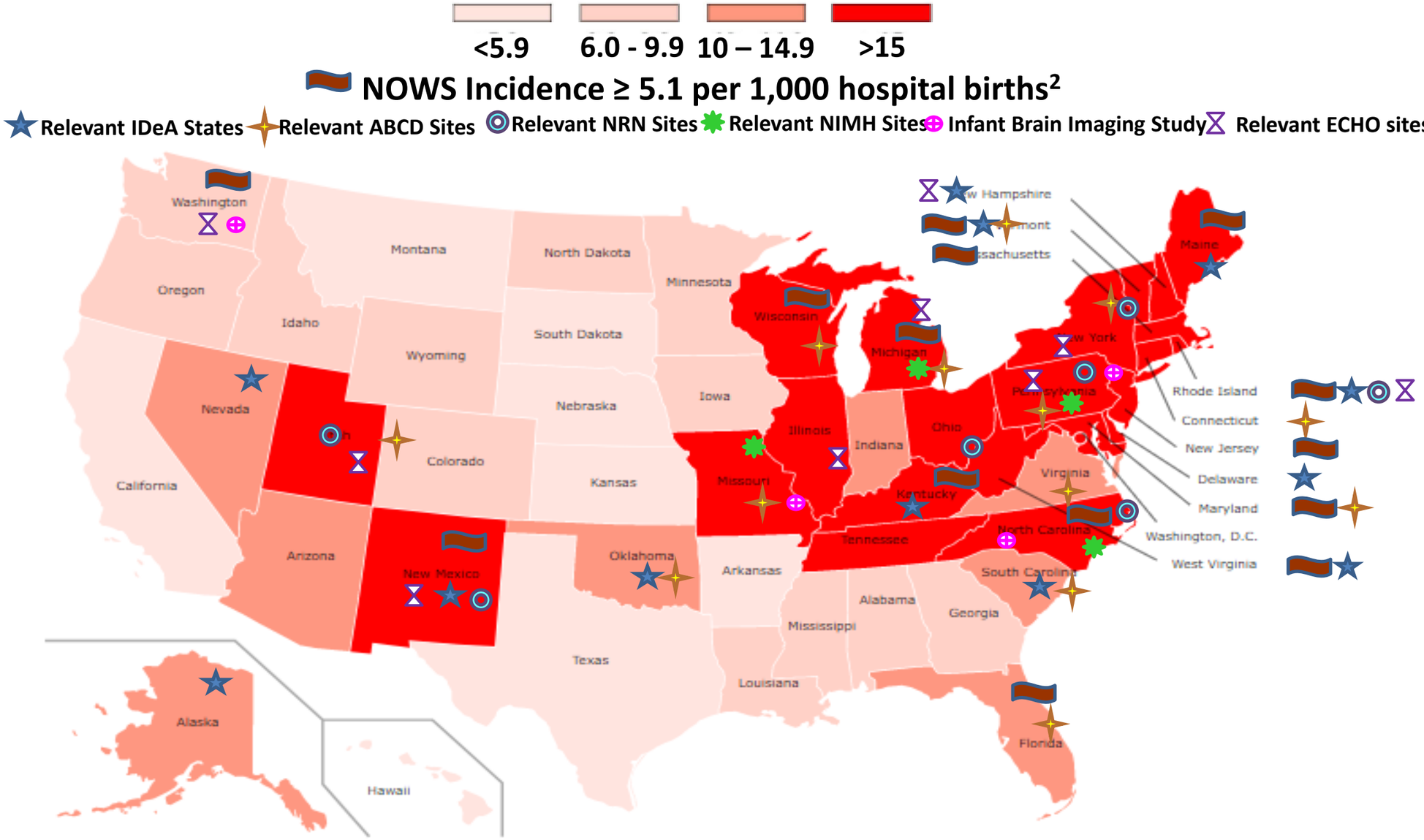
State Laws

Medical and Recreational Marijuana

Medical Marijuana

Limited Medical Access, Low THC/High CBD

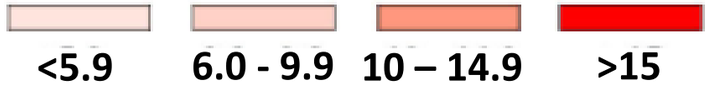
Opioid-Related Overdose Death Rates (per 100,000 people)[1]



[1]NIDA (2018) Opioid Summaries by State from CDC Wonder - https://www.drugabuse.gov/drugs-abuse/opioids/opioid-summaries-by-state

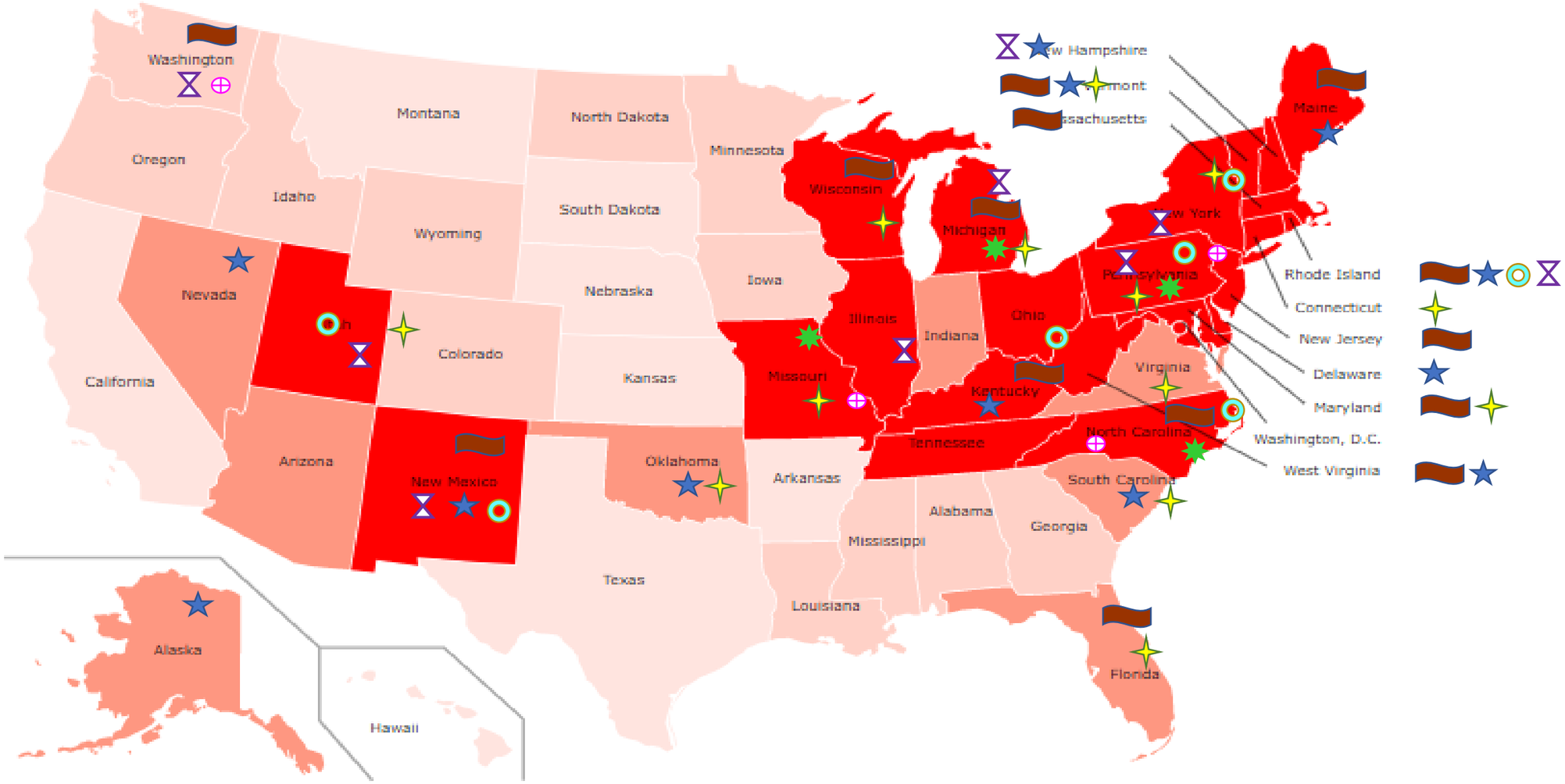
[2]Ko JY et al. (2016) Incidence of Neonatal Abstinence Syndrome — 28 States, 1999–2013. MMWR 65:799–802.

