

Risk Factors for Adolescent Marijuana Use Across Cultures and Across Time

JUDITH S. BROOK
DAVID W. BROOK
ORLANDO ARENCIBIA-MIRELES
LINDA RICHTER
MARTIN WHITEMAN

*Department of Community and Preventive Medicine
Mount Sinai School of Medicine*

ABSTRACT. An integrated analysis of the data from 3 different studies was conducted to examine the early psychosocial predictors of later marijuana use among adolescents. Longitudinal analysis of interview data was performed. The data used in the analysis were derived from (a) a sample of 739 predominantly White adolescents representative of the northeastern United States, (b) a sample of 1,190 minority adolescents from the East Harlem section of New York City, and (c) a sample of 1,374 Colombian adolescents from two cities in Colombia, South America. In 2 of the samples, participants were interviewed in their homes, and in the 3rd study, participants were assessed in school. The predictors included a number of variables from (a) the personality domain, reflecting the adolescents' conventionality and intrapsychic functioning; (b) the family domain, representing the parent-child mutual attachment relationship and parental substance use; (c) the peer domain, reflecting the peer group's delinquency and substance use; and (d) the adolescents' own use of legal drugs. The dependent variable was adolescent marijuana use. The results of the analysis demonstrated remarkable consistency in the risk and protective factors for later marijuana use across the 3 samples, attesting to the robust nature of these predictors and their generalizability across gender, time, location, and ethnic/cultural background. These findings have important implications for designing intervention programs. Programs aimed at preventing adolescent marijuana use can be designed to incorporate universal features and still incorporate specific components that address the unique needs of adolescents from different groups.

Key words: adolescence, culture, marijuana use, risk factors

IN THE PRESENT STUDY, we examined the consistency of research findings regarding the risk factors for adolescent marijuana use in different cultures and across time by comparing the factors related to the development of marijuana use in three existing studies. The first study, "Childhood Etiologic Determinants of Adolescent Drug Use" (Childhood Etiologic Study), is a prospective, longitudinal study of children first interviewed in 1975 and followed up at five points in

time over a period of 20 years. In this article, we present data that were collected from interviews with adolescents in that study in 1986 and 1992. The second study, entitled "Drug Use and Problem Behaviors in Minority Youth" (Minority Youth Study), also an ongoing longitudinal research project, investigates minority adolescents interviewed in 1990 and again in 1995. The research for the third study, titled "Drug Use and Problem Behavior Among Colombian Adolescents" (Colombian Youth Study), was conducted in Colombia, South America, and examines youngsters originally interviewed in 1996 and again in 1998. In the present study we attempt to integrate the data from these three studies and identify the risk factors occurring during adolescence that predict marijuana use among the various ethnic and cultural groups represented in samples from both the United States and Colombia at different time periods.

This investigation, which integrates findings from the samples of the three studies, is unique in that it is representative of a wide range of circumstances in which youth grow and develop. More specifically, the Childhood Etiologic Study is representative of a relatively low-stress developmental environment in terms of the prevalence of drugs and violence. The northeastern United States, and particularly upstate New York, where the majority of the Childhood Etiologic Study sample was recruited, is characterized by suburban neighborhoods that, despite the wide range in socioeconomic status of the residents, are mostly safe and have relatively low rates of random crime and violence. In contrast, the Minority Youth Study recruited participants from East Harlem, an inner-city neighborhood in New York City. In this area, the environment in which the adolescents grow up can be characterized as one of relatively high stress in which resources (e.g., education, health) are relatively few and drugs and crime are prevalent. Finally, the environment in which our Colombian Youth Study took place is fraught with stressors, including extremely high rates of violence and crime and rampant illicit drug use. Thus, taken together, the participants included in the present integrated analysis are highly representative of the wide range of circumstances under which today's youth develop and face both the risks and consequences of drug use.

Comparisons of results obtained in cross-sectional and longitudinal surveys of problem behavior are relatively rare, although investigators do often compare their findings with published data from other studies (Brook, Brook, Gordon, Whiteman, & Cohen, 1990). In the area of delinquency, there have been several

This study was supported by Grants DA 03188, 05072, 10348, and Research Scientist Award DA 00244 to Judith S. Brook from the National Institute on Drug Abuse. The authors acknowledge Richard Needle for suggesting the analysis for this article and for his comments on it. They thank Patricia Needle and Jacques Normand for their insights on the article, Summer Zheng for her assistance with the statistical analysis, Liz Rubenstone for her able assistance in organizing the study, and Linda Capobianco for her help in the preparation of the manuscript.

Address correspondence to Judith S. Brook, Box 1044A, Mount Sinai School of Medicine, 1 Gustave L. Levy Place, New York, NY 10029.

studies comparing the risk factors using a prospective, longitudinal design in different countries (Farrington, Byron, & LeBlanc, 1982; Farrington & Loeber, 1999; Moffitt, Caspi, Silva, & Stouthamer-Loeber, 1995; Pulkkinen & Tremblay, 1992). Direct comparisons of similar or identical early risk factors for later drug-use behavior are less commonly found. Indeed, to our knowledge, only one study (Zoccolillo, Price, Ted, & Hwu, 1999) has examined the risk factors for drug abuse or dependence. The researchers reported that in the United States, New Zealand, and Canada, there were high rates of drug abuse or dependence associated with antisocial personality disorder.

Cross-cultural comparisons of risk factors for drug use are significant because they enable researchers to understand how current knowledge of drug use can be generalized across cultures and over time. Such findings help clarify the nature of the interventions needed to reduce or prevent the development of drug use in different cultures and during different time periods.

