Parameters of Teenage Alcohol Use: A Path Analytic Conceptual Model

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Table 1: Path Analytic Conceptual Model

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Direct Effects</th>
<th>Indirect Effects</th>
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<tbody>
<tr>
<td>Parental modeling</td>
<td>Alcohol use</td>
<td>Peer use</td>
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<td>Family cohesion</td>
<td>Alcohol use</td>
<td>Peer use</td>
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<td>Peer attitudes</td>
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<td>Alcohol use</td>
<td>Adolescent social skills</td>
<td>Alcohol use</td>
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<td>Alcohol use</td>
<td>Cognitive expectancies of alcohol</td>
<td>Alcohol use</td>
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Alcohol abuse among adolescents is a serious social and health problem. Numerous surveys in the past decade have suggested that upwards of 15%-40% of junior and senior high school students may experience drinking-related problems (e.g., Hetherington, Dickinson, Cipwynyk, & Hay, 1978; Rachal, Hubbard, Williams, & Tuchfeld, 1976). Early reports of alcohol abuse among teenagers tended to be descriptive, clinical case reports (e.g., Lourie, 1943). Investigations conducted from the 1950s through the early 1970s typically used simple correlational methods to assess the relation between individual variables and adolescent drinking. Teenage alcohol use and abuse was found to vary with such parameters as parental modeling of alcohol use, family cohesion, peer alcohol use, peer attitudes toward alcohol, demographics, adolescent social skills, and cognitive expectancies of the effects of alcohol (e.g., Burkett, 1980; Christiansen, Goldman, & Inn, 1982; Zucker & Barron, 1970). The contribution of simple correlational studies, however, was limited by the inability to identify the relative predictive power of these parameters of teenage drinking and the inability to evaluate complex interrelations among the variables that influence adolescent alcohol use.

Recent adolescent drinking studies have used more sophisticated methods, such as multiple regression (Jessor & Jessor, 1975, 1977; Smart & Gray, 1979; Smart, Gray, & Bennett, 1978), which allow simultaneous evaluation of several predictors of teenage drinking. A recent methodological advance has been the application of path-analytic techniques to the study of adolescent drinking (e.g., Cronkite & Moos, 1980; Huba & Bentler, 1982; Huba, Wingard, & Bentler, 1980). Briefly, path analysis is a technique that yields estimates of the magnitude of effects of several independent variables upon some criterion behavior or dependent measure. Predictor-variable effects are defined quantitatively (e.g., direct effects of independent variables upon the dependent measure are usually represented as the percent of 1 standard deviation change in the criterion measure associated with a change of 1 full standard deviation in the independent measures, holding all other variables constant). Path coefficients are thus analogous to standardized beta weights in multiple regression (Kenny, 1979).

There are two advantages of path analysis over a multivariate algorithm such as multiple regression. First, path analysis allows estimation of the interrelations among the predictor variables that may affect the criterion behavior; these patterns of covariation are known as indirect effects (Alwin & Hauser, 1975; Cronkite & Moos, 1980). Second, path analysis requires an a priori theoretical model that specifies the hypothesized interrelations between predictor and criterion variables. The statistical procedures of path analysis are thus of secondary importance to the construction and evaluation of reasonable theoretical models (Duncan, 1975). Because it can be used to evaluate the adequacy of models designed to identify the parameters of some criterion using nonexperimental data, path analysis has sometimes been referred to as causal modeling for correlational data. Although this view of path analysis is controversial (Kenny, 1979), the method, nevertheless, can be used to test and improve theoretical models.

Path analysis has become an increasingly attractive statistical procedure to those working in the area of alcohol research, largely because the technique can be used to aid the construction and evaluation of empirically based models of teenage drinking. Recently, there has been an increasing awareness of the need for comprehensive conceptual models for two reasons. First, data collected in this area are typically nonexperimental in nature, and their interpretation must be conducted within some theoretical framework. Second, the inability of several types of primary, secondary, and tertiary prevention programs...
to substantially modify teenage drinking has highlighted the lack of a precise theoretical framework to guide program planning, modification, and implementation (Huba, Wingard, & Bentler, 1980).

The purpose of the present study was to evaluate a path-analytic model of adolescent drinking. A large sample of high school students completed questionnaires reflecting several parameters identified in previous research as predictive of teenage alcohol use. This study was distinguished by its use of the linear structural relations (LISREL) method of path analysis, developed by Jöreskog and Sörbom (1984), to analyze the intercorrelations among variables that influence adolescent drinking.

