

Childhood and Adolescent Predictors of Alcohol Abuse and Dependence in Young Adulthood*

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ABSTRACT. *Objective:* To provide a comprehensive examination of childhood and adolescent predictors of alcohol abuse and dependence at age 21, theoretically guided by the social development model. *Method:* Data were taken from an ethnically diverse urban sample of 808 students (51% male), surveyed at age 10 and followed prospectively to age 21 in 1996. Potential predictors of alcohol abuse and dependence at age 21 were measured at ages 10, 14 and 16. Relationships between these predictors and alcohol abuse and dependence were examined at each age, to assess changes in their patterns of prediction over time. *Results:* Strong bonding to school, close parental monitoring of children and clearly defined family rules for behavior, appropriate parental rewards for good behaviors, high level of refusal skills and strong belief in the moral order predicted a lower risk for alcohol abuse and dependence at

age 21. Of these, strong bonding to school consistently predicted lower alcohol abuse and dependence from all three ages (10, 14 and 16). By contrast, youths who had a higher risk of alcohol abuse and dependence at age 21 engaged in more problem behaviors, had more opportunities to be involved with antisocial individuals and spent more time with and were more bonded to those individuals, viewed fewer negative consequences from antisocial behaviors and held more favorable views on alcohol use. Of these, prior problem behaviors and antisocial opportunities and involvements at ages 10, 14 and 16 consistently predicted alcohol abuse and dependence at age 21. *Conclusions:* These important malleable predictors, identifiable as early as age 10, provide potential intervention targets for the prevention of alcohol abuse and dependence in early adulthood. (*J. Stud. Alcohol* **62**: 754-762, 2001)

AMONG ADOLESCENTS, alcohol is the most commonly used psychoactive drug. The 1999 Monitoring the Future national survey of secondary school students found that approximately 52% of 8th grade students, 71% of 10th grade students and 80% of 12th grade students had used alcohol in their lifetime (Johnston et al., 2000). Alcohol consumption and heavy episodic drinking (i.e., having five or more drinks in a row) tend to be higher during young adulthood than at any other period across the lifespan (Hilton, 1991; Johnston et al., 1998; Wilsnack et al., 1984). For some adolescents, moderate alcohol use appears to be positively related to psychosocial functioning and adjustment (Labouvie, 1990; Maggs, 1997; Silbereisen and Noack, 1988); however, others develop serious alcohol-related psychiatric disorders of alcohol abuse and dependence in young adulthood (Hill et al., 2000; Kandel, 1980; Newcomb and Bentler, 1988; White, 1987). In fact, alcohol abuse and dependence are most prevalent in young adulthood. The combined prevalence of these disorders is estimated to be 16%

(Grant et al., 1994) among those aged 18-29. The relatively high prevalence of alcohol abuse and dependence and their negative sequelae of academic failure, health problems, motor-vehicle accidents and personal violence (Bruner and Fishman, 1998; Chaiken and Chaiken, 1990; Goldstein et al., 1992; Gordis, 1995; Kingery et al., 1992; Parrish, 1994) indicate the importance of preventing these disorders before they emerge. To do so requires knowledge of the malleable predictors of alcohol abuse and dependence. These predictors should be the targets of efforts to prevent the emergence of alcohol abuse and dependence in early adulthood.

Many predictors of adolescent substance use have been identified (for reviews, see Hawkins et al., 1992; Jacob and Leonard, 1994; Johnstone, 1994; Mrazek and Haggerty, 1994; Sher, 1994). These include factors in communities (e.g., extreme poverty, disorganized neighborhood, easy availability of substances and laws and community norms favorable toward drug or alcohol use); in families (e.g., parental alcoholism, poor family management practices, high levels of family conflict, parental and sibling attitudes favorable toward alcohol and drug use, parental and sibling involvement in alcohol or drug use); in schools (e.g., lenient school policies and social norms favorable toward alcohol or drug use); in peer groups (e.g., association with antisocial peers, drug or alcohol use by peers); and within individuals (e.g., sensation-seeking disposition, early and persistent antisocial behavior, early initiation of alcohol use, academic failure, low degree of commitment to school,

