A Longitudinal Study of Antisocial Behaviors in Early Adolescence as Predictors of Late Adolescent Substance Use: Gender and Ethnic Group Differences

Michael Windle
Research Institute on Alcoholism
Buffalo, New York

Data from the National Longitudinal Youth Survey (NLSY) were analyzed to study interrelationships between antisocial behaviors in early adolescence (ages 14–15) and late adolescent alcohol and drug use 4 years later (when adolescents were 18–19). Correlations between classes of antisocial behaviors in early adolescence and substance use in late adolescence were of higher magnitude and more uniform for men than for women; for women, property offenses (e.g., vandalism) in early adolescence were more highly associated with alcohol use, alcohol-related problems, and illicit drug use in late adolescence than with either status offenses or transgressions against persons. Multiple regression analyses indicated that early-adolescent substance involvement was a significant predictor of late-adolescent alcohol and drug use. Additional significant predictors included early adolescent general delinquency, male gender, and non-Black ethnicity.

Longitudinal studies have generally supported significant associations between childhood antisocial behavior and subsequent disordered behavior (e.g., alcoholism or antisocial personality disorder) in adolescence and adulthood (e.g., Kohlberg, LaCrosse, & Ricks, 1972; Zucker & Gomberg, 1986). Nevertheless, the direction of causation between antisocial behaviors and substance use and abuse remains equivocal, as does the strength of the interrelations (Collins, 1986; Guze, Tuason, Gatfield, Stewart, & Picken, 1962; Robins, 1966). This uncertainty regarding causation is especially prominent in adolescence, where patterns of covariation exist between antisocial behaviors, substance use, and poor school performance, reflecting more of a general tendency toward deviance. Jessor and Jessor (Jessor & Jessor, 1977; Jessor, Graves, Hanson, & Jessor, 1968) have referred to the pattern of covariation among the deviant behaviors as the "problem behavior syndrome."

The current study focuses on the longitudinal relations between antisocial behaviors committed in early adolescence (i.e., prior to age 15) and substance use and abuse among the same subjects 4 years later, in late adolescence. Thus, I investigated the continuity and discontinuity of dysfunctional, antisocial behavior in early adolescence and dysfunctional, substance-use behavior in late adolescence. In addition, I addressed several other issues of relevance to the study of the antisocial behavior–substance use relationships. A national probability sample was used in the current study, and this was beneficial for at least four reasons. First, many studies in this research area have been conducted with treatment samples (e.g., juvenile delinquents and alcoholics), which restrict the generalizability of the findings. Second, high school samples have often been used to study these interrelationships in adolescents, and concern is often expressed about the representativeness of samples, given that select high-risk groups (e.g., dropouts, absentees) are often excluded (e.g., Blane & Hewitt, 1977). Third, studies of the interrelationships between antisocial behaviors and substance use have often been restricted to men; the current study assesses these interrelationships for men and women. I was therefore able to investigate further the findings of Robins (1986), who reported that, although it was infrequent among women, conduct disorder (antisocial behavior) was particularly ominous for women with respect to future adjustment. Fourth, the sample contained sufficiently large numbers of Hispanics, Blacks, and Whites to permit meaningful racial and ethnic-group comparisons.

Method

Secondary analysis of the National Longitudinal Survey of Youth (NLSY) was used to investigate the interrelations between antisocial behaviors and subsequent substance use. The sampling design of the NLSY consisted of a national probability sample of 5,700 female youths and 5,700 male youths between the ages of 14 and 21 in 1979, with an oversampling of Blacks, Hispanics, and economically disadvantaged Whites. A multistage, stratified-area, probability sampling procedure was used to obtain a representative sample of persons born in the years 1957 through 1964 in the coterminous United States (Wolpin, 1983). Participants have been interviewed annually through personal household interviews since 1979. The sample was assessed annually from 1979 through 1985, with a retention rate of 95% across the seven waves of measurement. Initial funding for NLSY was from the Department of Labor, although other Federal agencies (e.g., National Institute of Alcoholism and Alcohol Abuse, National Institute of Drug Abuse, and Department of Criminal Justice) later commissioned for the inclu-

I gratefully acknowledge the comments and suggestions of Don C. Fowles and two anonymous reviewers.