Opioid-Related Overdose Death Rates (per 100,000 people)[1]



NOWS Incidence ≥ 5.1 per 1,000 hospital births[2]

Relevant IDeA States **Relevant ABCD Sites** **Relevant NRN Sites** **Relevant NIMH Sites** **Infant Brain Imaging Study** **Relevant ECHO sites**



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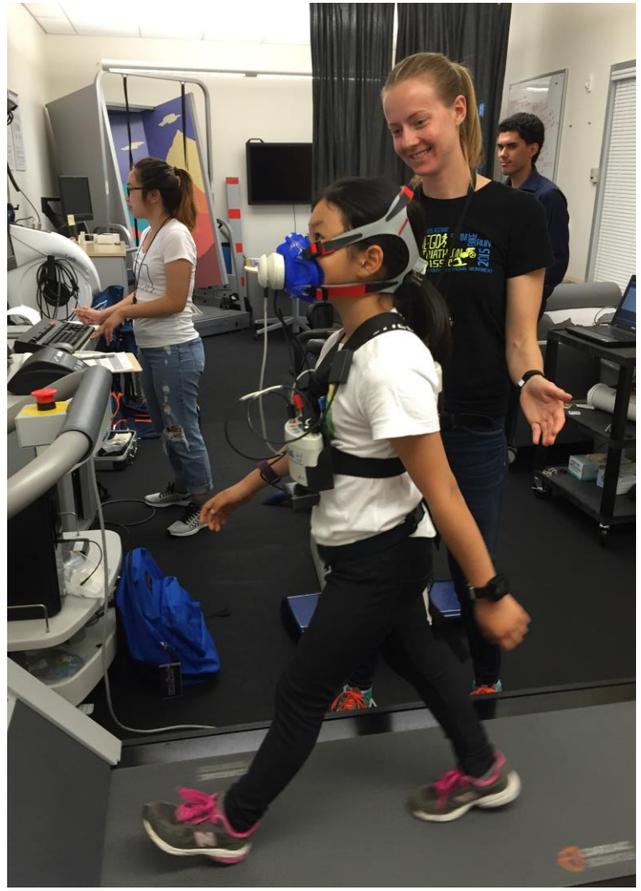
[2]Ko JY et al. (2016) Incidence of Neonatal Abstinence Syndrome — 28 States, 1999–2013. MMWR 65:799–802.

FitBit Validation Study (n=59)

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



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

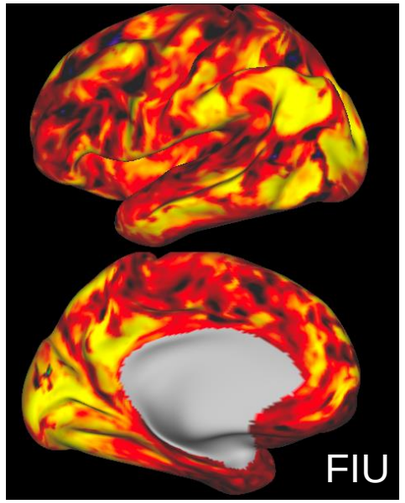
Sleep*	UCSD Mean ± SD	SRI Mean ± SD	VCU Mean ± SD
Min of sleep/valid day	**504.8 ±46.0**	**502.2 ±38.6**	**506.3 ±29.7**

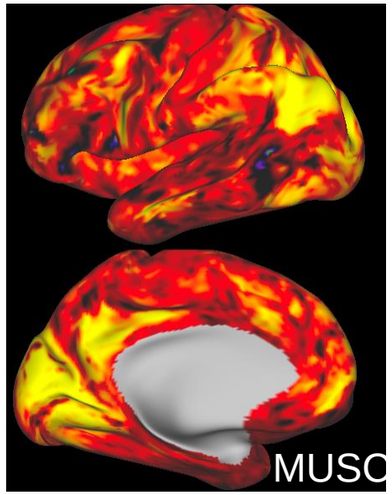
Activity**	Weekdays	Weekends
Steps	11,521.9 (±4814.9)	11,021.3 (±3482.5)
Moderate Vigorous Physical Activity (minutes)	51.3 (±44)	41.8 (±38)
Resting Heart Rate	65.4 (±19.3)	69.2 (±15.9)

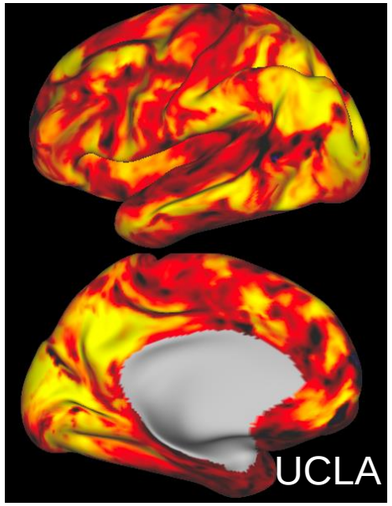
*of those with 3+ wear days
*based on first 34 participants