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attitudes favorable toward alcohol or drug use, positive expectancy of alcohol or drug use, low level of social and refusal skills). Many of the studies to date have focused on predicting the initiation of alcohol use in adolescence (e.g., Brook et al., 1986; Kosterman et al., 2000), regular drinking (e.g., Reifman et al., 1998; Schulenberg et al., 1996) alcohol misuse (e.g., Hawkins et al., 1997; Lonczak et al., 2001) or heavy episodic drinking (e.g., Reifman et al., 1998). Few studies have examined the predictors of diagnosable psychiatric disorders of alcohol abuse and dependence in early adulthood as defined by clinical diagnostic criteria. As a result, less is known about childhood and adolescent predictors of these serious alcohol-related disorders. Research on the etiology of alcohol abuse and dependence is needed (Kandel, 1998).

The few studies examining the etiology of alcohol abuse and dependence have focused on a limited set of potential predictors. However, these studies do provide evidence that predictors of alcohol abuse and dependence can be identified in childhood. For example, Brook et al. (1992) found that childhood aggression, acting out and peer illegal drug use, all measured at ages 5-10, significantly increased the odds of adolescent alcohol abuse versus moderate alcohol use at ages 16-21, defined by DSM-III criteria (American Psychiatric Association, 1980). They did not find a significant effect of maternal attachment on the risk of alcohol abuse. Crum et al. (1998) identified several early predictors of alcohol abuse or dependence in adulthood, defined by DSM-III-R criteria (American Psychiatric Association, 1987). These included early teacher reports of underachievement in first grade, dropping out of high school, whether the family set definite rules about school during adolescence, and how often the adolescent worked on homework with his or her family. Rohde et al. (2001) found that adolescent daily smoking and conduct/oppositional defiant disorders predicted alcohol use disorder at age 24 when demographic variables, adolescent alcohol use disorder and other disorders were controlled.

Alcohol abuse and dependence are likely to result from a developmental process involving the dynamic interplay of multiple influences over time. The effects of biological, psychological and social predictors may vary at different life stages (Zucker, 1994). Determining the developmental time points at which factors stabilize as predictors of later alcohol abuse and dependence can inform decisions about when in development to address specific factors in order to reduce risk for later abuse and dependence. However, few studies have examined predictors of later alcohol abuse and dependence at different stages of childhood and adolescence.

This study examines predictors of alcohol abuse and dependence across development periods and is guided by the social development model (SDM) (Catalano and Hawkins, 1996; Farrington and Hawkins, 1991; Hawkins and Weis, 1985). The SDM hypothesizes that children learn patterns

of behavior from socializing units of family, school, peers and community institutions. There is a prosocial pathway and an antisocial pathway in the model. Processes of socialization in each pathway involve four constructs: (1) perceived opportunities for involvement in activities and interactions with others, (2) the degree of involvement and interaction, (3) the skills to participate in these interactions and (4) the rewards or costs received from involvement. When these socializing processes are consistent, a social bond develops between the individual and the socializing unit. This bond directly affects individual behavior. A prosocial bond is hypothesized to inhibit deviant behavior by establishing an individual's stake in conforming to the norms and values of the socializing unit. The SDM identifies three exogenous constructs that affect these socialization processes: (1) position in the social structure (e.g., race and gender); (2) external constraints (e.g., family supervision and monitoring); and (3) constitutional factors (e.g., hyperactivity). The SDM proposes that outcomes in an earlier developmental period (prior behaviors) affect socialization processes in the next.

Based on constructs in the social development model, this study seeks to fill the gaps in knowledge about the predictors of alcohol abuse and dependence as defined by DSM-IV diagnostic criteria (American Psychiatric Association, 1994). It examines a wide range of theoretically derived possible predictors of alcohol abuse and dependence at age 21 at three ages: age 10, when children are still in elementary school; age 14, when most children are in middle school; and age 16, when children progressing normally are in high school. The main goal is to identify the patterns of prediction across SDM constructs and across these developmental periods.