Correspondence concerning this article should be addressed to Michael Windle, Research Institute on Alcoholism, 1021 Main Street, Buffalo, New York 14203.
sion of questions relevant to particular agencies. Therefore, some of the items used in the survey changed at different measurement occasions. For example, questions pertaining to illicit substance use were included primarily in the 1984 interview. Similarly, questions pertaining to anti-social behaviors or delinquency were included only in 1980.

The target sample for this study was those participants aged 14 and 15 in 1980, when survey items pertaining to childhood or early adolescent antisocial behaviors were assessed. This study also makes use of their follow-up data in 1984 pertaining to alcohol and drug use and to education-related indices (e.g., education level or dropout status). This provided a maximum sample size of 1,254 male youths and 1,157 female youths (for some analyses, sample size was trivially reduced because of missing values). Eighteen percent of the sample was Hispanic, 25% was Black, and 57% was White.

Measurement of Key Variables

Alcohol consumption was expressed in terms of the average number of alcoholic beverages consumed per day over the past 30 days. Alcohol-related aggressive behaviors represent the summation of three dichotomous, "yes-no" questions about feeling aggressive or angry while drinking, getting into a heated argument while drinking, and getting into a fight while drinking.

Dependency symptoms represent the summation of eight dichotomous, "yes-no" questions pertaining to inability to reduce drinking, fear of becoming an alcoholic, difficulty stopping drinking before becoming intoxicated, having blackouts, drinking first thing in the morning, hands shaking in the morning after drinking, getting drunk while drinking by one's self, and breaking promises not to drink.

Two variables for illicit substance use were derived. Marijuana represented the lifetime number of occasions on which marijuana or hashish were used. Illicit substances represented the summation of the lifetime number of occasions of using amphetamines, psychedelics, cocaine, inhalants, barbiturates or sedatives, tranquilizers, heroin, and (nonprescribed) narcotics (e.g., codeine, demerol, morphine, methadone, darvon, and opium). The response format for the marijuana and illicit substance use variables was a 6-point Likert scale, with the response options (0-5) being never used (0), 1-9 occasions (1), 10-39 occasions (2), 40-99 occasions (3), 100-999 occasions (4), and 1000 or more occasions (5). Cigarette use was also measured with respect to the average number of cigarettes smoked per day over the past 30 days.

A 7-point Likert-scale response format (0-6) was used for the 20 antisocial or delinquent items that were measured in 1980. The seven response options referred to the number of times that the participant committed each antisocial behavior in his or her lifetime. Response options were never (0), once (1), twice (2), 3-5 times (3), 6-10 times (4), 11-50 times (5), and greater than 50 times (6). In order to obtain more precise estimates of the actual number of antisocial behaviors committed, responses were conservatively recoded to the midpoint for each response option. For example, those responses marked 3 (indicative of 3-5 times) were recoded as 4 (the midpoint). Those responses marked 4 (indicative of 4-6 times), 5 (indicative of 5-7 times), and 6 (indicative of more than 50 times) were recoded as 5, 12, and 51, respectively. Several subscales were formed by summing the responses of various items from the list of 20 antisocial behaviors. Two different global subscores were formed—one by summing across all 20 items, and one by summing across 15 items, excluding those 5 items associated with substance involvement activities in early adolescence. In addition, four subscales were formed in accord with classifications frequently used in the delinquency literature (e.g., Canter, 1982; Figueira-McDonough, Barton, & Sarri, 1981; Hindelang, Hirschi, & Weis, 1981). Specifically, subscales were formed to measure status offenses, property offenses, person offenses, and substance involvement. (The items used to form each of these subscales are provided in Table 1, except that "helped in gambling operation" was excluded from the substance involvement index.)