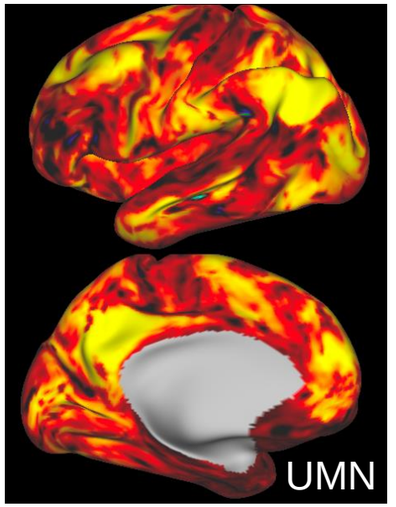
Courtesy of Susan Tapert (UCSD)

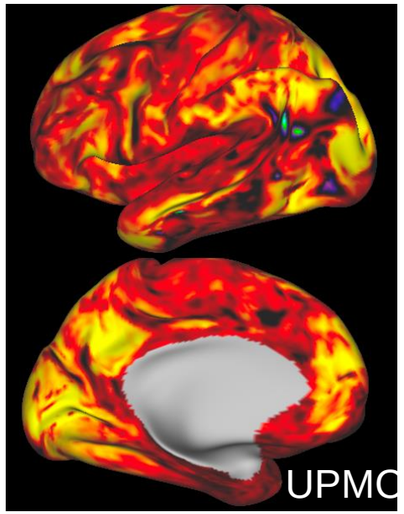
Individual Differences – Brain Imaging

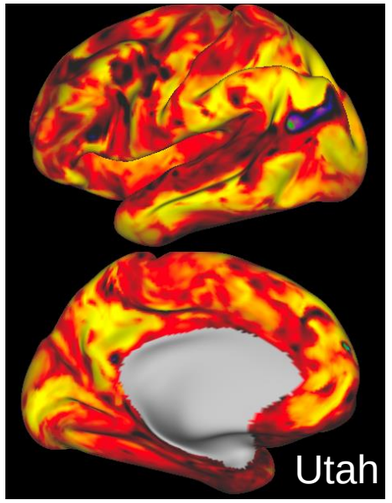


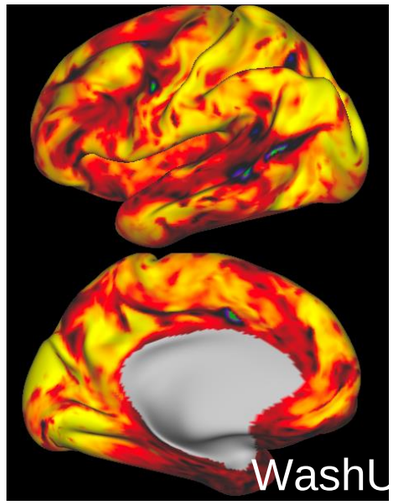


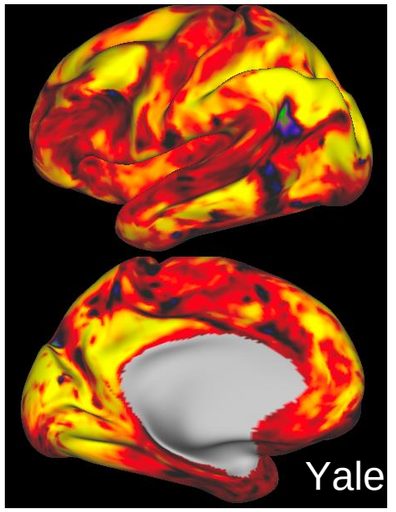




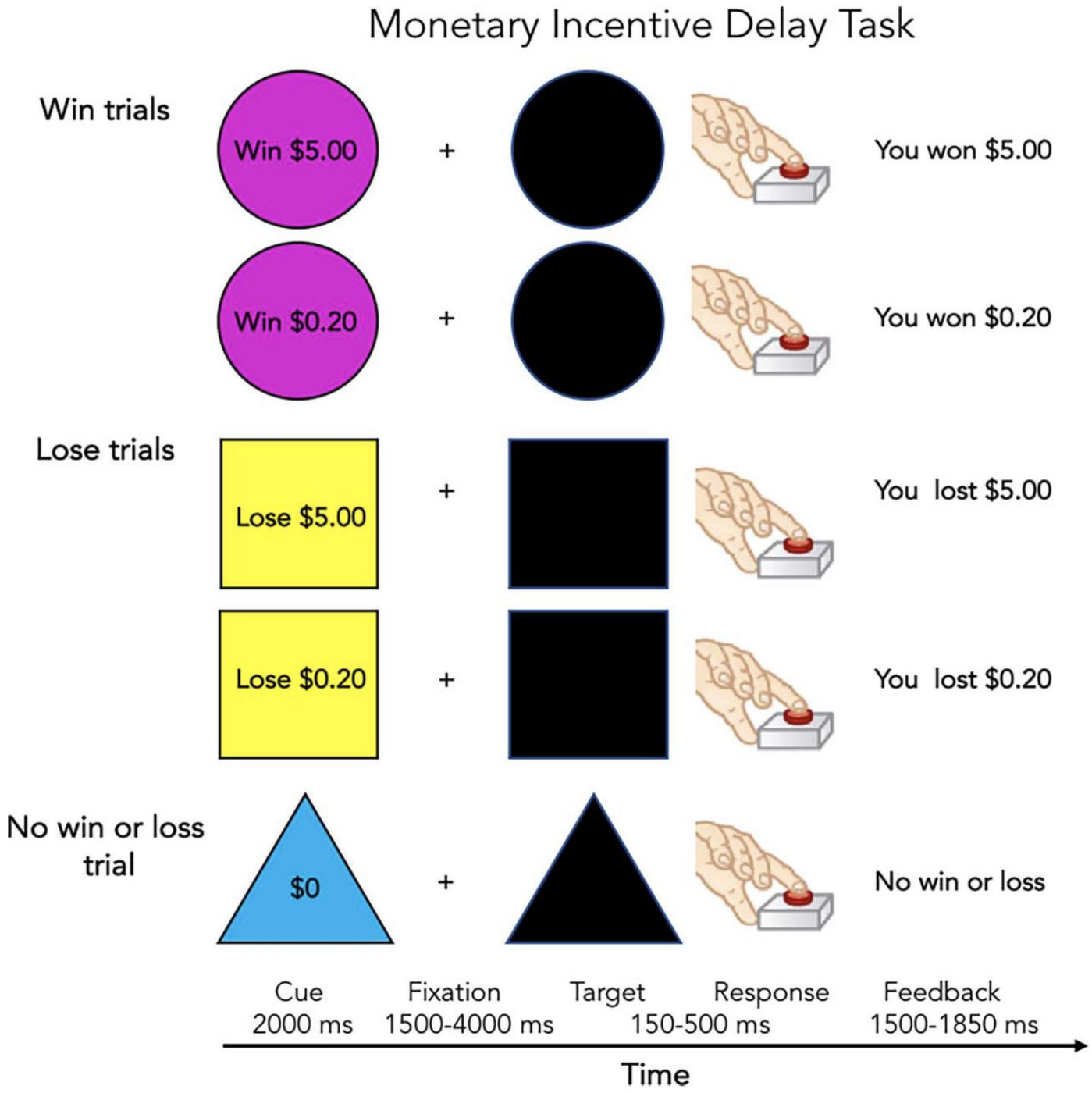






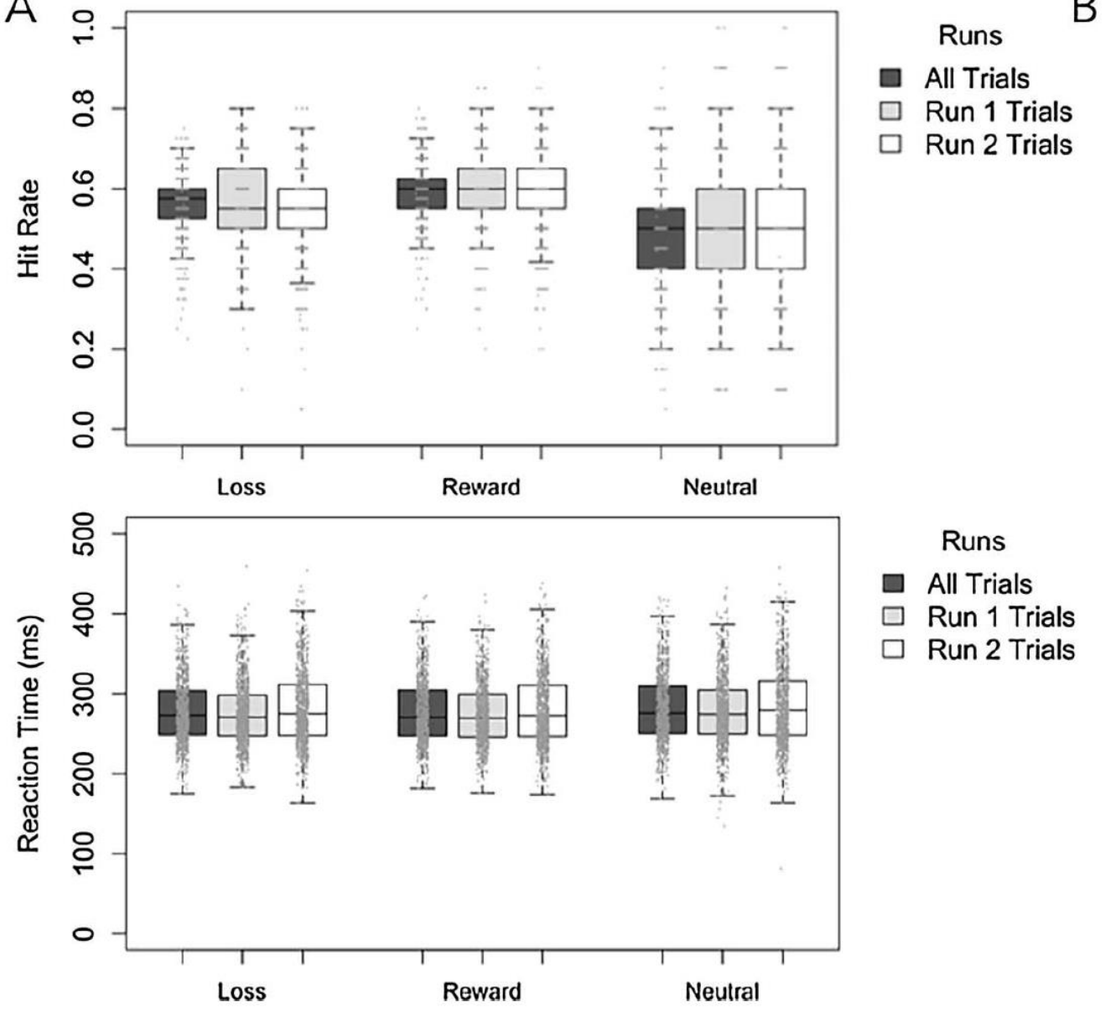