Method

Subjects

A total of 499 high school students participated in this study. Subjects were drawn from four large, suburban public high schools in the midwestern United States. Univariate analyses indicated that the students from the four high schools did not differ significantly across demographic characteristics (age, sex, and race) or age of first alcohol use. Of these 499 students, 208 students were in Grade 12, 176 in Grade 11, and 115 in Grade 10. Girls comprised 51% of the sample; Whites comprised 96% of the sample, with Blacks comprising 2% and Orientals comprising 2%. The average age was 16.6 years. Of the entire sample, 17% (16% of the boys, 18% of the girls) reported themselves to be abstainers, and the mean age of first alcohol use among the remaining 83% was 13.2 years. The reported average number of drinks (number of bottles of beer or glasses of wine or 1 oz portions of liquor) consumed each month by the subjects who drank was 23 (SD = 34). The boys reported a mean of 27 drinks consumed each month (SD = 39), whereas the girls reported a mean of 18 drinks (SD = 27); these mean values are significantly different and are consistent with previous research that has suggested higher levels of alcohol consumption by male adolescents.

The drinking levels of the adolescents who reported alcohol use were classified according to criteria used by Hetherington et al. (1978) and Rachal et al. (1976). Six percent of all subjects were infrequent (1 drink or less per month) drinkers (5% of the boys, 7% of the girls); 13% were light (2–4 drinks per month) drinkers (13% of both sexes); 35% were moderate (5–20 drinks per month) drinkers (31% of the boys, 38% of the girls); and 29% were heavy (more than 20 drinks per month) drinkers (35% of the boys, 23% of the girls). Adolescents who were either moderate or heavy drinkers and also reported two or more serious drinking-related consequences on the Problem Drinking Scale (PDS; Parks, 1958; Smart et al., 1978) were classified as problem drinkers. Boys comprised 52% of problem drinkers, 38% of the girls) were problem drinkers.

Independent measures. Adolescent drinking criteria. Teenage drinking was measured by three scales: a quantity-frequency index of the number of drinks (bottles of beer or glasses of wine or shots of liquor) reported consumed each month (Hetherington et al., 1978; Smart et al., 1978; Strauss & Bacon, 1953; Rachal et al., 1976); the Problem Drinking Scale (PDS; Parks, 1958; Smart et al., 1978); and one descriptive item from Cahanal (1970) that provided a summary of the subjects' overall perception of their own level of drinking (1 = nondrinker, 2 = very light, 3 = fairly light, 4 = medium, 5 = fairly heavy, 6 = very heavy). Quantity-frequency indices of the number of alcoholic drinks reported consumed each month provide a common criterion measure in studies of teenage drinking and allow comparison of drinking rates across studies. The PDS consists of 12 true-false items that reflect behaviors indicative of problem drinking (e.g., drinking before breakfast; intoxication more than once a week; blackouts; drinking has led to aggressive or destructive behavior). Williams (1967) reported that the PDS significantly discriminated between problem and nonproblem drinking college students (drinking status defined by independent criteria). The average intercorrelation of these criterion measures within the present sample was .66 (range = .65–.67). Higher scores on all three criterion measures suggested greater alcohol use and associated problems.

Independent measures. Family functioning. The adolescents' ratings of family interactions and communication integrity were assessed by two rating scales: the 16-item Family Disengagement scale from the Family Adaptability and Cohesion Evaluation Scales II (FACES II; Olson, Bell, & Portner, 1982) and the 22-item Conflict Behavior Questionnaire (CBQ; Prinz, Foster, Kent, & O'Leary, 1979).

The FACES II Family Disengagement scale consists of items such as, "In our family everyone goes his own way," and subject agreement with each item is rated on a 5-point scale. Olson et al. (1982) reported an internal consistency coefficient of .83, and Rodick, Henggeler, and Hanson (1986) reported a 1-week test-retest reliability coefficient of .90. The Family Disengagement scale of the FACES II has been successfully applied to the discrimination of clinic and nonclinic families and marital dyads by Garbarino, Seben, and Schellenbach (1984), Rodick et al. (1986), and Russell (1979) and Sprinkle and Olson (1978).