Results

Frequency and Number of Delinquent Acts

The data in Table 1 summarize the proportion of male and female adolescents who ever committed each of the 20 delinquent acts and the mean number of times that they reported engaging in each act. There is considerable variability across the 20 acts with regard to the percentage of persons who ever committed these acts (from 0.5% to 49.8%). The same four delinquent acts were committed by the largest proportion of male and female adolescents ever committing delinquent acts, although the relative frequency and absolute percentages differ. For male adolescents, the highest four (from most to least frequent) were physical fight at school/work, consuming alcohol without parental permission, hit or threatened to hit someone, and truancy; for female adolescents, the highest four (from most to least frequent) were consuming alcohol without parental permission, truancy, hit or threatened to hit someone, and physical fight at school/work. The male/female ratio indicates that, whereas male and female adolescents may share some similarities with respect to rank-ordering, the percentage of male adolescents ever committing each of the delinquent acts is generally substantially greater than that of female adolescents. The only delinquent act in which a somewhat larger proportion of female than male adolescents engaged is running away from home.

The gender differences reported for the percentages of male and female adolescents ever committing each delinquent act are further indicated by the mean number of acts committed for each gender and by the significant t tests. Statistically significant gender differences were reported for 17 of the 20 delinquent acts. As in previous research on self-reported delinquency (e.g., Canter, 1982), male adolescents reported committing a higher number of aggressive activities (e.g., fighting) and serious offenses (e.g., car theft) than did female adolescents. Given these gender differences, subsequent analyses were conducted separately for male and female adolescents.

Ethnic and racial group differences in delinquent activity were analyzed using one-way analyses of variance (ANOVA) and Scheffe's post hoc comparisons. For the summated, 20-item delinquency index, no statistically significant differences were found for male adolescents, F(2, 1106) = 2.30, p = .10; however, significant differences were found for female adolescents, F(2, 1169) = 5.12, p < .01. The post hoc comparisons indicated that White female adolescents reported higher levels of delinquency than Black female adolescents. Further scrutiny of individual delinquency items indicated that activities involving alcohol and illicit drug use differentiated White and Black female adolescents; White female adolescents engaged in higher levels of delinquent activity for these items.

Correlations Between Delinquency Subscales and Substance Use

Consistent with a multidimensional conceptualization of delinquent activity (e.g., Canter, 1982; Figueira-McDonough et al., 1981; Huizinga & Elliott, 1986), Pearson correlations were computed between delinquency subscales and substance use variables. Table 2 summarizes these findings for male and fe-
Table 1
Male and Female Adolescent Self-reported Delinquent Activity