Courtesy of Damien Fair (Oregon Health & Science University)

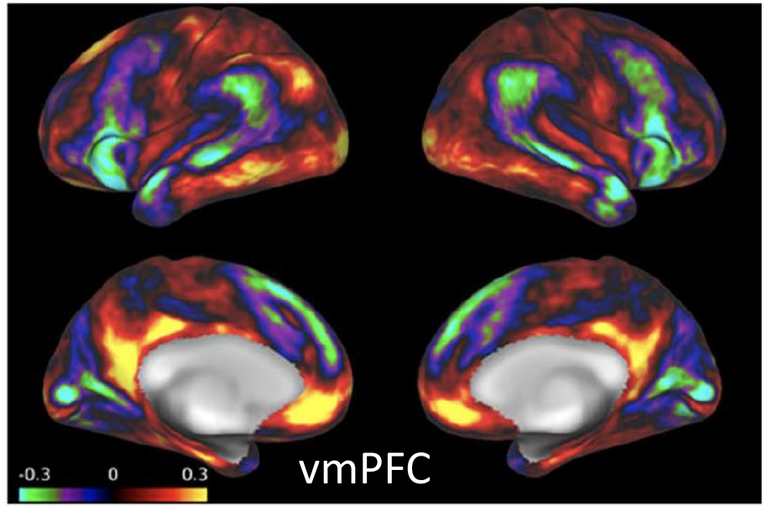

Monetary Incentive Delay Task
Win trials
Win $5.00
+
You won $5.00
Win $0.20
+
You won $0.20
Lose trials
Lose $5.00
+
You lost $5.00
Lose $0.20
+
You lost $0.20
No win or loss trial
$0
+
No win or loss
Cue
2000 ms
Fixation
1500-4000 ms
Target
Response
150-500 ms
Feedback
1500-1850 ms
Time