Method

Participants

The participants in this study are 808 individuals who participated in the Seattle Social Development Project (SSDP) (Abbott et al., 1998; Hawkins et al., 1987, 1991, 1997; Peterson et al., 1994). These participants were recruited in the fall of 1985 from all fifth-grade students attending 18 Seattle elementary schools serving high-crime neighborhoods ($n = 1,053$). From these 1,053 students, 808 (77%) and their families consented to take part in a longitudinal study, and were interviewed in the early fall of the fifth grade (mean age: 10.3 years) and again in the spring of the fifth grade (age 11). The participants were followed up and surveyed annually in the spring through the 10th grade (age 16), again in the 12th grade (age 18) and again at age 21. Respondents were tracked and interviewed wherever they moved. Annual participation rates for respondents were consistently high, averaging about 94% of the original

sample during the last five waves of interviews. Nonparticipation at each of the assessment waves was not related to gender, age-10 lifetime use of tobacco or alcohol, or delinquency; neither was it consistently related to ethnicity.

Of the 808 participants, 51% were male; 46% were white, 24% were black, 21% were Asian American, 6% were Native American and the remaining 3% were of other ethnic backgrounds. Just over half (52%) were from low-income families as measured by eligibility for the national school lunch program in Grades 5, 6 or 7.

Assessments

Data examined here were collected during the fall of the fifth-grade year (age 10), at ages 14 and 16 (grades 8 and 10, respectively, for those progressing routinely through middle and high school grades) and at age 21. The assessments at ages 10 and 14 involved surveys of youths, their parents (the majority of whom were mothers) and their teachers. At age 16, youths and their parents, but not teachers, were assessed. At age 21, only youths completed surveys. In addition, official court records on youth offenses and school records on grade point average were available at ages 14 and 16.

The student assessments elicited detailed information on their alcohol involvement, including age of onset, frequency of use, problems resulting from alcohol use and perceived norms and expectations regarding alcohol use. Relationships with parents, peers, teachers and schools were also assessed, as were self-reported involvement in criminal behavior and other drug use. The students' parents completed self-report assessments of alcohol use for themselves and their spouse, and their attitudes towards alcohol use. Teachers completed the Teacher Report Form of the Child Behavior Checklist (Achenbach, 1991; Achenbach and Edelbrock, 1983).

Measures

Alcohol abuse and dependence. Various measures of alcohol use and misuse have been used in different studies, and the lack of consistency in these measures across studies has contributed to noncomparability of results (Chassin, 1984). The present study uses the American Psychiatric Association's DSM-IV (1994) diagnostic criteria for alcohol abuse and dependence to provide a meaningful, clinically significant outcome measure. The Diagnostic Interview Schedule (DIS; Robins et al., 1995) was used to determine those meeting criteria for alcohol abuse and dependence at age 21. We are concerned in this study with understanding childhood and adolescent predictors of alcohol misuse in early adulthood that reaches the criteria established by the APA as a diagnosable psychiatric disorder; therefore, we seek to identify predictors of alcohol abuse and dependence.

As a result, a dichotomized, combined measure of alcohol abuse and dependence is used that compares individuals who did not meet criteria for either disorder with those who did meet the criteria in the last 12 months at age 21. Since alcohol dependence is a more rare and more serious disorder than alcohol abuse alone, we also examine predictors of alcohol dependence versus not having any alcohol disorder at age 21.

Controlled variables at age 10. We know that conduct problems, attention deficits and other psychopathology in childhood and adolescence increase the risk for alcohol abuse disorder (National Institute on Alcohol Abuse and Alcoholism, 1997). We are interested in understanding malleable predictors of alcohol-related disorders that could be addressed by preventive actions. Therefore, we have examined the effects of these malleable predictors, controlling for the effects of early symptoms of psychopathology as measured by the internalizing and externalizing scales of the Achenbach Child Behavior Checklist (Achenbach, 1991; Achenbach and Edelbrock, 1983) completed by teachers when children were age 10.