<table>
<thead>
<tr>
<th>Delinquent act</th>
<th>% ever committing</th>
<th>Ratio Male/female</th>
<th>Mean frequency</th>
<th>t(1, 2383)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Status offenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run away</td>
<td>7.8</td>
<td>9.9</td>
<td>0.79</td>
<td>0.20</td>
</tr>
<tr>
<td>Truancy</td>
<td>39.4</td>
<td>35.3</td>
<td>1.12</td>
<td>2.99</td>
</tr>
<tr>
<td>Property offenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vandalism</td>
<td>32.6</td>
<td>13.7</td>
<td>2.38</td>
<td>1.39</td>
</tr>
<tr>
<td>Shoplifted</td>
<td>31.4</td>
<td>22.6</td>
<td>1.39</td>
<td>1.53</td>
</tr>
<tr>
<td>Theft &lt; $50</td>
<td>26.3</td>
<td>12.6</td>
<td>2.09</td>
<td>0.86</td>
</tr>
<tr>
<td>Theft &gt; $50</td>
<td>9.2</td>
<td>2.3</td>
<td>4.00</td>
<td>0.36</td>
</tr>
<tr>
<td>Car theft</td>
<td>12.9</td>
<td>6.5</td>
<td>1.98</td>
<td>0.48</td>
</tr>
<tr>
<td>Broke into building</td>
<td>11.2</td>
<td>1.8</td>
<td>6.22</td>
<td>0.42</td>
</tr>
<tr>
<td>Sold or held stolen goods</td>
<td>19.3</td>
<td>5.1</td>
<td>3.78</td>
<td>0.92</td>
</tr>
<tr>
<td>Person offenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical fight at school/work</td>
<td>49.8</td>
<td>25.6</td>
<td>1.95</td>
<td>1.96</td>
</tr>
<tr>
<td>Used &quot;strong arm&quot; methods to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>get money/objects from people</td>
<td>6.9</td>
<td>2.5</td>
<td>2.76</td>
<td>0.28</td>
</tr>
<tr>
<td>Hit or threatened to hit</td>
<td>46.7</td>
<td>30.6</td>
<td>1.53</td>
<td>2.52</td>
</tr>
<tr>
<td>someone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically attack with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intent to injure or kill</td>
<td>13.8</td>
<td>6.8</td>
<td>2.03</td>
<td>0.66</td>
</tr>
<tr>
<td>Intentionally lied to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>someone to get what you</td>
<td>29.4</td>
<td>22.5</td>
<td>1.31</td>
<td>1.24</td>
</tr>
<tr>
<td>wanted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance involvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consume alcohol without</td>
<td>47.3</td>
<td>44.2</td>
<td>1.07</td>
<td>6.94</td>
</tr>
<tr>
<td>parental permission</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoked marijuana</td>
<td>22.8</td>
<td>23.2</td>
<td>0.98</td>
<td>6.35</td>
</tr>
<tr>
<td>Used hard drugs</td>
<td>8.9</td>
<td>9.1</td>
<td>0.98</td>
<td>1.11</td>
</tr>
<tr>
<td>Sold marijuana</td>
<td>8.1</td>
<td>4.2</td>
<td>1.93</td>
<td>1.09</td>
</tr>
<tr>
<td>Sold hard drugs</td>
<td>2.0</td>
<td>0.8</td>
<td>2.50</td>
<td>0.20</td>
</tr>
<tr>
<td>Helped in gambling operation</td>
<td>2.9</td>
<td>0.5</td>
<td>5.80</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Note. ns range for male adolescents from 1,231 to 1,254, and for female adolescents from 1,139 to 1,157.

*p < .05. **p < .01. ***p < .001.

Table 2
Pearson Correlations Between Early Adolescent Delinquency Variables and Late-Adolescent Substance Use by Gender

<table>
<thead>
<tr>
<th>Delinquency variables</th>
<th>Alcohol use</th>
<th>Alcohol-related aggressive behaviors</th>
<th>Dependency symptoms</th>
<th>Cigarette use</th>
<th>Marijuana use</th>
<th>Illicit substance use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status offenses</td>
<td>.16 (.06)*</td>
<td>.16 (.08) ns</td>
<td>.14 (.08) ns</td>
<td>.15 (.02)**</td>
<td>.26 (.06)**</td>
<td>.19 (.07)**</td>
</tr>
<tr>
<td>Property offenses</td>
<td>.13 (.12) ns</td>
<td>.20 (.15) ns</td>
<td>.08 (.10) ns</td>
<td>.18 (.10) ns</td>
<td>.19 (.21) ns</td>
<td>.09 (.10) ns</td>
</tr>
<tr>
<td>Person offenses</td>
<td>.15 (.01)**</td>
<td>.14 (.04)*</td>
<td>.10 (.03) ns</td>
<td>.16 (.03)**</td>
<td>.16 (.06)*</td>
<td>.07 (.04) ns</td>
</tr>
<tr>
<td>Substance involvement</td>
<td>.23 (.22) ns</td>
<td>.18 (.21) ns</td>
<td>.12 (.17) ns</td>
<td>.32 (.17)***</td>
<td>.40 (.26)***</td>
<td>.17 (.19) ns</td>
</tr>
<tr>
<td>Delinquency (15 items)</td>
<td>.17 (.07)*</td>
<td>.14 (.10) ns</td>
<td>.12 (.08) ns</td>
<td>.18 (.07)**</td>
<td>.24 (.13)**</td>
<td>.14 (.08) ns</td>
</tr>
<tr>
<td>Delinquency (20 items)</td>
<td>.17 (.14) ns</td>
<td>.14 (.17) ns</td>
<td>.11 (.15) ns</td>
<td>.22 (.09)**</td>
<td>.25 (.18) ns</td>
<td>.18 (.18) ns</td>
</tr>
</tbody>
</table>

Note. Numbers outside the parentheses are correlations for male adolescents and those inside the parentheses are correlations for female adolescents. Statistical significance levels refer to tests of differences between the correlation coefficients for male and female adolescents.

