Substance use among older adolescents: A latent class analysis

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Substance Use Among Older Adolescents: A Latent Class Analysis

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Introduction

• The use of alcohol, tobacco and illicit substances by adolescents is a major public health concern.

• Adolescents often use multiple substances concurrently.

• Prior studies have described heterogeneous profiles of concurrent substance use and abuse in adults.

• However, few studies have empirically identified the cross-sectional profiles of concurrent alcohol, tobacco and marijuana use in older adolescents.
Goals of the present study:

• Use latent class analysis (LCA) to identify latent subgroups of adolescents defined by heterogeneous profiles of concurrent alcohol, tobacco and marijuana use.

• Identify risk factors associated with membership in the latent classes.
Hypotheses:

1. LCA would identify classes defined by distinct substance use profiles, including:
   - A low-risk class (minimal substance use).
   - One or more concurrent substance use classes.

2. Classes defined by profiles of concurrent substance use would include higher proportions of members who:
   - A) Were male
   - B) Were White
   - C) Reported depression symptoms
   - D) Reported oppositional defiant disorder (ODD) symptoms
Method:

Participants:
• 1500 Twins ascertained from the Missouri Twin registry.
• Mean Age: 18.3 years (Range: 17.4 -19.6).
• Inclusion criterion: Not yet attending college (n = 1376).

Assessments:
• Semi-structured Interview for the study of the Genetics of Alcoholism (C-SSAGA), administered via telephone.
• Mailed self-report questionnaires.
• Assessed:
  - Demographic information.
  - Alcohol, tobacco and marijuana use histories.
  - DSM-IV depression and ODD symptoms.
• Data were collected near the end of the participants’ senior year in high school.
## Descriptive statistics:

<table>
<thead>
<tr>
<th>Substance Use Variables: (dichotomous)</th>
<th>% endorsed item (Total n = 1376)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever had 1 drink</td>
<td>64.3 %</td>
</tr>
<tr>
<td>Had 1 drink on 24 or more days</td>
<td>29.1 %</td>
</tr>
<tr>
<td>Ever binge drank (males: 5 drinks in 24hrs. / females: 4 drinks)</td>
<td>45.9 %</td>
</tr>
<tr>
<td>Binge drank (within last year)</td>
<td>37.1 %</td>
</tr>
<tr>
<td>Binge drank (within last 30 days)</td>
<td>19.8 %</td>
</tr>
<tr>
<td>Ever smoked 1 cigarette</td>
<td>45.3 %</td>
</tr>
<tr>
<td>Smoked ≥ 100 cigarettes</td>
<td>15.8 %</td>
</tr>
<tr>
<td>Ever used marijuana</td>
<td>30.7 %</td>
</tr>
<tr>
<td>Used marijuana &gt; 20 times</td>
<td>11.3 %</td>
</tr>
<tr>
<td>Ever felt sick / vomited due to drinking</td>
<td>27.5 %</td>
</tr>
<tr>
<td>Ever blacked out due to drinking</td>
<td>13.4 %</td>
</tr>
</tbody>
</table>
Descriptive statistics:

<table>
<thead>
<tr>
<th>Risk Factors: (dichotomous)</th>
<th>Total n = 1376 % of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (Male)</td>
<td>34.9 %</td>
</tr>
<tr>
<td>Race (White)</td>
<td>82.6 %</td>
</tr>
<tr>
<td>3 Depression symptoms</td>
<td>10.2 %</td>
</tr>
<tr>
<td>≥ 5 ODD symptoms</td>
<td>21.5 %</td>
</tr>
</tbody>
</table>

• ODD and Depression symptom counts were dichotomized because the distributions were skewed. Cut-offs were chosen to identify participants at relatively high risk for psychopathology.
Analyses:

• Latent class analyses were computed using Mplus 5.1.

• The Bayesian Information Criterion (BIC) was used to determine the optimal number of latent classes.

• The LCAs computed the probabilities of class membership for each individual, and individuals were assigned to the class for which the probability of membership was highest.

• Risk factors were included in the LCAs as covariates. (latent classes were regressed onto the risk factors using simultaneous multinomial logistic regression).

• The covariate analyses tested for differences in the proportions of members in each class (relative to a reference class) who were male, white and who reported 3 depression symptoms and 5 or more ODD symptoms.
Results

• BIC indicated a 6-class model best fit the data.