Predictors at ages 10, 14 and 16. Using the SDM as a guide, constructs expected to predict later alcohol abuse and dependence were identified at ages 10, 14 and 16, corresponding to Grades 5, 8 and 10, respectively, for students progressing normally through school. These ages were selected to assess the predictive power of SDM constructs in the elementary, middle and high school developmental periods. All predictors were operationalized for each developmental period using the optimal set of items available (reports from youths, parents, teachers, school and court records). Thus, congeneric measures of predictors were used, consistent with the developmental status of respondents.

The number of items underlying each construct at ages 10, 14 and 16, the averaged scale reliability (when applicable) across these three ages and the sample questionnaire items used to measure these constructs are available from the first author upon request, as is complete information on variable creation. Reliabilities are not applicable for index measures that were summative indices across diverse behaviors not expected to be highly correlated (Bollen and Lennox, 1991). All predictors were continuous variables, except those indicated in their names to be binary variables (e.g., eligible for free lunch or not).

Analyses

We first examined the effect of internalizing and externalizing behaviors at age 10, separately. Both were included as controlled variables in all subsequent analyses studying the effects of sociodemographic variables at age 10 and the effects of all SDM constructs at ages 10, 14 and 16. There were totals of 34, 44 and 41 separate logistic regressions predicting the effects of SDM constructs at ages 10, 14 and

16, respectively, on the risk of alcohol abuse and dependence at age 21. In each logistic regression model, we examined the effect of one predictor controlling for age-10 internalizing and externalizing behaviors. For each predictor, an adjusted odds ratio was calculated at each age. It represents the increased or decreased risk of having alcohol abuse and dependence disorder at age 21 associated with one unit increase in the level of the predictor, independent of the effects of age-10 internalizing and externalizing behaviors. Since many predictors were examined at each age, Bonferroni adjustment (with family confidence coefficient 0.90) was made within each SDM domain (e.g., the domain of external constraints or the domain of bonding to prosocial others and activities). Further, gender differences in the effects of ages 10, 14 and 16 SDM predictors were examined by adding the main effect of gender and the interaction term between gender and the corresponding predictor. Last, similar logistic regression analyses were conducted predicting alcohol dependence versus not having any alcohol disorder for all predictors at ages 10, 14 and 16.

Results

Prevalence of alcohol abuse and dependence at age 21

At age 21, 14% of the SSDP sample met the diagnostic criteria for alcohol dependence and 13% met the diagnostic criteria for alcohol abuse only. This prevalence of 27% who met alcohol abuse and dependence diagnostic criteria is higher than the prevalence of 16% alcohol abuse and dependence in national samples for young adults aged 18-29 (Grant et al., 1994). Prior studies have shown that periods of heaviest use of alcohol increase rapidly through age 18, with sharp declines after age 21 (Bates and Labouvie, 1997; Kandel and Yamaguchi, 1985). In addition, hazard rates for onset of alcohol abuse/dependence are highest between the ages of 15 and 19 years for both males and females, and median age at onset is 21 (Burke et al., 1990). Thus, the prevalence of 27% is not implausible at age 21 in this higher-risk urban sample.

Elementary school predictors of alcohol abuse and dependence

Table 1 presents the odds ratios predicting alcohol abuse and dependence versus not having any alcohol disorder associated with age-10, -14 and -16 predictors, adjusted for the effects of childhood internalizing and externalizing behaviors. The predictors in Table 1 are arranged in the hypothesized sequence of the social development model: sociodemographic background, prior behaviors, external constraints, prosocial path (including the domains of opportunities, involvement, skills for interaction, consequences/

rewards for involvement, bonding and beliefs), and antisocial path (including the domains of opportunities, involvement, consequences/rewards for involvement, bonding and beliefs). Odds ratios in bold indicate that the predictors achieve statistical significance after the Bonferroni adjustment was made within each SDM domain.

Table 1 first presents the odds ratios associated with the controlled variables, sociodemographic background variables and SDM predictors measured at age 10. Both internalizing and externalizing behaviors at age 10 were significantly associated with alcohol abuse and dependence at age 21. The effects of these two variables were controlled in all subsequent analyses.