*p < .05. **p < .01. ***p < .001.
male adolescents. The correlations outside the parentheses correspond to correlations of male adolescents and those inside the parentheses correspond to correlations of female adolescents. The statistical significance level for each of these correlations is not presented, in order to make the table more legible. With a sample size of 1,000 participants, a Pearson correlation of .06 is statistically significant at the .05 level, and a correlation of .08 is statistically significant at the .01 level.

A conservative .01 alpha level was used for the correlations for the delinquency subscales (i.e., the first four rows of Table 2) in order to reduce the Type I error rate. These correlations provide two interesting findings. First, for male adolescents, the correlations are statistically significant ($p < .01$) in 23 out of 24 instances, and correlations are relatively similar in size. Second, for female adolescents, only 14 of 24 correlations are statistically significant. Furthermore, none of the six correlations with late-adolescent substance use is significant for early-adolescent person offenses, and only two of six are significant for early-adolescent status offenses. However, all six correlations were significant for both early-adolescent property offenses and early-adolescent substance involvement. Thus, in addition to early-adolescent substance involvement, property offenses committed by early-adolescent girls are associated with late-adolescent substance use.

To test for possible gender differences in the magnitude of the correlations for each bivariate relation, correlations were converted to $z$ scores, and statistical significance tests were conducted. The results of these statistical tests are reported in Table 2 next to the female correlations. These significance levels therefore correspond to tests of differences between the male and female correlations for each of the paired bivariate associations. One-third of the tests indicated statistically significant ($p < .05$) gender differences; male adolescents manifested a more potent relationship in every instance. It thus appears that the antisocial behaviors of early-adolescent boys are more highly associated with late-adolescent substance use than are the antisocial behaviors of early-adolescent girls. However, it should also be noted that no gender differences were found for two-thirds of these statistical tests.

**Longitudinal Relations Between Delinquency and Substance Use**

A hierarchical multiple regression model was used to assess the influence of early-adolescent, non-drug-related delinquency (hereafter called general delinquency) on late adolescent substance use, over and above the influence of early-adolescent substance involvement. The index of general delinquency was formed by summing the frequencies of delinquent behaviors for the 15 delinquency items that did not reference substance involvement. For each of the six dependent variables (alcohol consumption, alcohol-related aggressive behaviors, dependency symptoms, cigarette use, marijuana use, and illicit drug use), a hierarchical multiple regression equation was specified. To minimize the Type I error rate due to multiple comparisons, the alpha level for statistical significance was set at .01.

As already indicated, early-adolescent substance involvement was entered first, followed by general delinquency. In addition, Hispanic ethnicity (Hispanic vs. non-Hispanic), Black ethnicity (Black vs. non-Black), and gender were entered as the third, fourth, and fifth predictors, respectively. Six two-way interactions were entered next in the following order: Substance Involvement $\times$ Hispanic Ethnicity, Substance Involvement $\times$ Black Ethnicity, General Delinquency $\times$ Hispanic Ethnicity, General Delinquency $\times$ Black Ethnicity, Substance Involvement $\times$ Gender, and General Delinquency $\times$ Gender. Finally, 4 three-way interactions were entered in the following order: Substance Involvement $\times$ Hispanic Ethnicity $\times$ Gender, General Delinquency $\times$ Hispanic Ethnicity $\times$ Gender, Substance Involvement $\times$ Black Ethnicity $\times$ Gender, and General Delinquency $\times$ Black Ethnicity $\times$ Gender. Thus, 15 independent variables were entered in each of the six hierarchical regressions (1 for each dependent variable).