Monetary Incentive Delay Task

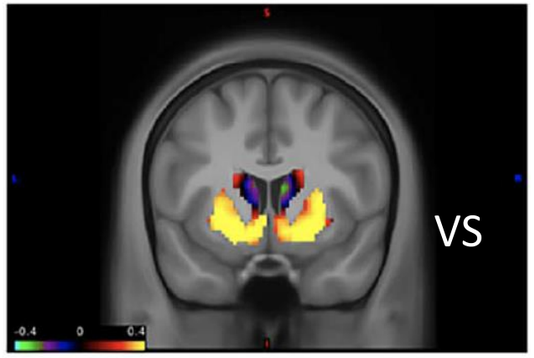
A



B

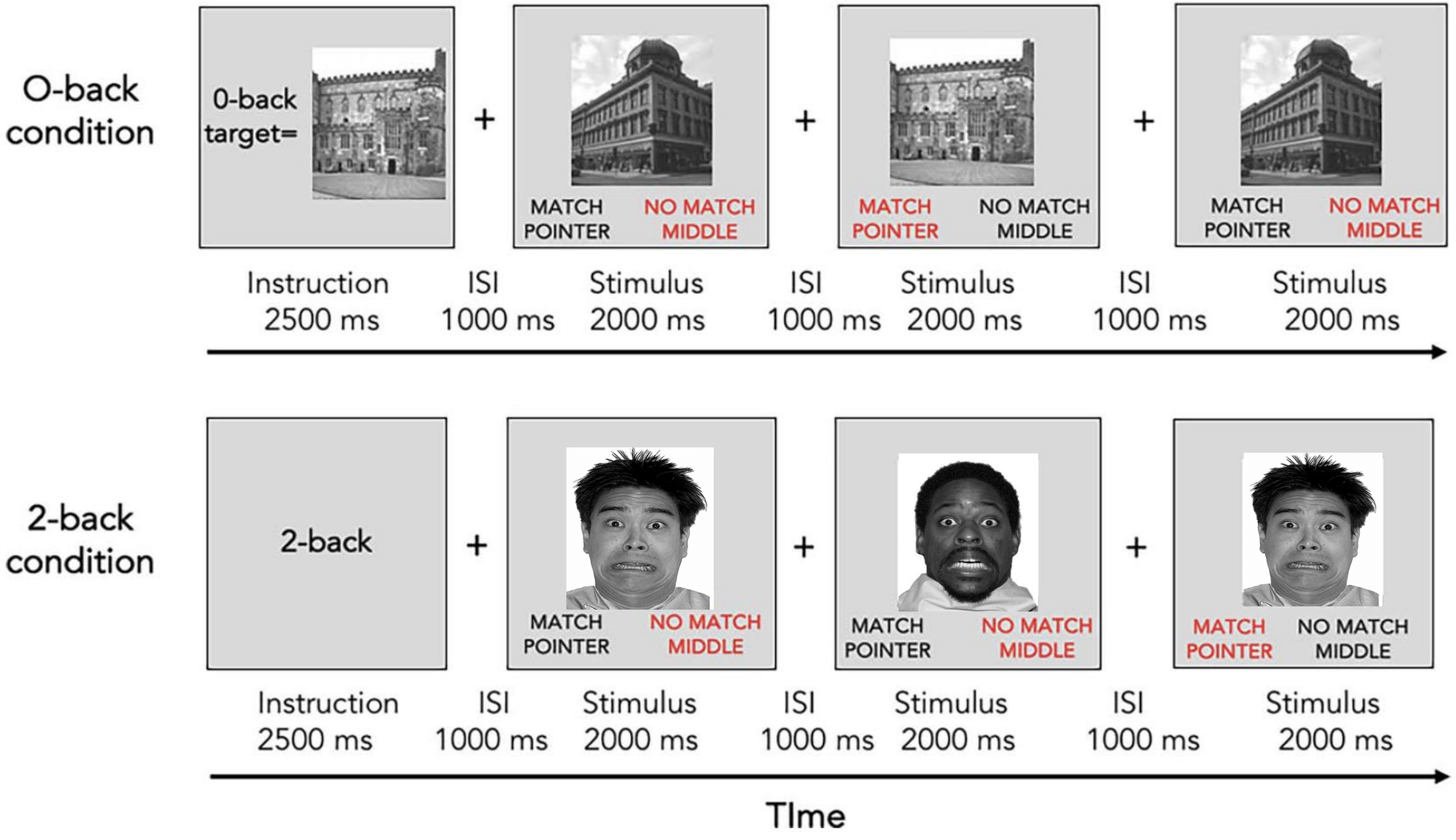


Contrast: Reward success vs fail

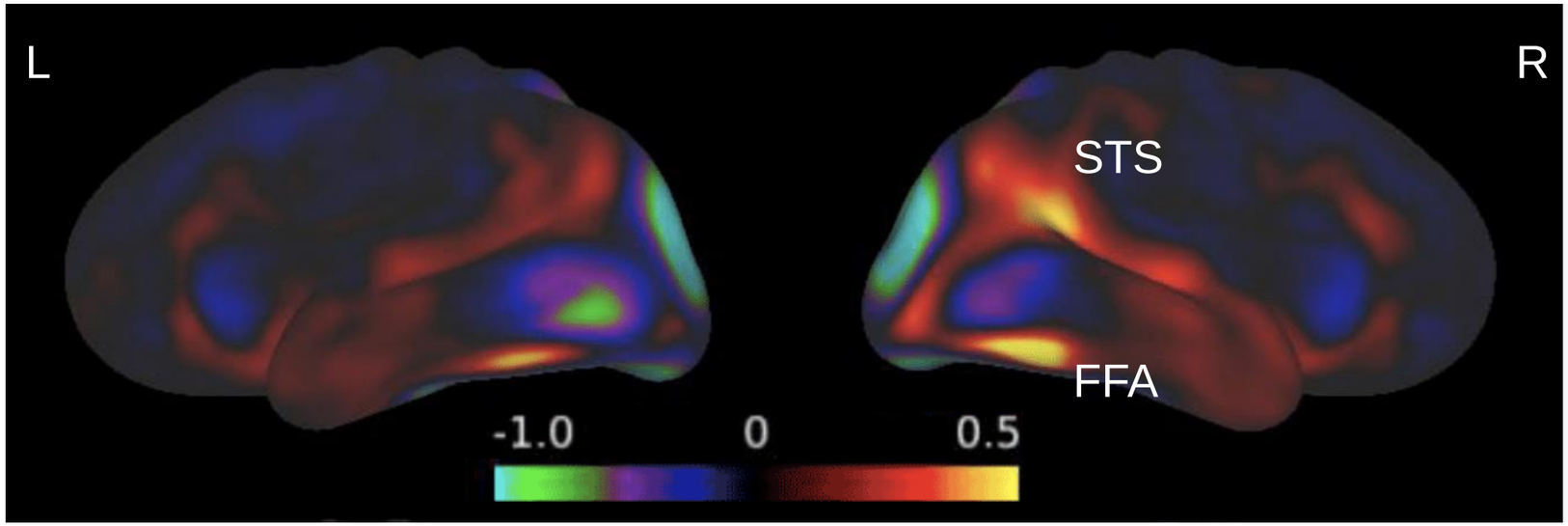


n=856

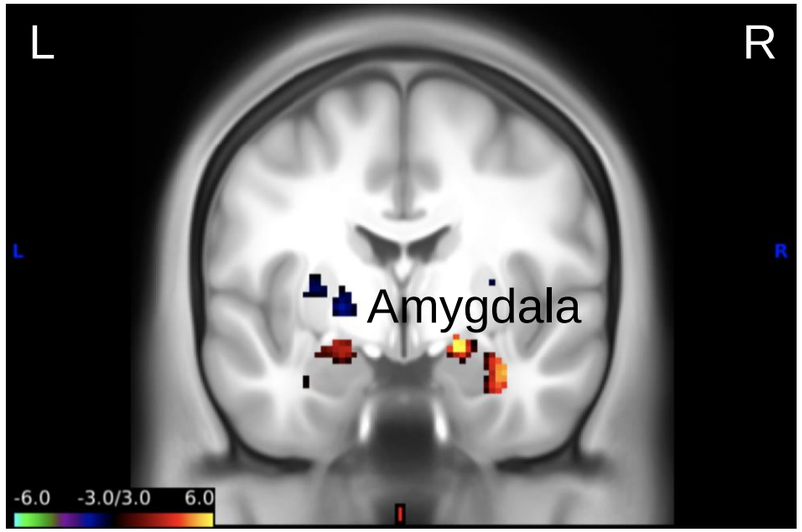
Emotional N-Back Task