• Classes are described according to the probability that the class endorsed each substance use variable (i.e., item endorsement probability profiles--substance use patterns).

Class Descriptions

1. **Low-risk (n= 592):** Minimal substance use.

2. **Experimenter (n= 146):** Tried alcohol, tobacco and marijuana.

3. **Occasional Binger (n= 203):** Tried binge drinking, but tended not to use tobacco or marijuana.

4. **Regular Binger (n= 228):** Binge drank regularly, tried tobacco and marijuana but had not progressed to regular co-use.

5. **Smoker (n= 79):** Used tobacco regularly, used marijuana frequently but did not binge drink regularly.

6. **Polysubstance User (n= 128):** Concurrent use of all substances.
Results: Item Endorsement Probability Profiles

Polysubstance User 9.3%
Regular Binger 16.6%
Occasional Binger 14.8%
Smoker 5.7%
Experimenter 10.6%
Low-risk 43.0%
**Results:** Risk Factors (covariate analyses)

Percentage of members in each class who:

<table>
<thead>
<tr>
<th></th>
<th>Low-risk</th>
<th>Experimenter</th>
<th>Occasional Binger</th>
<th>Regular Binger</th>
<th>Smoker</th>
<th>Polysubstance User</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Covariate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Male</td>
<td>32.1%</td>
<td>32.9%</td>
<td>33.0%</td>
<td>37.3%</td>
<td>25.3%</td>
<td>54.7%</td>
</tr>
<tr>
<td>B) White</td>
<td>79.4%</td>
<td>55.5%</td>
<td>91.6%</td>
<td>94.7%</td>
<td>88.6%</td>
<td>88.3%</td>
</tr>
<tr>
<td>C) 3 Depression Symptoms</td>
<td>6.8%</td>
<td>13.7%</td>
<td>8.4%</td>
<td>14.0%</td>
<td>12.7%</td>
<td>17.2%</td>
</tr>
<tr>
<td>D) ≥ 5 ODD Symptoms</td>
<td>12.2%</td>
<td>28.8%</td>
<td>7.9%</td>
<td>26.3%</td>
<td>60.8%</td>
<td>45.3%</td>
</tr>
</tbody>
</table>

- For each covariate, one set of analyses tested for differences in the proportions in each of the classes relative to the Low-risk (reference) class.
**Results:** Risk Factors (covariate analyses)

- For each covariate, another set of analyses tested for significant differences among the proportions in the experimenter, occasional binger, regular binger, smoker and polysubstance user classes.

Odds ratios that are **underlined** differ relative to the low-risk class ($p < .05$). Odds ratios (in rows) with different superscripts differ from each other ($p < .05$).

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Experimenter</th>
<th>Occasional Binger</th>
<th>Regular Binger</th>
<th>Smoker</th>
<th>Polysubstance User</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Male</td>
<td>1.15&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.15&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.15&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.74&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.40&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>B) White</td>
<td>.34&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.27&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.27&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.27&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.27&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>C) 3 Depression Symptoms</td>
<td>1.69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.69&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>D) $\geq$ 5 ODD Symptoms</td>
<td>2.48&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.48&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11.88&lt;sup&gt;c&lt;/sup&gt;</td>
<td>5.94&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
**Results:** Probability of being a member of the classes as a function of risk factor combinations.
Discussion

• As expected, the LCA identified latent classes defined by minimal use (low-risk class) and concurrent use of all substances (polysubstance user class).

• Intermediate classes included experimenters, occasional bingers, regular bingers and smokers.

• Relative to the low risk class, depression symptoms were associated with a small risk (OR = 1.69) for membership in the intermediate and polysubstance user classes.

• The risk factors related to the highest probability for being in the polysubstance user class were male gender, White race and ODD symptoms.
Discussion

• The risk factors related to the highest probability for being in the smoker class were female gender, White race and ODD symptoms.

• The risk factor related to the highest probability for being in the occasional binger class was White race.

• The risk factors related to the highest probabilities for being in the regular binger class were White race and ODD symptoms.

• The risk factors related to the highest probabilities for being in the experimenter class were non-white race and ODD symptoms.
Conclusion

• The results suggest that heterogeneous profiles of concurrent alcohol, tobacco and marijuana use exist in the older adolescent population, and these profiles are associated with specific risk factors.

• Knowledge about the typological heterogeneity of substance users in this age group can aid in developing more targeted prevention and intervention strategies.

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