Only 3 of 36 two-way and 2 of 24 three-way interactions were significant, and no interaction was significant for more than two of the six dependent variables. Thus, although there may be a few significant interaction effects, there were no readily identifiable patterns that could be interpreted parsimoniously. Consequently, the presentation of the results and the discussion will focus on the "main-effect" predictors as summarized in Table 3.

Adolescent substance involvement, entered first, predicted all six dependent measures. General delinquency and Black ethnicity contributed significantly for four dependent measures, gender for three, and Hispanic ethnicity for two. Thus, all of the main-effect predictors added significantly to the prediction of at least two of the dependent measures. It is of particular importance that general delinquency was a relatively consistent contributor even when the effect of prior substance involvement had already been taken into account.

Although these results suggest an important contribution of general delinquency, it must be remembered that this variable was entered early, which allowed it to capture any predictive variance it had in common with the independent variables entered later. The degree of overlap with other predictor variables was indicated by the significance levels that were found for general delinquency when all 15 predictors had been entered. At this stage, the effect of variables entered later can reduce the significance of variables entered earlier. In all six regression models, the effect of general delinquency was nonsignificant in the final analyses with all 15 predictors. Examination of the regression analyses suggested that the loss of significance for general delinquency was especially associated with gender and Black ethnicity when these were entered as single predictors or in interaction with general delinquency. Also, all five of the significant two- and three-way interactions mentioned above involved general delinquency. Thus, general delinquency may well share predictive variance with ethnicity and gender and may interact with these variables for specific dependent measures.

**Discussion**

The research findings of this study, which used a national probability sample of adolescents, corroborated findings of some prior studies that had used more restricted samples (e.g., juveniles or alcoholics). For example, the general pattern of covariation among problem behaviors was consistent with Jessor and Jessor (1977), and the finding of higher substance use among those reporting higher levels of antisocial behaviors was...
in accord with Blane (1982–1983). The higher level of substance abuse in late adolescence among those reporting higher levels of antisocial behavior in early adolescence also was consistent with studies summarized by Zucker and Gomberg (1986) on childhood precursors of adult alcoholism.

In assessing gender specificity for the interrelationships between delinquency subscales and substance use variables, the findings indicate that, for women, late-adolescent substance use is more highly associated with the commission of property offenses (e.g., vandalism or car theft) in early adolescence than with offenses in other categories (e.g., status or person offenses). This relationship may be due to the severity of these offenses. The higher severity of these offenses reflects higher levels of deviance, and these categories are subsequently associated (4 years later) with more dysfunctional substance-abuse behavior. These relationships between offense categories and subsequent substance use and abuse do not parallel the findings for men, where interrelationships are more uniform between offense categories and substance use and abuse. Therefore, the severity of offenses may have different meanings and implications for male and female adolescents and may differentially predict subsequent behaviors.

The hierarchical multiple regression analyses revealed several interesting findings regarding the prediction of late-adolescent substance use from early adolescent delinquency, gender, and ethnicity. Early-adolescent substance involvement was the most consistent predictor of late-adolescent substance use, alcohol-related aggression, and alcohol-dependency symptoms; it significantly predicted all six dependent variables. However, early-adolescent, non-substance-related delinquency was also significantly related to four of the dependent variables following the forced entry of early adolescent substance involvement in the regression equations. That is, early-adolescent, non-substance-related delinquency significantly predicted variation in four of the six dependent variables over and above the variation predicted by early-adolescent substance involvement. This is of importance because it suggests that early-adolescent general delinquency, rather than simply substance involvement, increases the risk for late-adolescent substance abuse and related alcohol problems.