Faces versus Places



Fear vs Neutral Faces



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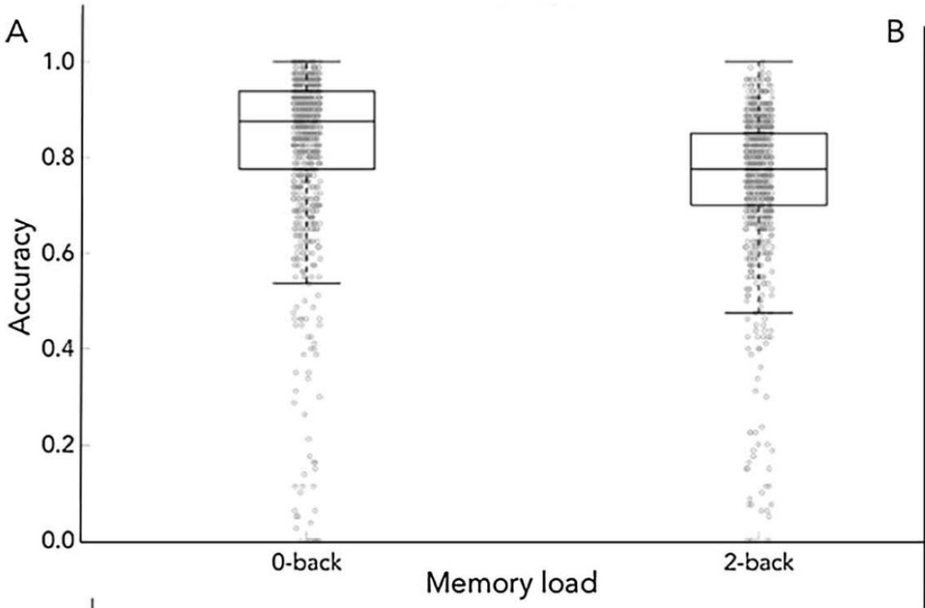
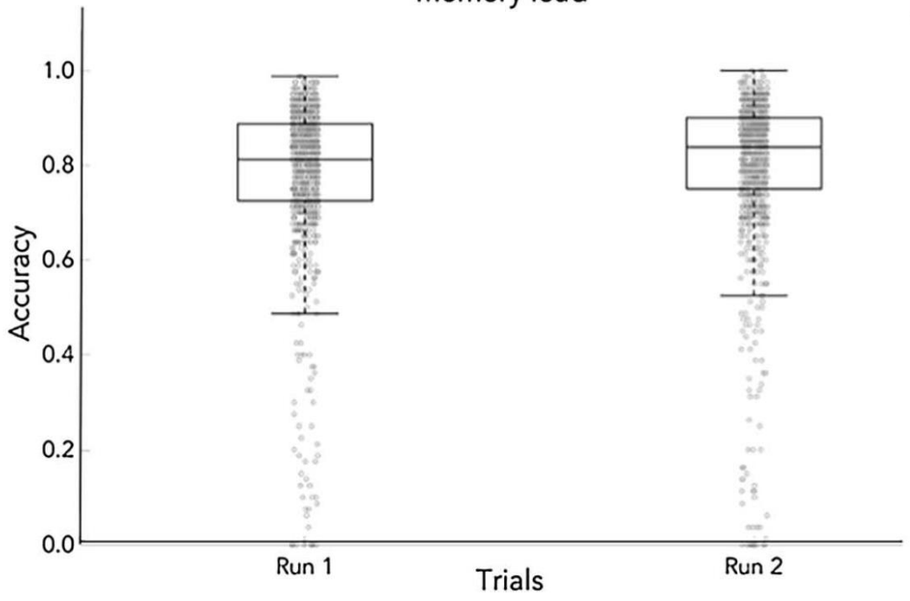
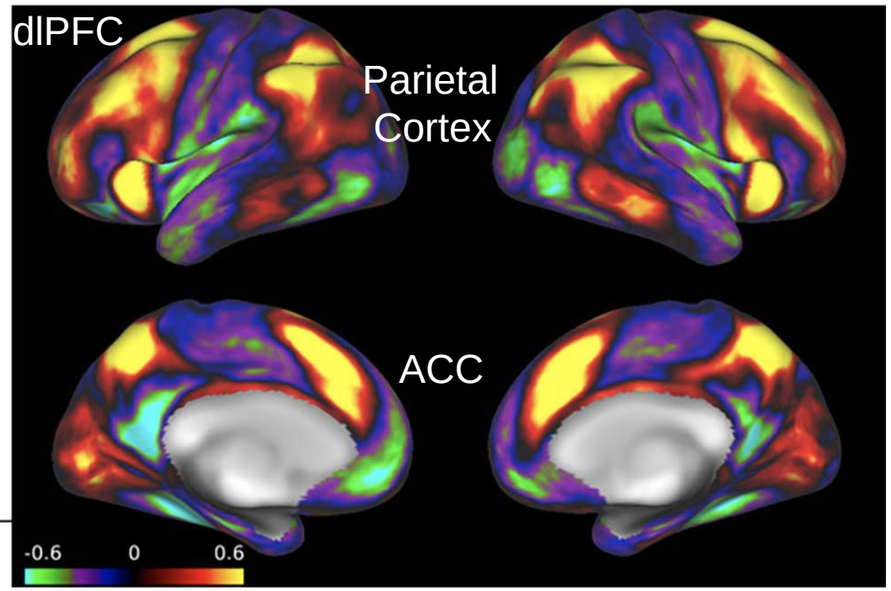
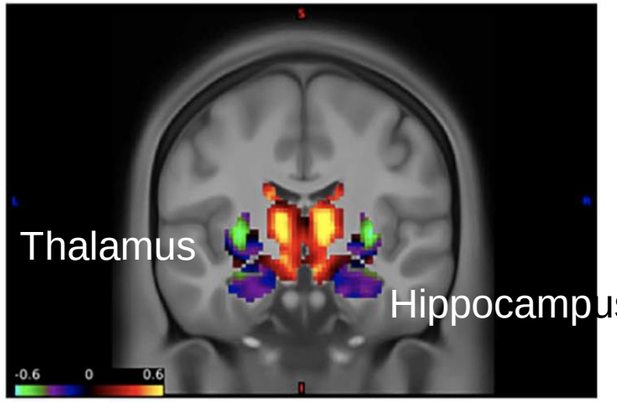
Emotional N-Back Task







