NCANDA: Characterization of the Sample

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NCANDA Overview

- Aims
- Recruitment
- Protocol
- Sample characteristics
- Next directions
Background

- Adolescence:
  - Neuromaturation
  - Escalations in substance use

- Deleterious effects of heavy drinking on adolescent neuromaturation suggested
  - Cross-sectional analyses
  - Smaller longitudinal studies

- Verify in large, representative sample
NCANDA Conceptual Model

Adolescent Alcohol Consumption
- Dose/Duration/Timing

Developmental Context
- Genetics
- Age/Gender/Puberty
- Risks

Brain Development
- Structure
- Function

Environment

Behavior
- Neurocognition Functioning
- Alcohol problems/AUD
- Psychopathology
- Maturation
- Real life functioning
NCANDA Aims

1. Drinking → adolescent neurodevelopment

2. Effects of dose, duration, and age of drinking

3. Resolution of effects with abstinence

4. Modulating factors:
   - Pubertal stage
   - Sleep
   - Sex
   - Psychopathology
   - Family history of alcoholism

5. Brain features → addiction & psychopathology
NCANDA Design

Administration:
- Sandy Brown – Coordinator
- Susan Tapert – Scientific Director

Data:
- Dolf Pfefferbaum
- Kilian Pohl
- Edie Sullivan

Sites:
- U Pittsburgh – Duncan Clark
- SRI – Ian Colrain & Fiona Baker
- Duke Univ – Michael DeBellis
- OHSU – Bonnie Nagel
- UCSD – Susan Tapert

Scientific Advisors:
- Ken Sher
- Raquel Gur
- Andrea Hussong
- Arpana Argrawal
- Bob Zucker

5 Sites

>50,000 reached via school and community recruitment

>7,500 responded

831 enrolled

53% Representative

47% with 1+ risk factor for heavy drinking, including 17% who exceeded threshold for alcohol use

3 annual follow-ups (~25% heavy drinkers)
Exclusions at Project Entry

- Not age 12.0 - 21.9 years
- No parental consent
- Factors that preclude valid participation
- Early developmental problems
- Major psychiatric disorder
- Medications
- Serious medical problem
- Excessive substance use
## Substance Use Criteria

For classification as Non/Low Drinker:

<table>
<thead>
<tr>
<th>Age</th>
<th>Lifetime Days Drinking (^a)</th>
<th>Max Drinks on One Occasion (^a)</th>
<th>Lifetime Days Cigarette Use (^b)</th>
<th>Lifetime Days Marijuana Use (^b)</th>
<th>Lifetime Other Drug Use (^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>12-12.9</td>
<td>(\leq 5)</td>
<td>(\leq 3)</td>
<td>(\leq 3)</td>
<td>(\leq 10)</td>
<td>(\leq 5)</td>
</tr>
<tr>
<td>13-13.9</td>
<td>(\leq 5)</td>
<td>(\leq 3)</td>
<td>(\leq 3)</td>
<td>(\leq 10)</td>
<td>(\leq 10)</td>
</tr>
<tr>
<td>14-14.9</td>
<td>(\leq 5)</td>
<td>(\leq 4)</td>
<td>(\leq 3)</td>
<td>(\leq 20)</td>
<td>(\leq 15)</td>
</tr>
<tr>
<td>15-15.9</td>
<td>(\leq 5)</td>
<td>(\leq 4)</td>
<td>(\leq 3)</td>
<td>(\leq 30)</td>
<td>(\leq 20)</td>
</tr>
<tr>
<td>16-16.9</td>
<td>(\leq 11)</td>
<td>(\leq 4)</td>
<td>(\leq 3)</td>
<td>(\leq 40)</td>
<td>(\leq 25)</td>
</tr>
<tr>
<td>17-17.9</td>
<td>(\leq 23)</td>
<td>(\leq 4)</td>
<td>(\leq 3)</td>
<td>(\leq 50)</td>
<td>(\leq 30)</td>
</tr>
<tr>
<td>18-18.9</td>
<td>(\leq 51)</td>
<td>(\leq 4)</td>
<td>(\leq 3)</td>
<td>(\leq 60)</td>
<td>(\leq 35)</td>
</tr>
<tr>
<td>19-19.9</td>
<td>(\leq 51)</td>
<td>(\leq 4)</td>
<td>(\leq 3)</td>
<td>(\leq 70)</td>
<td>(\leq 40)</td>
</tr>
<tr>
<td>20-20.9</td>
<td>(\leq 51)</td>
<td>(\leq 5)</td>
<td>(\leq 3)</td>
<td>(\leq 80)</td>
<td>(\leq 45)</td>
</tr>
<tr>
<td>21-21.9</td>
<td>(\leq 51)</td>
<td>(\leq 5)</td>
<td>(\leq 3)</td>
<td>(\leq 90)</td>
<td>(\leq 50)</td>
</tr>
</tbody>
</table>