For males, the odds of alcohol abuse and dependence at age 21 was 2.1 times greater than that for females. Compared with European Americans, African Americans, Asian Americans and other ethnic groups had lower probabilities of alcohol abuse and dependence and Native Americans had higher probabilities of alcohol abuse and dependence at age 21. However, the differences were not statistically significant. Poverty, measured by whether the student was eligible or not for free lunch during the fifth, sixth or seventh grades, was not significantly associated with risk for alcohol abuse and dependence at age 21. The sociodemographic variables were not included in analyses of predictors at later years.

Table 1 shows that 10 of the 34 SDM constructs measured at age 10 significantly predicted alcohol abuse and dependence at age 21. At age 10, delinquency predicted a higher probability of alcohol abuse and dependence at age 21. However, neither use of alcohol nor the use of other drugs in the previous month was significantly associated with a higher risk for alcohol abuse and dependence at age 21. As the prevalence of alcohol use in the previous month was about 14%, the nonsignificant finding is not related to scarcity of this predictor. Clear family rules and good family monitoring by parents at age 10 were significantly predictive of a lower probability of alcohol abuse and dependence at age 21, whereas family norms regarding children's alcohol use were not.

At age 10, on the prosocial path of the social development model, a higher level of bonding to school significantly predicted lower risk for alcohol abuse and dependence at age 21. When considering the antisocial path, living in a neighborhood with more trouble-making youths predicted higher probabilities of alcohol abuse and dependence at age 21. In addition, having antisocial friends, frequent alcohol use among best friends, frequent contact with antisocial friends and a high level of bonding to the antisocial friends at age 10 predicted higher probabilities of alcohol abuse and dependence at age 21. Last, as early as age 10, intentions to use alcohol and favorable attitudes toward alcohol use predicted alcohol abuse and dependence at age 21.

TABLE 1. Odds ratios predicting alcohol abuse and dependence (AAD) and alcohol dependence only (AD) associated with age 10, 14, and 16 predictors, adjusted for age 10 internalizing and externalizing behaviors^a

	Age 10		Age 14		Age 16	
	AAD (n = 755)	AD (n = 656)	AAD (n = 755)	AD (n = 656)	AAD (n = 755)	AD (n = 656)
Controlled variables ^b						
Internalizing behaviors at age 10 (T-CBC)	2.59[†]	1.99	—	—	—	—
Externalizing behaviors at age 10 (T-CBC)	2.30[†]	2.31[†]	—	—	—	—
Sociodemographics						
Male vs female	2.14[‡]	3.28[‡]	—	—	—	—
Ethnicity						
African American vs European American	0.69	0.54	—	—	—	—
Asian American vs European American	0.72	0.59	—	—	—	—
Native American vs European American	1.22	1.23	—	—	—	—
Others vs European American	0.75	0.78	—	—	—	—
Eligible for free lunch vs not eligible	0.81	0.88	—	—	—	—
External constraints						
Community norms favorable to alcohol use	NA	NA	1.10	1.17	NA	NA
School norms favorable to alcohol use	NA	NA	1.05	1.13	1.17	1.18
Family norms favorable to children's alcohol use	1.00	1.00	1.06	1.03	0.87	1.00
Strict family monitoring and rules	0.78[*]	0.77	0.81	0.86	0.77[*]	0.73[*]
Prior behaviors						
Misbehavior at school	1.23	1.28	1.42[†]	1.45[*]	1.59[†]	1.73[†]
Delinquency	1.42[*]	1.58[†]	1.53	1.74	2.00[‡]	2.22[‡]
Use of alcohol	1.10	1.11	1.40[†]	1.36[*]	1.26[*]	1.23
Use of other drugs	1.09	1.07	1.01	0.98	1.47	1.55
Sexually active or not	NA	NA	1.83[†]	1.97[†]	1.93[†]	2.17[†]
Average number of offenses (court record)	NA	NA	1.16	1.10	1.31[†]	1.27
Prosocial path						
Opportunities for prosocial involvement						
Community opportunities	0.94	0.88	1.14	1.09	NA	NA
Family opportunities	1.03	1.15	1.02	1.09	0.94	0.94
School opportunities	1.13	1.16	1.02	0.92	0.95	0.84
Prosocial involvement						
Religious activities	0.88	0.80	0.83	0.84	0.82	0.80
Family activities	0.91	0.88	0.96	0.94	0.83	0.89
School activities	1.07	0.99	1.01	0.88	1.08	0.89
Skills for interaction and involvement						
High refusal skills						
To engagement in antisocial activities	NA	NA	0.97	1.01	0.76[†]	0.75[*]
To offers of alcoholic beverages	NA	NA	0.77[†]	0.78	0.58[‡]	0.52[‡]
High academic skills (self-reported grade at age 10 and school GPA at ages 14 and 16)	0.99	0.94	0.87	0.81	0.83	0.89