The CBQ is comprised of items such as, "We almost never seem to agree," which are presented in a true-false format, and is designed to reflect adolescents' perceptions of the quality of family communication. Prinz et al. (1979) reported an internal consistency coefficient of .94 for the CBQ. These investigators also found that the CBQ was the strongest discriminator of clinic and nonclinic mother–adolescent dyads in multiple analyses when compared with several other classes of independent variables (e.g., coded tape-recorded conversations of mothers and adolescents, daily home reports of conflict).

The correlation between the FACES II Family Disengagement scale and the CBQ Communication scale in the present sample was .30; the FACES II scale attained an average correlation with the three drinking criterion scales of .32 (range = .27–.36), whereas the average correlation of the CBQ scale with the criterion drinking measures was .36 (range = .34–.38). High scores on both scales indicate perceived poor communication and high family disengagement or conflict.

Parental alcohol approval. Four Cahalan (1970) items that reflected the subjects' perceptions of parental approval of their drinking were used. Separate items for mother and father approval of alcohol use by their children were presented, including "What is the attitude of your father toward your drinking?" and "What is the attitude of your mother toward your drinking?" (1 = strongly disapprove, 2 = indifferent, 3 = strongly approve) as well as "What influence did your father have on your drinking?" and "What influence did your mother have on your drinking?"
drinking?" (1 = drink less, 2 = none, 3 = drink more). Responses to the two items about perceived father approval were summed, as were those to the two items about mother approval, to obtain a separate rating for each parent. Higher scores suggested greater perceived parent approval or actual encouragement of adolescent drinking. The correlation of the sum of the two father items with the sum of the two mother items was .60 in this sample, both sums attained negligible correlations with the drinking criterion scales (range = -.05-.02).

Peer alcohol approval. The perceived degree of peer use and approval of the consumption of alcohol was assessed using a quantity-frequency index of the number of drinks the adolescents reported that their closest friends consumed each month and two descriptive items presented by Cahalan (1970). The Cahalan items were "What is the attitude of your two or three closest friends about your drinking?" (1 = strongly disapprove, 2 = indifferent, 3 = strongly approve) and "What influence have your two or three closest friends had on your drinking?" (1 = drink less, 2 = none, 3 = drink more). For both the number of reported peer drinks per month and all Cahalan items, higher scores reflected greater perceived peer alcohol use and approval. These three peer approval indices attained an average intercorrelation of .20 (range = .03-.54), and the mean correlation of all peer scales with the drinking criterion scales was .30 (range = .04-.71).

Adolescent social skills. Two scales were used to measure adolescent social reasoning skills and activity: the Adolescent Problems Inventory (API; Freedman, Rosenthal, Donahoe, Schlundt, & McFall, 1978) and the Adolescent Activity Scale (AAS; Douvan & Adelson, 1966). The API consists of 44 multiple-choice items, and each item presents a brief scenario involving a problematic social interaction with parents, peers, teachers, or others. Subjects select one of five behavioral alternatives (ranging from physical aggression to more appropriate responses) to the conflict, and responses are scored based on the adaptiveness of the choice. Freedman et al. (1978) reported an internal consistency coefficient of .97 for the API and reported that this scale significantly discriminated samples of institutionalized delinquents, noninstitutionalized control adolescents, and adolescent leaders (nominated by school guidance counselors for high adjustment). The API also significantly discriminated among institutionalized delinquent boys who differed in frequency of behavior problems exhibited on the ward (Freedman et al., 1978). More recently, Hunter and Kelley (1986) reported that the API failed to significantly predict external criteria, such as the number of arrests and the severity of offenses, within an incarcerated male juvenile sample.

The AAS is a 30-item checklist of common teenage activities (e.g., going to movies, talking on the phone, bicycling, dancing), and the score on this inventory is simply the number of activities endorsed by the adolescent. Higher scores on both the API and the AAS suggest greater social reasoning ability and activity. The API and AAS correlated at .18 (range = .01-.30). For both the number of reported peer drinks per month and all Cahalan items, higher scores reflected greater perceived peer alcohol use and approval. These three peer approval indices attained an average intercorrelation of .20 (range = .03-.54), and the mean correlation of all peer scales with the drinking criterion scales was .30 (range = .04-.71).