Male gender was a significant predictor of alcohol use, alcohol-related aggression, and alcohol-dependency symptoms. In interpreting this finding, one must consider differences in substance-use practices among male and female adolescents. Epidemiological studies have indicated that male adolescents begin drinking at an earlier age than do female adolescents and that a larger percentage of male adolescents than female adolescents are heavy drinkers (e.g., Barnes & Welte, 1986; Rachal et al., 1980). Thus, the age range used in this study may have been one that favored predictive relations for male adolescents with respect to delinquency–drinking behavior relations, whereas predictive relations for gender might have been somewhat attenuated if the second occasion of measurement had occurred when subjects were older and drinking experiences more similar. It is also possible that early-adolescent, delinquent behavior may not be an equally potent predictor of adolescent (or adult) substance use for men and women. Rather, for women, it is conceivable that internalizing symptomatology (e.g., depression),

---

Table 3
Hierarchical Multiple Regressions Predicting Late-Adolescent Substance Use With Predictor Variables: Regression Coefficients and $R^2$ Values for Each Model

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Alcohol use</th>
<th>Aggressive behaviors</th>
<th>Dependency symptoms</th>
<th>Cigarette use</th>
<th>Marijuana use</th>
<th>Illicit substance use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance involvement (SI)</td>
<td>.22***</td>
<td>.25**</td>
<td>.20**</td>
<td>.27**</td>
<td>.13**</td>
<td>.18**</td>
</tr>
<tr>
<td>General delinquency (GD)</td>
<td>.12** (ns)</td>
<td>.08** (ns)</td>
<td>.08* (ns)</td>
<td>ns</td>
<td>.07* (ns)</td>
<td>ns</td>
</tr>
<tr>
<td>Non-Hispanic/Hispanic (H)</td>
<td>ns</td>
<td>.09**</td>
<td>ns</td>
<td>.09**</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Non-Black/Black (B)</td>
<td>-19**</td>
<td>-11**</td>
<td>-07**</td>
<td>-11**</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Gender (G)</td>
<td>.23**</td>
<td>.15**</td>
<td>.18**</td>
<td>ns</td>
<td>(0.06**)</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Two-way interactions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI × H</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>SI × B</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>GD × H</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>GD × B</td>
<td>.12** (ns)</td>
<td>.10* (ns)</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>SI × G</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>GD × G</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Three-way interactions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI × H × G</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>SI × B × G</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>GD × B × G</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td><em>F Value</em></td>
<td>18.24***</td>
<td>18.09***</td>
<td>14.28**</td>
<td>17.31**</td>
<td>3.87***</td>
<td>5.65**</td>
</tr>
<tr>
<td><em>R^2</em></td>
<td>.16</td>
<td>.11</td>
<td>.09</td>
<td>.11</td>
<td>.03</td>
<td>.04</td>
</tr>
</tbody>
</table>

Note. Beta weights and significance levels for the successive entry of predictors in the respective regression equations appear without parentheses. Beta weights and significance levels of variables in which significance levels were altered in the full 15-variable predictor model are given in parentheses. The $F$ and $R^2$ values are in reference to the 15-variable predictor model.

* $p < .01$. ** $p < .001$. 
rather than externalizing symptomatology (e.g., delinquency),
may be more predictive of substance use and abuse (e.g., Ens-
minger, Brown, & Kellam, 1982; Windle & Barnes, 1988).

Differences in ethnicity were predictive in several regression
equations, particularly with regard to the non-Black/Black cat-
egories. The direction of beta weights in the regression
equations in which the Black ethnicity variable was significant
indicated that non-Black status was predictive of late-adoles-
cent alcohol and cigarette use, alcohol-related aggression, and
dependency symptoms. Again, epidemiological findings are in-
formative in that they consistently demonstrate that Black ado-
scents report lower levels of substance use than do White and
Hispanic adolescents (e.g., Barnes & Welte, 1986; Harford,
1984; Rachal et al., 1980). Given the lower levels of substance
use by black adolescents, early adolescent delinquency may not
be as predictive of late adolescent substance use as it is for some
other adolescent ethnic groups. Whether early adolescent delin-
quency among Black adolescents (and adolescents of other eth-
nic groups) predicts substance use and abuse, antisocial behav-
iors, and criminality in adulthood cannot be addressed in this
study; however, a major objective of developmental psychopa-
thology is to study such variations in the timing and temporal
ordering of events and processes that link early-adolescent de-
linquency to late-adolescent and adult dysfunctional behaviors,
including substance use and abuse.