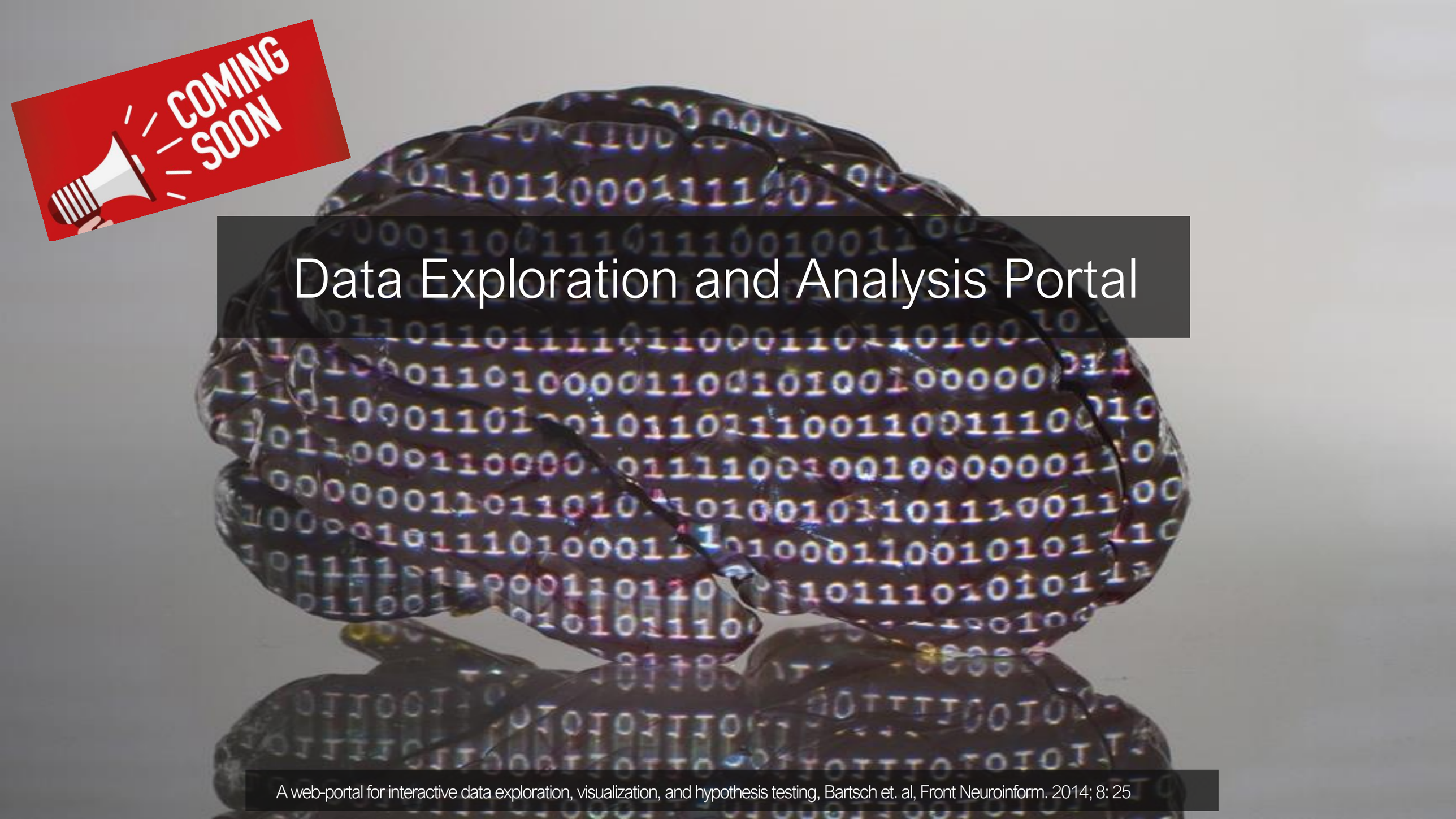
Contrast: 2-back – 0-back



n=517

Six-month Follow-up

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



Data Exploration and Analysis Portal

A web-portal for interactive data exploration, visualization, and hypothesis testing, Bartsch et. al, Front Neuroinform. 2014; 8: 25

Hypothesis Testing on DEAP

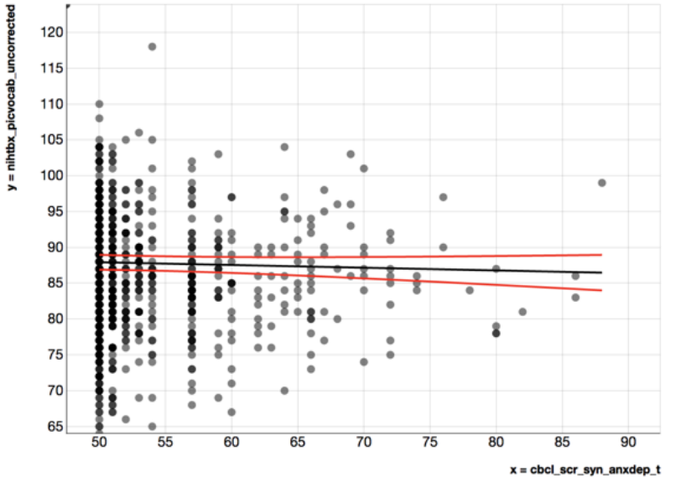
Can changes in anxiety be explained by cognitive development scores measured in the picture vocabulary test, if one corrects for known covariates?

Model specification

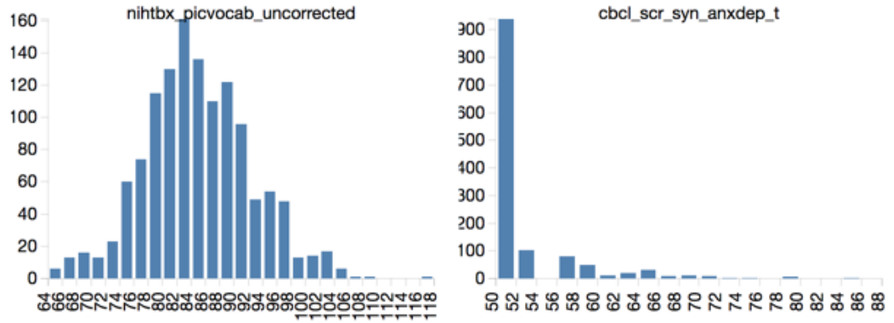
Independent Variable	cbcl_scr_syn_anxdep_t
Dependent Variable	nihtbx_picvocab_uncorrected
User Covariates	
Fixed Effect Covariates	Race/Ethnicity, GENDER, EDU, INC, MARITAL, AGE
Random Effects	SITE, FAMILY