Adolescent positive alcohol expectancy. All subjects completed six scales developed by Christiansen et al. (1982) to measure the degree of cognitive expectancy of positive benefits of drinking alcohol. All scale items are presented in a true–false format. These factor analytically derived scales include 15 items to measure alcohol as a magical, global transformer of all experiences (e.g., "Drinking makes the future seem brighter"); 17 items to measure drinking as the enhancement of social and interpersonal experiences (e.g., "People act like better friends after a few drinks"); 10 items to measure the expectancy of alcohol to improve cognitive and motor functioning (e.g., "Drinking makes people more alert"); 10 items to measure the belief that alcohol enhances sexual functioning (e.g., "People feel sexier after a few drinks"); 10 items to measure the expectation that alcohol intensifies and enhances emotionality (e.g., "Drinking makes people feel stronger or more powerful"); and 13 items to measure the belief that alcohol reduces tension and enhances relaxation (e.g., "Drinking relaxes people"). Internal consistency coefficients for these scales were .75, .76, .66, .77, .47, and .74, respectively. These expectancy scales are positively predictive of level of alcohol consumption among adolescents (Christiansen et al., 1982), with high scores indicating greater belief in these perceived behavioral effects of alcohol. In the present study, the average intercorrelation among the six AEQ scales was .27 (range = .07-.60); the mean correlation with the drinking criterion scales was .20 (range = .01-.49).

Path-Analysis Model of Teenage Drinking

Presented in Figure 1 is the path-analysis model of teenage alcohol use evaluated in this study. This LISREL path analysis consists of two components: a measurement model and a structural equation model (Bryner & Romney, 1985; Everitt, 1984; Joreskog & Sorbom, 1984). The measurement model is the LISREL representation of measurement error. Most path-analysis procedures are predicated on the assumption that constructs are measured without error, both in terms of the reliability and the construct validity of psychological tests (Lomax, 1986). This assumption is usually unrealistic, however, and the estimation of path coefficients will likely be biased if scale reliabilities are less than 1.00 (Won, 1982).

The LISREL analysis represents measurement error in the following manner: the algorithm is based on the assumption that test scales imperfectly measure underlying or latent constructs. The LISREL program constructs linear combinations of observed scales (as in factor analysis) to estimate standardized scores on the latent variables, and loadings of the observed scales on these linear combinations indicate the magnitude of the covariance of each scale with underlying latent constructs. Residual or error variance is estimated for each observed measure and represents variance not shared with other observed measures in the theoretical model.

More specifically, the representation of residual or error variance of the observed variables in LISREL is essentially identical to the representation of residual variance in common factor analysis: the variance of all measures is partitioned into common and residual (or unique) variance (Lord & Novick, 1968). Common variance is that shared with other measures of the same underlying construct, whereas residual variance consists of two components: random, unsystematic variability (due to random sources of measurement error, such as error in item content sampling; Nunnally, 1978) and nonrandom variance that is specific to each observed measure (due to selection of particular measures by the investigator; Lomax, 1986). Thus, LISREL represents both random measurement error and specific variance in its estimation of the residual variance of the observed measures. Also, LISREL estimates of the direction and the magnitude of relations among the latent constructs are corrected for attenuation due to the residual variance of the observed measures (Joreskog & Sorbom, 1984). This algorithm is analogous to the classical correction for attenuation for estimating the correlation of true scores of two variables by using the correlation between observed scores and the reliability of each measure (Lomax, 1986; Lord & Novick, 1968).

The measurement model aspect of Figure 1 shows the latent constructs that are hypothesized to be measured by the indicated observed scales. Consistent with standard LISREL notation (Joreskog & Sorbom, 1984), observed variables are indicated with rectangles and latent constructs are indicated with circles. One-way arrows connecting the underlying constructs with the observed measures represent the factor loadings of the observed scales. As an example of one portion of the LISREL measurement model, the latent construct positive alcohol expectancy is measured by six separate rating scales.

The second component of a LISREL path model, the structural equation model, specifies the relation between the latent constructs. One-way arrows between the circles in Figure 1 represent the postulated direct effects between the latent constructs. And path coefficients in the LISREL algorithm provide estimates of the direction and magnitude of direct effects among the latent variables. Because the LISREL procedure
can provide standardized path coefficients, the scale of measurement of the latent constructs in LISREL is arbitrary and thus allows use of observed variables with different measurement metrics.