*continued**Middle school predictors of alcohol abuse and dependence*

Eight of the 44 SDM constructs measured at age 14 predicted alcohol abuse and dependence at age 21. Involvement in several problem behaviors predicted a higher risk of alcohol abuse and dependence at age 21, including having misbehaved at school, used alcohol in the last month and been sexually active. None of the predictors in the domain of external constraints at age 14 had a significant effect on alcohol abuse and dependence at age 21.

At age 14, a number of factors on the prosocial path predicted significantly less risk of alcohol abuse and dependence at age 21. They are high levels of refusal skills, strong bonding to school and belief in the moral order. Two SDM constructs on the antisocial path at age 14 predicted higher probabilities of alcohol abuse and dependence

at age 21: having known adults with alcohol use problems and having spent time with antisocial friends.

High school predictors of alcohol abuse and dependence

Of the 41 SDM constructs measured at age 16, 24 predicted alcohol abuse and dependence at age 21. A number of problem behaviors predicted higher risk of alcohol abuse and dependence at age 21. These are having misbehaved at school, committed delinquency, used alcohol in the last month, been sexually active and been charged with offenses in juvenile court. Youths who reported good parental monitoring and clear family rules during the high school period had a significantly lower probability of alcohol abuse and dependence at age 21.

TABLE 1. (continued)

	Age 10		Age 14		Age 16	
	AAD (n = 755)	AD (n = 656)	AAD (n = 755)	AD (n = 656)	AAD (n = 755)	AD (n = 656)
Consequences for prosocial involvement						
Parents reward good behavior	0.91	0.87	0.84	0.83	0.83	0.68[†]
Rewarding school experience	0.84	0.71	0.88	0.86	0.98	0.96
High family conflict	1.08	1.19	1.13	1.15	1.22	1.36
Bonding to prosocial others and activities						
To school	0.64[†]	0.56[†]	0.68[†]	0.63[*]	0.67[†]	0.51[‡]
High educational expectations	NA	NA	0.90	0.80	0.75[†]	0.76[*]
To family members	0.84	0.85	0.89	0.79	0.80	0.73
Beliefs						
Beliefs in the moral order	0.83	0.71[*]	0.81[§]	0.76[§]	0.63[‡]	0.56[‡]
Antisocial path						
Opportunities for antisocial involvement						
Availability of marijuana in the neighborhood	1.28	1.56[†]	1.31	1.52[†]	1.71[‡]	2.08[‡]
Trouble-making kids in the neighborhood	1.32[†]	1.43[†]	1.11	1.09	1.31[†]	1.40[†]
Antisocial behavior of friends	1.53[†]	1.84[‡]	1.33	1.46	1.97[‡]	2.32[‡]
Alcohol use among adults you know	NA	NA	1.32[†]	1.34[†]	1.25	1.27
Alcohol use among parents (parent survey)	1.05	1.21	1.31	1.39	1.42[†]	1.65[†]
Alcohol use among siblings	NA	NA	1.00	1.10	1.03	1.04
Alcohol use among best friends	1.29[*]	1.37[*]	1.22	1.35	1.66[‡]	1.90[‡]
Alcohol use among students in your grade	NA	NA	1.06	1.09	1.26	1.24
Antisocial involvement						
In parents' alcohol use (parent survey)	1.05	1.16	1.17	1.13	NA	NA
Time with antisocial friends	1.29[*]	1.39[*]	1.30[*]	1.34[*]	1.72[‡]	1.95[‡]
Consequences for antisocial involvement						
Low cost for antisocial behavior	0.95	1.17	1.23	1.31	1.44[*]	1.41
Moderate and consistent family discipline	1.07	1.26	1.14	1.31	0.92	0.89
Perceived rewards for alcohol use	1.08	0.92	0.94	0.95	1.55[†]	1.89[‡]
Perceived costs of alcohol use	0.94	0.83	0.78	0.74	0.57[‡]	0.50[‡]
Bonding to antisocial others						
To antisocial community	1.18	1.21	1.14	1.11	1.21[*]	1.28[*]
To antisocial friends	1.45[†]	1.62[‡]	1.19	1.26	1.67[‡]	1.89[‡]
Antisocial beliefs						
Intention to use alcohol	1.22[*]	1.23	1.19	1.17	1.56[‡]	1.65[‡]
Pro alcohol use beliefs	1.22[*]	1.27[*]	1.20	1.20	1.73[‡]	2.17[‡]