Submit

Regression model fit



Data used in the model



Result tables / Model comparisons

	Estimate	Std. Error	t value	Pr(> | t |)	sig
(Intercept)	52.27064	1.77974	29.37	< 1e-6	***
nihtbx_picvocab_uncorrected	0.02316	0.01322	1.75	0.0798201	.
race.ethnicityBlack	-1.15741	0.37474	-3.09	0.0020246	**
race.ethnicityHispanic	-0.14640	0.30244	-0.48	0.628372	
race.ethnicityAsian	-1.21511	0.66369	-1.83	0.0671952	.
race.ethnicityOther	0.13576	0.33444	0.41	0.6848096	
genderM	0.67781	0.18458	3.67	0.0002436	***
high.educBachelor	-0.05391	0.54923	-0.10	0.9218111	
high.educHS Diploma/GED	-0.90738	0.57636	-1.57	0.1154924	
high.educPost Graduate Degree	-0.17039	0.56453	-0.30	0.7628061	
high.educSome College	-0.06243	0.52201	-0.12	0.9048016	
marriedyes	-0.40629	0.24155	-1.68	0.0926505	.
interview_age	-0.00946	0.01301	-0.73	0.4672105	
household.income[< 50K]	1.12847	0.32764	3.44	0.0005784	***
household.income[> =50K& < 100K]	0.48843	0.24194	2.02	0.0435734	*

Table 3: Statistical parameter table.

Risk and Protective Factors for Sipping

Culture & Environment

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

*Modified from PhenX

Total Model: R-sq: .088; p<.001; 79.5% accurate

	B	S.E.	P-value
Sex (Male)	.209	.084	.012
Peer Use	.741	.182	.000
Availability (Hard)	-.913	.083	.000
Rules (Yes)	-1.526	.287	.000
Neighborhood Safety	-.093	.039	.018
School Involvement	-.092	.018	.000

Not significant

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

Courtesy of Mary Heitzeg (University of Michigan)

Risk and Protective Factors for Sipping

Males

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

	B	S.E.	P-value
Peer Use	.697	.218	.001
Availability (Hard)	-.815	.109	.000
Rules (Yes)	-1.628	.374	.000
School Disengagement	.089	.043	.039
School Involvement	-.066	.026	.010

Not significant

- Neighborhood Safety

Females

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

	B	S.E.	P-value
Peer Use	.961	.325	.003
Availability (Hard)	-1.035	.126	.000
Rules (Yes)	-1.422	.453	.002
Neighborhood Safety	-.156	.059	.008
School Involvement	-.098	.028	.000
Family Conflict	-.090	.034	.009

Not significant

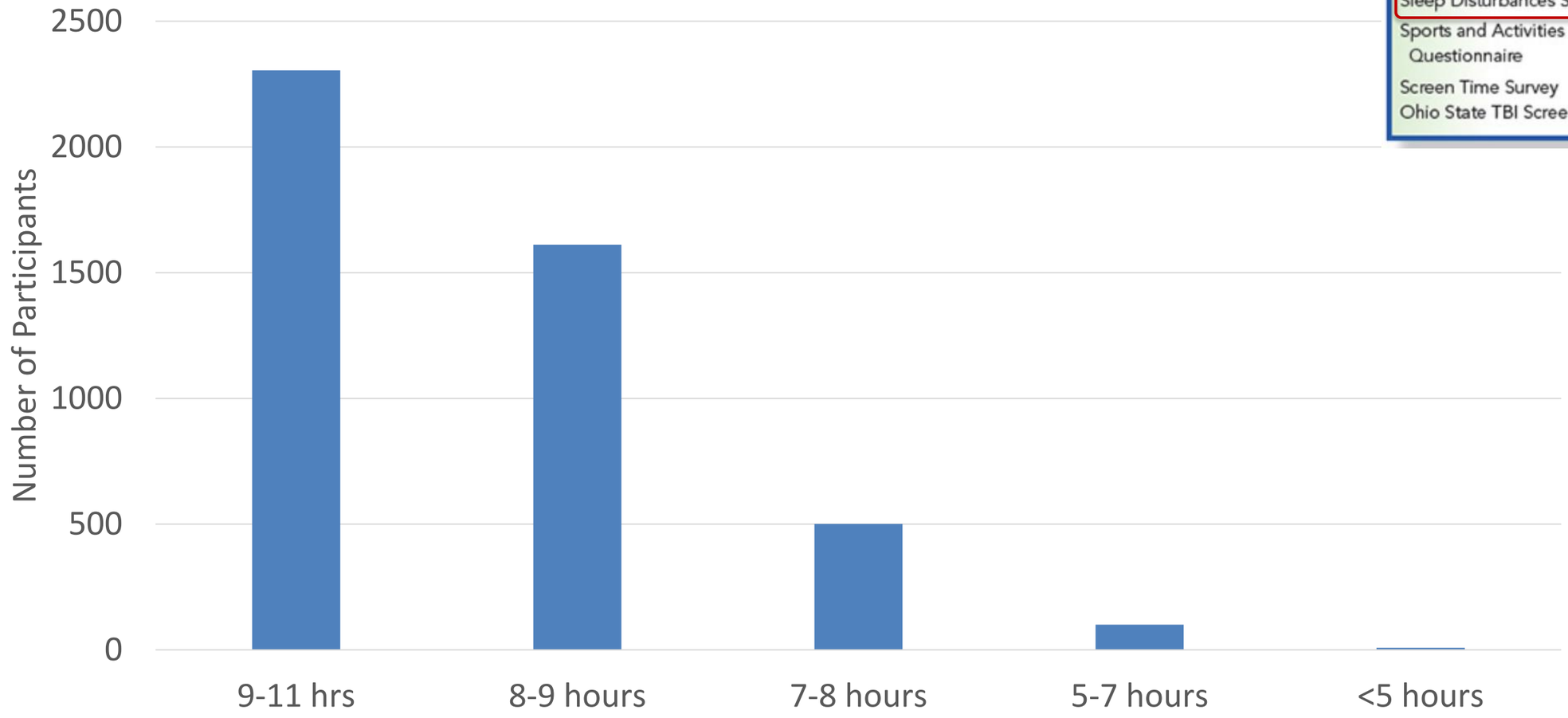
- School Disengagement

Courtesy of Mary Heitzeg (University of Michigan)

Sleep

Physical Health

- PhenX Demographics Survey
- Medical History Questionnaire
- Developmental History Questionnaire
- PhenX Medications Survey
- Menstrual Cycle Survey
- Sleep Disturbances Scale for Children
- Sports and Activities Involvement Questionnaire
- Screen Time Survey
- Ohio State TBI Screen - Short



(n=4,524)