Three classes of constructs empirically associated with the criterion of teenage drinking in previous research are outlined in Figure 1. These constructs or parameters are arranged by proximity to the target behavior of drinking. Quantity of alcohol consumed and degree of related problems are hypothesized to be influenced by several adolescent characteristics, including age, sex, social skills, and positive alcohol expectancies. For example, positive alcohol expectancies seem to be clearly established before the actual onset of drinking and are positively correlated with quantity of alcohol consumed among adolescents who are drinking (Christiansen et al., 1982). Figure 1 also presents the hypothesized reciprocal relations (represented by two-way arrows) among social skills, expectancies, and drinking. That is, although adolescent levels of social skills competence and alcohol expectancies may affect initial alcohol use, continued drinking experience may in turn alter these characteristics. For example, although previous research has indicated that adolescents with poor social skills are at risk for heavier alcohol use, heavy alcohol use may in turn lead to further deterioration of social skills.

Other types of hypothesized parameters of adolescent drinking include peer approval of alcohol use and family/parent variables (family cohesion, communication, and parental alcohol approval). Although these variables have been individually identified as possible determinants of teenage drinking, recent findings indicate that parents may also affect peer alcohol approval by influencing the selection of their children's friends (i.e., by serving as "parental gatekeepers"; Hansen, Graham, Sobel, Flay, & Johnson, 1985). Because there was no theoretical reason to expect a causal link between parent alcohol approval and adolescent social skills, a path between these variables is not specified.

As shown in Figure 1, several possible indirect effects among these variables are outlined. For example, peer alcohol attitude and approval could influence an adolescent's positive expectancies of alcohol, which in turn could affect his or her use of alcohol. Family cohesion could affect adolescent social skills, which in turn could influence the amount of drinking.

Statistical Analysis

The LISREL algorithm is an iterative maximum-likelihood procedure that estimates several parameters of the measurement and structural equation models. Estimated parameters include the loadings of observed variables on the latent constructs (specified by the measurement portion of the model) and of the path coefficients among the latent variables (specified by the structural equation portion of the model; Jöreskog & Sörbom, 1984). As mentioned, these path coefficients indicate the magnitude of direct influences or effects among the latent variables and are interpreted as standardized regression weights. Also, indirect and total effects (the sum of direct and indirect effects) of all predictors on the criterion measures are estimated.

The overall goodness-of-fit of the hypothesized path model to the observed patterns of variable covariation is evaluated by indices provided by the LISREL program, including a chi-square test of the fit of the entire model and an overall goodness-of-fit index (which varies between 0-1) and indicates the relative amount of observed variance and covariance accounted for by the model (Jöreskog & Sörbom, 1984).

Results

Evaluation of Response Biases

Because all measures used in this study were adolescent self-report scales, three indices were examined to evaluate the possibility of pervasive response biases in the subjects' questionnaire responses. These indices included relations among specific sets of measures, the pattern of intercorrelations of all rating scales, and the comparability of rates of alcohol use reported by the current sample with those reported in independent studies. All three characteristics have been utilized in previous adolescent alcohol-use surveys as indices of the accuracy and integrity of subject responses (e.g., Porter, Vieira, Kaplan, Heesch, & Colyar, 1973; Whitehead & Smart, 1972).

The first index allows evaluation of whether a high portion of the subjects responded randomly to questionnaire items. If large numbers of subjects responded to questionnaire items randomly, then a number of relations may not be found. As expected, male adolescents reported drinking significantly more alcoholic drinks each month than female adolescents; the number of reported drinks consumed each month increased with subject age (mean drinks per month for age 15 and under = 18; for age 16 = 21; for age 17 and older = 25); and the number of serious drinking-related problems reported in the last year (on the PDS) correlated significantly with the number of drinks consumed each month, \( r(497) = .68, p < .01 \).

Other systematic types of response sets (such as the halo effect) may be suggested by inspection of the patterns within the correlation matrix of all measures. For example, failure to find discriminant validity (the failure of conceptually distinct measures to correlate significantly) could indicate the presence of a systematic response set (Cronbach, 1984). In the present study,
the correlation matrix of all observed measures suggested patterns of covariation consistent with theoretical expectations. For example, there was no theoretical reason to anticipate a significant covariation between ratings of parental alcohol approval and scores on the adolescent social skills reasoning (ASIR) and activity (SAAS) scales, and these zero-order correlations ranged from -.05 to -.11. Adolescent self-reports of the number of drinks consumed each month and the number of drinks believed to be consumed each month by their peers were only moderately correlated (r = .35), suggesting that the subjects may have been able to differentiate their own frequencies of drinking from their friends' frequencies.