Notes: ^aAll items are from the youth surveys unless noted in parentheses. NA = not available. ^bOdds ratios for internalizing and externalizing were obtained separately from univariate analyses. In the analyses for all following predictors, both were included in the models as control variables. Bonferroni adjustment (with family confidence coefficient 0.90) was made within each domain ([§] $p < .10$; ^{*} $p < .05$; [†] $p < .01$; [‡] $p < .001$).

A number of predictors on the prosocial path at age 16 predicted significantly lower risk of alcohol abuse and dependence in young adulthood. These are high levels of refusal skills, strong bonding to school, a high level of educational expectations and strong belief in the moral order. A variety of factors on the antisocial path at age 16 were predictive of increased risk of alcohol abuse and dependence at age 21. For example, more opportunities for antisocial activities (e.g., living in a neighborhood with high availability of marijuana, having trouble-making youths in the neighborhood, having antisocial friends and alcohol use by parents and best friends) were associated with higher risk of alcohol abuse and dependence at age 21. Having more involvement with antisocial friends also predicted a higher probability of alcohol abuse and dependence at age 21. If a youth perceived fewer negative consequences (low cost) for antisocial involvement (e.g., engaging in antisocial behavior or alcohol use) and more rewards from alcohol use

at age 16, he or she was at higher risk for alcohol abuse and dependence at age 21. In addition, stronger bonding to antisocial community or antisocial friends at age 16 predicted a higher risk of alcohol abuse and dependence at age 21. Last, intention to use alcohol and favorable attitude toward alcohol significantly predicted higher probabilities of alcohol abuse and dependence at age 21.

Gender differences in the effects of elementary, middle and high school SDM constructs

Very few significant gender by predictor interactions were found in this study. Of 34 constructs investigated at age 10, only two—strict family monitoring and rules, and family opportunities for prosocial involvement—interacted significantly with gender beyond the $p < .10$ level. At age 14, only 2 of 44 constructs investigated—use of other drugs and average number of offenses—interacted significantly

with gender beyond the $p < .10$ level. At age 16, 6 of 41 predictors—misbehavior at school, sexually active or not, high academic skills, bonding to family members, alcohol use among siblings and bonding to antisocial community—had significant gender interactions at the $p < .10$ level. Of these 10 significant gender differences, three showed more predictive power for females than for males in the expected direction (family opportunities at age 10, average number of offenses at age 14 and alcohol use among siblings at age 16); the rest showed more predictive power for males than for females in the expected directions.

In sum, six SDM prosocial constructs predicted a lower risk for alcohol abuse and dependence at age 21. The significant protective factors were strong bonding to school, high educational expectations, close parental monitoring of children and clearly defined family rules for behavior, appropriate parental rewards for good behaviors, high level of refusal skills and strong beliefs in the moral order only. Of these, only school bonding consistently predicted less risk for alcohol abuse and dependence from all three developmental periods. On the antisocial path, youths who had a higher risk of alcohol abuse and dependence at age 21 were those who engaged in more problem behaviors, had more opportunities for involvement with antisocial others, spent more time with and were more bonded to those individuals, viewed fewer negative consequences from antisocial behaviors and held more favorable views on alcohol use. Of those, prior problem behaviors, antisocial opportunities and involvement consistently predicted alcohol abuse and dependence from all three ages: 10, 14 and 16. Overall, with development from age 10 to age 16, more constructs of the SDM were significantly related to later alcohol abuse or dependence, as expected.

