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>Maximum 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></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-12.9</td>
<td>≤5</td>
<td>≤3</td>
<td>≤3</td>
<td>≤10</td>
<td>≤5</td>
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<tr>
<td>13-13.9</td>
<td>≤5</td>
<td>≤3</td>
<td>≤3</td>
<td>≤10</td>
<td>≤10</td>
</tr>
<tr>
<td>14-14.9</td>
<td>≤5</td>
<td>≤4</td>
<td>≤3</td>
<td>≤20</td>
<td>≤15</td>
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<tr>
<td>15-15.9</td>
<td>≤5</td>
<td>≤4</td>
<td>≤3</td>
<td>≤30</td>
<td>≤20</td>
</tr>
<tr>
<td>16-16.9</td>
<td>≤11</td>
<td>≤4</td>
<td>≤3</td>
<td>≤40</td>
<td>≤25</td>
</tr>
<tr>
<td>17-17.9</td>
<td>≤23</td>
<td>≤4</td>
<td>≤3</td>
<td>≤50</td>
<td>≤30</td>
</tr>
<tr>
<td>18-18.9</td>
<td>≤51</td>
<td>≤4</td>
<td>≤3</td>
<td>≤60</td>
<td>≤35</td>
</tr>
<tr>
<td>19-19.9</td>
<td>≤51</td>
<td>≤4</td>
<td>≤3</td>
<td>≤70</td>
<td>≤40</td>
</tr>
<tr>
<td>20-20.9</td>
<td>≤51</td>
<td>≤5</td>
<td>≤3</td>
<td>≤80</td>
<td>≤45</td>
</tr>
<tr>
<td>21-21.9</td>
<td>≤51</td>
<td>≤5</td>
<td>≤3</td>
<td>≤90</td>
<td>≤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
**Other Data Collected:**

<table>
<thead>
<tr>
<th>All Sites</th>
<th>Speciality 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

The graph shows the age distribution of the NCANDA sample across different baseline ages, with each age category representing a range of 12-21 years. The bars are color-coded to represent different sites: Duke, Pitt, OHSU, SRI, and UCSD. The y-axis represents the count (N) of participants, and the x-axis represents the age at baseline.
Balanced Female : Male Ratio

- UCSD
- OHSU
- Pitt
- Duke
- SRI

Female
Male
Ethnicity: Nationally Representative

2010 US Census

- Non/Low Drinkers
- Exceed Threshold Drinkers
- 2010 US Census
## 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>(n=334)</td>
<td>(n=348)</td>
<td>(n=64)</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 Other Drug Use: ET at Baseline (% of 139)
Risk Criteria: Target 50%

1. 1\textsuperscript{st} 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

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

p < .05

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