Finally, the levels of alcohol use (the numbers of subjects who were classified as abstainers, infrequent, light, moderate, and heavy drinkers) and the incidence of problematic consequences of drinking reported by subjects in this study were similar to findings of other surveys of high school students in the United States (Donovan et al., 1983; Moberg, 1983; Rachal et al., 1976) and in Canada (Hetherington et al., 1978).

Although such indices do not, of course, affirm the accuracy of the self-reports of all subjects, neither do they indicate that wide-scale distortion or random responding compromised the accuracy of this data set.

**Predictive Power of Adolescent, Peer, and Family Variables**

To provide an index of the overall predictive power of the path model outlined in Figure 1, the 18 observed (family/parent, peer, demographic, social skill, and positive alcohol expectancy) variables were entered as independent variables in a multiple correlation analysis. The multiple correlation between all predictors and a linear composite of all three teenage drinking indices (drinks per month plus PDS plus drinking self-concept) was .72, F(18, 490) = 90.40, p < .001, indicating that a substantial 52.4% of the total criterion variance was explained by all predictor variables.

**Fit of the Path-Analytic Model**

The LISREL goodness-of-fit indices indicated adequate fit of the path model in Figure 1 to the observed data. The overall goodness-of-fit index, which varies from 0 (no correspondence to the data) to 1.00 (perfect fit) was .944, and the adjusted goodness-of-fit index (corrected for degrees of freedom) was .900. The associated chi-square statistic was significant, χ²(118, N = 499) = 307.72, p < .01. Although the statistical significance of this chi-square test may suggest poor fit of the model, its significance is virtually guaranteed in a large sample. In this instance, the overall goodness-of-fit statistics may be more appropriate indices (Everitt, 1984).

**Total, Direct, and Indirect Effects**

Presented in Table 1 are the LISREL estimates of the total effects of the adolescent ratings of family/parent, peer, demographic, social skill, and alcohol expectancy variables on one another; estimates of the total effects of these variables on self-reported drinking; and reciprocal effects of drinking on social skills and alcohol expectancies. The effects of adolescent demographics (sex and age) upon all subsequent variables were relatively small (all < .160), indicating little incremental validity in the prediction of adolescent ratings of social skills, positive expectancies, or drinking. By contrast, the total effects of adolescent ratings of family functioning and parental alcohol approval on subsequent variables were substantial. Reports of high levels of family disengagement, poor communication, and parental alcohol approval were positively predictive of peer alcohol approval (.497) and negatively related to adolescent social skills (— 1.093). Adolescents who reported poor family relationships also expressed stronger beliefs (.119) about alcohol's positive influence on social, emotional, cognitive, interpersonal, or sexual functioning.

Ratings of perceived peer and parental alcohol approval were both positively predictive of the strength of adolescents' beliefs about the beneficial effects of alcohol (.962 for parental approval, .758 for peer approval). As expected, reported parental attitudes toward alcohol use corresponded strongly with peer attitudes (.484). Inspection of the reciprocal effects of drinking on adolescent ratings of alcohol expectancies and social skills indicated that higher levels of alcohol use could have been associated with a deterioration (—.456) of social skills and with an increase (.246) of positive expectancies.

The LISREL estimates of the direct and indirect effects of all predictor variables on adolescent drinking are summarized in Table 2. Coefficients for specific indirect effects are reported only if their values are greater than .150. Consistent with results reported in Table 1, the direct and indirect relations of age and sex to reports of drinking were very small. The direct effects...

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1 Jöreskog and Sörbom (1984) suggested that another indication of the adequacy of fit of a path-analytic model in LISREL is that the program does not output "unreasonable" values for several types of information. Examples of unreasonable output include negative variances or correlation coefficients with absolute values greater than 1.00. Because the LISREL estimation procedure is not constrained to yield only reasonable values, this is no small consideration. Such unreasonable values, which may occur concurrently with relatively high overall goodness-of-fit index values, would indicate a flawed model. No such unreasonable values were obtained in the present analysis.