Predictors of alcohol dependence

The effects of SDM predictors at ages 10, 14 and 16 on alcohol dependence are also presented in Table 1. In general, SDM predictors that showed significant effects on the combined measure of alcohol abuse and dependence also showed significant effects on alcohol dependence across all three ages. It is interesting to note that, as shown by the size of the corresponding odds ratios, these significant predictors generally had greater effects on predicting alcohol dependence, in spite of the smaller number of youths in the study who met criteria for this more serious disorder.

Discussion

Results from this study suggest promising approaches in childhood and adolescence to reduce risk and enhance protection against later alcohol abuse and dependence. These include establishing early and maintaining strong bonds to school, maintaining close parental monitoring and clear fam-

ily rules for behavior, providing appropriate parental rewards for children's good behavior, enhancing refusal skills and promoting prosocial beliefs. Among these, enhancing children's bonds to school should be a continuous goal from childhood through adolescence. Crum and colleagues (1998) found childhood and adolescent academic performance important predictors of alcohol abuse and dependence in adulthood. This study found that childhood and adolescent bonding (commitment and attachment) to school also consistently protects against later alcohol abuse and dependence.

This study also shows that at the early age of 10, efforts that prevent and reduce delinquency, prevent and reduce a child's association with and bonding to antisocial and alcohol-using peers and prevent children from developing favorable attitudes towards alcohol use may also reduce the risk of alcohol abuse and dependence in young adulthood. The consistency in prediction from prior problem behaviors, antisocial opportunities and antisocial involvement across ages 10, 14 and 16, indicates the importance of continued prevention efforts throughout childhood and adolescence. These findings are consistent with prior reports of the importance of childhood and adolescent problem behaviors (e.g., aggression and conduct problems) in affecting alcohol abuse and dependence in young adulthood (Brook et al., 1992; Rohde et al., 2001).

Limitations of the study should be noted. First, it examined each SDM predictor independently from the others; thus, the present study provides a foundation for theory-guided multivariate analyses of alcohol abuse and dependence. In addition, although differences in the strength of predictors at different developmental periods were observed, the present methods do not allow assessment of whether these differences are statistically significant, nor do they allow the examination of whether the changes in these predictors over time had significant effects on the risk of alcohol abuse and dependence. Further studies focusing on these issues will yield more developmental insight into the etiology of alcohol abuse and dependence.

It is noteworthy that on the prosocial path of the SDM, neither opportunities for prosocial involvement nor prosocial involvement were, by themselves, protective against later alcohol abuse and dependence. Another study using SSDP data showed that the prosocial socialization process of opportunities, involvement and rewards significantly predicted less alcohol misuse at age 18 through prosocial bonding and belief (Lonczak et al., 2001). Prosocial opportunities and involvement may be only indirectly linked to later alcohol abuse and dependence.

Many predictors of alcohol abuse and dependence found in this study have predicted such other problem behaviors among youths as early high school dropout (Battin-Pearson et al., 2000), violence (Herrenkohl et al., 2000) and gang membership (Hill et al., 1999), using data from SSDP. The findings in this study provide some support for Jessor and

Jessor's theory (1977) of problem behavior, and offer important implications for prevention. Preventive efforts targeting these predictors may not only yield beneficial results in the prevention and reduction of adolescent delinquency, violence or crime, but may also help to prevent and reduce alcohol abuse and dependence in young adulthood.

This study found individual, family, peer, school and community factors, at ages 10, 14 and 16, that predicted alcohol abuse and dependence in early adulthood. These data suggest that preventing alcohol abuse and dependence in young adulthood is a long-term undertaking. It should begin early and should involve a broad spectrum of individuals and institutions (e.g., parents, teachers, schools and members of the community) focused on strengthening those specific protective factors and reducing those specific risk factors that are salient during each developmental period from the elementary grades forward.

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