There are, of course, many variables not included in this
study that influence causal pathways leading toward and away
from antisocial behaviors in early-adolescent and late-adoles-
cent substance use. For example, familial influences (e.g., disci-
plinary practices, marital discord, and parental psychopath-
ology) have been consistently related to antisocial behavior and
substance use in childhood and adolescence (e.g., Hetherington
& Martin, 1986; Jessor & Jessor, 1977; Patterson, 1982). The
study does, nevertheless, indicate that early-adolescent anti-
social behaviors are predictive of late-adolescent substance use
and that male gender and non-Black ethnicity are also signifi-
cant predictors of late-adolescent substance use. Future re-
search will need to use longitudinal research designs to untangle
and more precisely specify the processes involved in the de-
velopment of substance abuse problems in late adolescence and
early adulthood and the role(s) of antisocial behaviors in this
process.

References
use among 7th-12th grade students in New York State. Journal of
Studies on Alcohol, 47, 53-62.
Blane, H. T. (1982-1983). Problem drinking in delinquent and nonde-
linquent adolescent males. American Journal of Drug and Alcohol
Abuse, 9, 221-232.
the literature, 1960-1975. (Contract No. ADM 281-75-0026). Wash-
ington, DC: National Institute on Alcohol Abuse and Alcolholism.
ology, 20, 373-393.
Collins, J. J. (1986). The relationship of problem drinking to individual
offending sequences. In A. Blumstein, J. Cohen, J. A. Roth, & C. A.
Visher (Eds.), Criminal careers and "career criminals"(pp. 89-120).
in the antecedents of substance use among adolescents. Journal of
Social Issues, 38, 25-47.
deviance: Gender similarities in adolescent subcultures. In M. Q.
Warren (Ed.), Comparing female and male offenders (pp. 17-45).
Psychiatric illness and crime with particular reference to alcoholism:
A study of 223 criminals. Journal of Nervous and Mental Disease,
134, 512-521.
adolescents: Results of a national survey. Annals of the New York
Academy of Sciences, 472, 130-141.
Hetherington, E. M., & Martin, B. (1986). Family factors and psychopa-
thology in children. In H. C. Quay & J. S. Werry (Eds.), Psychopatho-
lological disorders of childhood (3rd ed., pp. 332-390). New York: Wi-
ley.
Huizinga, P., & Elliott, D. S. (1986). Reassessing the reliability and va-
Criminology, 2, 293-327.
personality, and deviant behavior: A study of a tri-ethnic community.
development: A longitudinal study of youth. New York: Academic
Press.
Kohlberg, L., LaCrosse, J., & Ricks, D. (1972). The predictability of
adult mental health from childhood behavior. In B. Wolman (Ed.),
Manual of child psychopathology (pp. 1217-1284). New York: Mc-
Graw-Hill.
Rachal, J. V., Guess, L. L., Hubbard, R. L., Maisto, S. A., Cavanaugh,
behavior: Vol. I. The extent and nature of adolescent alcohol and drug
use: The 1974 and 1978 national sample studies (pp. 1-140). Chapel
Hill, NC: Research Triangle Institute.
Robins, L. N. (1966). Deviant children grown up. Baltimore, MD: Wil-
liams & Wilkins.
Robins, L. N. (1986). Changes in conduct disorder over time. In D. C.
Farran & J. D. McKinney (Eds.), Risk in intellectual and psychoso-
Windle, M., & Barnes, G. M. (1988). Similarities and differences in
 correlates of alcohol consumption and problem behaviors among
male and female adolescents. The International Journal of the Addic-
tions, 23, 707-728.
Zucker, R. A., & Gomberg, E. S. L. (1986). Etiology of alcoholism re-
considered. American Psychologist, 41, 783-793.

Received August 8, 1988
Revision received July 29, 1989
Accepted August 7, 1989