2 The LISREL estimates of the reciprocal effects between social skills and drinking and between alcohol expectancies and drinking were constrained to be equal. There was no a priori reason to suspect that the causal effects among these constructs were greater (or less) in one direction than another (e.g., that social skills had a greater impact on drinking than drinking had on social skills). Such equality constraints are common in reciprocal causal models and in turn reduce the number of parameters that must be estimated.

3 Because total effects are the sum of all direct and indirect effects of variables on subsequent variables in a causal model, the absolute values of these sums may be greater than 1.00. Also, some of these total effects, such as those for perceived parental approval of teenage drinking, are much higher than the zero-order correlations than some of these measures obtained with the drinking criterion scales. However, recall that path coefficients reflect predictive power corrected for intercorrelations with other measures and that it is possible for path coefficients for some variables to be larger than their zero-order validity coefficients (e.g., as in a suppressor effect in multiple regression).

4 Significance tests are reported in Table 2 only for direct effects. Because indirect effects are calculated by multiplying values of the appropriate direct effects, there is no statistical test available for individual indirect effects (Billings & Wroten, 1978).
of family functioning (.617) and peer alcohol approval (.579) ratings were significant. Direct effects of parental alcohol approval (.257), adolescent social skills (−.374), and alcohol expectancy (.201) ratings were smaller but statistically significant.

Perceived family cohesion/communication and parental alcohol approval ratings had relatively large indirect effects on teenage drinking. Overall family disengagement (.334) and perceived parental alcohol approval (.326) appeared to indirectly influence drinking through positive covariation with perceived peer alcohol approval. That is, adolescents who reported higher family conflict and parental approval of drinking also reported higher levels of alcohol use by their friends. Adolescents who reported poor family relationships or high family conflict also tended to have poorer social reasoning skills and lower activity levels and, in turn, reported more alcohol use (indirect effect = .225).

Discussion

The use of alcohol among teenagers is a multifaceted phenomenon, influenced by a complex network of antecedent external, family, and intrapersonal and interpersonal parameters. In this study, over 50% of the adolescent drinking criterion variance was accounted for by measures of adolescent alcohol expectancies, social skills, family functioning, and perceived peer and parental approval of alcohol use. In addition, the path analytic model evaluated in this investigation allowed identification of numerous direct and indirect influences among these parameters of adolescent drinking.

Before outlining the combinations of effects on teenage drinking suggested by the results of this study, some possible limitations to the generalizability of these findings will be considered. One important issue concerns the self-report method used in this investigation. Because all scales used in this study were self-report measures, common method variance may have inflated the absolute magnitudes of some of the obtained predictor-variable path coefficients. The relative magnitudes of these coefficients (and the differential predictive power indicated by them), however, would probably not have been affected by common method variance. Also, adolescents’ self-reports of the quantity and frequency of their drinking cannot automatically be assumed accurate (Bry, 1978). Previous research designed to evaluate the accuracy of adolescent self-reports concerning substance use, however, has generally supported their reliability and validity (Lavenhar, 1979; Porter et al., 1973; Whitehead & Smart, 1972). Most evidence suggests that adolescents tend to overreport rather than underreport their substance use (Schinke & Gilchrist, 1985). However, Petzel, Johnson, and McKillip (1973) reported that the base rate of high school students in their sample (N = 628) who were obviously exaggerating their substance use (as indicated by endorsement of use of bogus drugs) was less than 5%, and that inclusion of these subjects in their total sample did not significantly alter the proportions of students who reported using various actual drugs. Smart et al. (1978) found that scores from a lie scale (Eysenck & Eysenck, 1964) did not significantly predict the frequency and quantity of drinking or the occurrence of alcohol-related problems for a large sample of high school students. These findings are also consistent with research with other populations (e.g., patient and outpatient adult alcoholics), which has suggested that self-reports of alcohol use can be verifiably accurate (e.g., Sobell & Sobell, 1978). Finally, although confidence in the reports of alcohol use by the subjects in this study would be enhanced if they were corroborated by other measures or informants, such as peer reports or physical measures of alcohol use (blood serum levels), these alternatives would create some obvious ethical problems.

We must also consider the accuracy of adolescents’ self-reports concerning others. Reports of quality of family relationships and parent and parental approval of alcohol use were obtained only from the students themselves; other informants, such as parents or siblings, were not surveyed. Thus, the extent

Table 2

Direct and Indirect Effects on Teenage Drinking

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<td>Peer</td>
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<td>.850</td>
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<tr>
<td>Social</td>
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<tr>
<td>Expect</td>
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Note. Family = family functioning; Parent = parental alcohol approval; Peer = peer alcohol approval; Social = social skills; Expect = positive alcohol expectancies.