\(^a\) NIAAA, 2008  
\(^b\) SAMHSA, 2013
NCANDA Screening

Step-down screening approach
>50,000 reached, >7,500 responded

2548 Completed Screens

1110 Ineligible

252: MRI / Physical / No parent

310: Substance use

548: Meds / Prenatal / LD

607 not enrolled
(target N met with representation & ~50% at-risk)

1438 Eligible

831 Enrolled

692 Non/Limited Drinking

139 Exceeded Drinking Thresholds
Modified Accelerated Longitudinal Design

◆ Samples subjects from range of ages

◆ Oversampled age 12-15

◆ Allowed ~15% to exceed drinking thresholds
  – Mostly 18-21
  – Can estimate trajectories representing continuum from non-drinking to heavy drinking
  – Accelerated time scale

Duncan et al., 1996; Duncan et al., 2006; Miyazaki & Raudenbush, 2000
## NCANDA Protocol: Interview

<table>
<thead>
<tr>
<th>Youth</th>
<th>Parent / Informant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Youth assent (age 12-17) or consent (18+)</td>
<td>Parent consent</td>
</tr>
<tr>
<td>*<em>Computerized Semi-Structured Assessment for the Genetics of Alcoholism <em>NCANDA Version</em></em></td>
<td><strong>Computerized Semi-Structured Assessment for the Genetics of Alcoholism-Parent (12-17)</strong></td>
</tr>
<tr>
<td>Demographic Interview</td>
<td>Demographic Interview-Parent</td>
</tr>
<tr>
<td>Family History Assessment Module</td>
<td>Traumatic Brain Injury Identification Method-Short Form</td>
</tr>
<tr>
<td>MacArthur Sociodemographic Questionnaire (18+)</td>
<td>Family History Assessment Module</td>
</tr>
<tr>
<td>Customary Drinking &amp; Drug Use Record</td>
<td>MacArthur Sociodemographic Questionnaire - Parent</td>
</tr>
<tr>
<td>Traumatic Brain Injury Identification Method-Short Form</td>
<td>Child Behavior Checklist (12-17)</td>
</tr>
<tr>
<td>Youth Self-Report (12-17) or Adult Self-Report (18+) – dimensional psychopathology</td>
<td>Access to Substances (12-17)</td>
</tr>
<tr>
<td>Exit interview</td>
<td>Exit interview</td>
</tr>
<tr>
<td>Locator update and payment</td>
<td>Locator update and Payment</td>
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</tbody>
</table>
### NCANDA Self-Report Measures:

<table>
<thead>
<tr>
<th>Measure</th>
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<tbody>
<tr>
<td>Access to Substances &amp; Neighborhood Strength (12-17)</td>
</tr>
<tr>
<td>Alcohol Expectancy Questionnaire-Adolescent version</td>
</tr>
<tr>
<td>Behavior Rating Inventory of Executive Function</td>
</tr>
<tr>
<td>California Healthy Kids Survey (12-18)</td>
</tr>
<tr>
<td>Child Trauma Questionnaire</td>
</tr>
<tr>
<td>Driving &amp; Riding Behavior &amp; History Questionnaire (15+)</td>
</tr>
<tr>
<td>Drug Taking Confidence Questionnaire</td>
</tr>
<tr>
<td>Hangover Symptom Survey</td>
</tr>
<tr>
<td>Life Events Questionnaire</td>
</tr>
<tr>
<td>Motives for Abstaining from Alcohol Questionnaire</td>
</tr>
<tr>
<td>Parent Warmth, Monitoring, Knowledge, Control &amp; Relationship (12-18)</td>
</tr>
<tr>
<td>Parental Monitoring (12-18)</td>
</tr>
<tr>
<td>Peer &amp; Romantic Relationships</td>
</tr>
<tr>
<td>Peer Group Deviance</td>
</tr>
<tr>
<td>Prosocial Tendencies</td>
</tr>
<tr>
<td>Pubertal Development Scale</td>
</tr>
<tr>
<td>Responses to Stress Questionnaire</td>
</tr>
<tr>
<td>Sexual Behavior Questionnaire</td>
</tr>
<tr>
<td>Single-Item Self-Esteem Scale</td>
</tr>
<tr>
<td><strong>Sleep</strong>: self-reported sleep problems, total sleep, chronicity, and weekday-weekend sleep difference</td>
</tr>
<tr>
<td>Social Support Questionnaire</td>
</tr>
<tr>
<td>Ten Item Personality Inventory</td>
</tr>
<tr>
<td>UPPS-P Impulsive Behavior Scale</td>
</tr>
<tr>
<td>Exit interview</td>
</tr>
</tbody>
</table>
Other Data Collected:

<table>
<thead>
<tr>
<th>All Sites</th>
<th>Specialty Projects at 2 Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI: T1, T2, DTI, &amp; resting state fMRI</td>
<td>Sleep studies – SRI &amp; Pittsburg</td>
</tr>
<tr>
<td>Neuropsychological assessment</td>
<td>Stroop fMRI task – SRI &amp; UCSD</td>
</tr>
<tr>
<td>Samples for genetic and epigenetic analyses, pubertal hormones, and drug screening</td>
<td>Anti-saccade fMRI task – Duke &amp; Pittsburg</td>
</tr>
<tr>
<td></td>
<td>Recovery protocol – UCSD &amp; Duke</td>
</tr>
</tbody>
</table>
Staff Training & QA

- Senior staff at each site

- Training process:
  1. Readings and observation
  2. Repeat mock sessions observed by senior staff with feedback
  3. Mock session approved by senior-level staff member
  4. Observed assessment with real subjects

- QA:
  - Annual calibration at each site
  - Check for interviewer drift and confirm training of new staff

- Additional in-person and Skype training and reliability checks
  - Dr. Schuckit provided video-recorded training on SSAGA

- Manuals: clinical, neuropsych, MRI, and data management
NCANDA Sample: Age Distribution

Age at Baseline

Duke
Pitt
OHSU
SRI
UCSD
Balanced Female : Male Ratio

- UCSD
- OHSU
- Pitt
- Duke
- SRI

Female and Male percentages for each institution.
Ethnicity: Nationally Representative

- Non/Low Drinkers
- Exceed Threshold Drinkers
- 2010 US Census

Bar chart showing the percentage of different ethnic groups as non/low drinkers, exceed threshold drinkers, and the 2010 US Census data.
# Sample Characteristics

**N = 831, age = 12-21 years**

<table>
<thead>
<tr>
<th></th>
<th>Non/Low Drinker (N=692)</th>
<th>Exceeded Threshold (N=139)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td><strong>(n=334)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (mean years)</td>
<td>15.6</td>
<td>15.8</td>
</tr>
<tr>
<td>Pubertal Development Scale (median)</td>
<td>3.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Socioeconomic status (mean)</td>
<td>17.0</td>
<td>16.6</td>
</tr>
<tr>
<td>% Right-handed</td>
<td>76%</td>
<td>83%</td>
</tr>
</tbody>
</table>
Sample Description

- 88% reside with one or both parents
- 27% parents divorced/separated/single
- 20% below college degree
- 18% household income <$50k/yr*
- 85% normal BMI (13% above, 2% under)

*higher in ET Drinkers (p<.05)
Substance Use at Baseline

- **Non/Low Drinker Males (n=334)**
- **Non/Low Drinker Females (n=348)**
- **ET Drinker Males (n=64)**
- **ET Drinker Females (n=75)**

- **Lifetime Days Drinking**
- **Lifetime Cigarettes Smoked**
- **Lifetime Days Marijuana Use**
Lifetime Other Drug Use: ET at Baseline (% of 139)
Risk Criteria: Target 50%

1. 1st full drink < age 15  
   (Grant & Dawson, 1997)

2. Family history of substance use disorder  
   (Edenberg et al., 1998; Schuckit & Smith, 1996)

3. 1+ externalizing symptoms  
   (Brown et al., 1996; Myers et al., 1995; Slutske et al., 1998)

4. 2+ internalizing symptom  
   (Chassin, et al., 2002; Hussong et al., 2011)
47% with 1+ Risk Factor for Heavy Drinking

- Non/Limited Drinkers
- Exceeded Threshold Drinkers

$p<.05$

- 1st drink <15
- FH of SUD
- 1+
- 2+

Externalizing

Internalizing
NCANDA Follow-up Design

- 4 assessments with imaging
  + Half-yearly telephone interviews

- 6-month: 98% of 831 done.
- 1-year: in progress, >90% complete.
Next Directions

- Begin to test Aims 1 and 5:
  - Effects of adolescent drinking on trajectory of adolescent brain development
  - Neural, cognitive, and affective markers predicting addiction & psychopathology
NCANDA Summary

- Exceeded recruitment goals on time
- Nationally representative sample
- Procedures and protocol set a standard
- High follow-up rates
- 47% with risk factors

→ Suggests aims can be tested
Acknowledgements

- U01 AA021695 (SAB+SFT)
- U01 AA021697 (AP+KMP)
- U01 AA021692 (SFT)
- U01 AA021681 (MDDB)
- U01 AA021690 (DBC)
- U01 AA021691 (BN)
- U01 AA021696 (IMC+FCB)
- T32 AA013525 (TB)

- NIAAA Program Staff
- NCANDA Scientific Advisory Board
- NCANDA Co-Investigators
- NCANDA Research Associates