* Indirect effect via peer = .334 and via social = .225.  
* Indirect effect via peer = .326.

* p < .01.
to which the adolescents’ reports were representative of the actual perceptions of their parents or peers is unknown. The generalizability of these results may also be limited by the racially homogeneous composition of this sample. The pattern of interrelations between the peer, family, and adolescent parameters of teenage drinking may vary across race. The very small proportion (4%) of minority teenagers in this study precluded evaluation of possible racial interactions with these parameters. Finally, in view of the large number of model parameters estimated by the LISREL procedure, the present sample size was considered too small to split and replicate the path-analytic analyses; these findings, therefore, need to be cross-validated with independent samples.

The strong direct relations indicated by path analysis among adolescent ratings of peer alcohol approval, family functioning, and social skills and adolescent drinking behavior is consistent with previous research (Alexander & Campbell, 1967; Canter, 1984; Globetti & Windham, 1967; Zucker & Barron, 1970). Furthermore, the present results suggest many possible intricate relations among these variables. For example, the level of adolescent social reasoning skills may directly affect the amount of teenage drinking and may itself be influenced by the quality of family cohesion and communication. Adolescent ratings of family functioning had a direct relation to the magnitude of perceived peer alcohol approval and to adolescent positive alcohol expectancies, which in turn were predictive of amount of drinking and related problems. Ratings of peer alcohol approval were powerfully related to adolescent positive alcohol expectancies. Finally, increasing amounts of alcohol consumption were negatively associated with social skills and were positively related to strength of positive alcohol expectancies.

The relatively weak predictive power of age and sex was inconsistent with the results of some previous studies (e.g., Marquiles, Kessler, & Kandel, 1977; Rachal et al., 1976). In the present study these variables were not powerful predictors of adolescent drinking, nor did they appear to strongly influence drinking through other mediating variables. Other classes of adolescent intrapersonal, family/parent, and peer influence showed differentially more predictive ability. The low predictive power of age, however, may have been attributable to the relatively restricted age range of the adolescents included in this study (Grades 10, 11, and 12). The relatively low predictive power of demographic variables in this study was consistent with the path-analytic findings of Cronkite and Moos (1980) in their adult sample.

In addition to delineating complex patterns of direct and indirect influences on adolescent drinking, these results may have some implications for the prevention and treatment of teenage alcohol problems. The importance of adolescent ratings of family cohesion and communication for predicting the level of teenage drinking suggests that intervention focused exclusively on the adolescent may not be as productive as treatment that involves other family members. Also, because family characteristic ratings also strongly predicted perceived peer alcohol approval, one therapeutic goal may be to shift the adolescent’s reference group to one with a lower estimation of drinking. Individual or group therapy oriented toward improving the adolescent’s social skills may be a beneficial therapeutic element. Finally, educational interventions directed toward instructing adolescents about the actual rather than the expected effects of alcohol (e.g., alcohol does not actually improve sexual functioning) may also be beneficial.

Although path analysis allows evaluation of a theoretical model that delineates possible direct and indirect effects among the presumed parameters of a criterion behavior, this method does not lend itself well to prediction for individual cases. Path analysis is still useful, however, for identifying variables that may predict the future drinking behavior of individuals. Other analysis methods, such as multiple regression, may be applied using demographic, family functioning, peer approval, social skills, and alcohol expectancy measures to generate drinking behavior predictions for individual adolescents (e.g., Jessor & Jessor, 1977). Of course, the ultimate value of such procedures for individual teenagers would be the prediction of problematic alcohol use prior to its onset.

These results suggest the benefit of conceptualizing teenage alcohol use with a comprehensive theoretical model that incorporates peer, family, and intrapersonal factors. This study is a preliminary attempt to understand teenage drinking by examining its relation to several possible antecedent parameters. Although any model can only, at best, be considered a crude approximation of a highly complex social reality (such as adolescent drinking), a better understanding of factors that contribute to the problem may arise through the use of a model to guide research. Much more research is needed to investigate the many interrelations among parameters of teenage drinking and to relate these findings to the prevention of alcohol-related problems among youth.

References