The framework for much of our work and the basis for the three studies that make up the integrated analysis are provided by family interactional theory (Brook et al., 1990), which is supported by extensive empirical work. According to this perspective, certain family variables, such as a close mutual parent-child relation, can assist the adolescent in coping with internal and external problems without resorting to rebellious behavior and marijuana use (Eisenberg & Fabes, 1992; Rutter, 1990).

In this investigation, we assessed qualitative dimensions of the parent-child relationship, such as the child's identification with the parent, the extent to which the parent displays affection to the child, and the parents' control or disciplinary tactics with the child, each of which is associated with less frequent drug use (Barrera, Chassin, & Rogosch, 1993; Baumrind & Moselle, 1985; Brook et al., 1990; Greenberg, Siegel, & Leitch, 1983; Wills & Cleary, 1996). Based on family interactional theory, we hypothesized that a close mutual parent-child relationship would insulate the adolescent from the development of attitudes conducive to deviant behavior, including drug use. Family drug use was also included because it has been found to be an important predictor of adolescent drug use (Ary, Tildesley, Hops, & Andrews, 1993; Aseltine, 1995; Brook & Brook, 1992; Duncan, Duncan, & Hops, 1996; Hansen et al., 1987; Kandel, 1996; Needle et al., 1986).

In addition to the family variables, certain personality factors, such as conventionality, ego integration, and interpersonal harmony, have been found to insulate the adolescent from drug use (Brook, Whiteman, Gordon, & Brook, 1984; Brook, Whiteman, Gordon, & Brook, 1986; Donovan, 1996; Jessor & Jessor, 1977). Family interactional theory also incorporates a focus on peer-group affiliations derived in part from social learning theory (Patterson, DeBaryshe, & Ramsey, 1989), sociological models of delinquency (Elliot, Huizinga, & Menard, 1989), and problem behavior theory (Jessor, Donovan, & Costa, 1991). The peer group in these theories, as well as in family interactional theory, is viewed as being proximal to deviant behavior such as drug use.

There are two variables in the present study that may moderate the relationship between the risk factors and drug use, namely, sex and age (Brook, Kessler, & Cohen, 1999; Clayton, 1991; Doumas, Margolin, & John, 1994; Thompson & Wilsnack, 1984). Therefore, we examined sex and age in interaction with the predictor variables.

Method

Procedure

The data set consisted of data from three prospective studies: the Childhood Etiologic Study, the Minority Youth Study, and the Colombian Youth Study. Each of the studies was similar in design and structure and, for each, the main purpose was to examine the psychosocial risk and protective factors that relate to marijuana use. Participants in the Childhood Etiologic Study were families with children drawn randomly from two counties in northern New York State. They were generally representative of families in the northeastern region of the United States with regard to socioeconomic status (SES) at the time the data was collected. The participants in the Minority Youth Study were African American and Puerto Rican adolescents who lived in East Harlem, New York. In the Colombian Youth Study, using census data, we randomly selected adolescents who lived with their biological mothers in one of two cities, Barranquilla or Medellin. Lay interviewers were used in the three studies. They received extensive training and were closely supervised. The interviewers and participants were matched in terms of ethnicity and, where possible, gender. Informed consent was obtained from both the mother and adolescent in order for the adolescent to participate. The major differences among the three studies were the location of the sample, the ethnic or cultural backgrounds of the participants, and the time when the study was conducted. The incentives for participation included money in the Childhood Etiologic Study and gifts in the Colombian Youth Study. Table 1 provides an overview of the key features of the sample for each of the studies included in the integrated analysis.

Childhood Etiologic Study. This was a survey of 739 adolescents. It examined the developmental factors related to drug use. There were 369 girls (50%) and 370 boys (50%). Six-hundred eighty participants (92%) were White. The mean age of the participants was 16.72 years ($SD = 2.78$). When first contacted in 1975, the youngsters were between the ages of 1 and 10 years old and were representative of children living in the northeastern United States. The study followed participants through five interviews over the course of 20 years, from 1975 to 1996 (T1–T5). For the purposes of the present integrated analysis, we included the participants who were interviewed at T3 (1986) and T4 (1992) of the study. At each of those times, both the youngsters and their mothers were interviewed in

TABLE 1
Key Features of United States and Colombian Investigations

Feature	Childhood Etiologic Study	Minority Youth Study	Colombian Youth Study
Gender of adolescents			
Female	369	650	676
Male	370	540	698
Mean age of adolescents			
First interview	16.72 ($SD = 2.78$)	14.07 ($SD = 1.31$)	15.11 ($SD = 1.74$)
Second interview	22.06 ($SD = 2.71$)	19.18 ($SD = 1.51$)	16.19 ($SD = 1.76$)
Ethnicity of adolescents	White (92%)	African American (53%) Puerto Rican (47%)	Mestizo (62.6%) Spanish (29.2%) Other (5.2%)
Sample location	Northeastern United States	East Harlem, New York	Colombia South America
Percent living with father	68.14%	37.82%	66.42%
Retention	97% (T3–T4)	90%	85%

their homes. At both times a structured questionnaire was used, and the participants reported on demographic factors, personality attributes, peer and family factors, and substance use (Brook, Kessler, et al., 1999).

Minority Youth Study. This was a study of 695 African American and 637 Puerto Rican adolescents in East Harlem, New York. At the second wave there were 631 African Americans and 559 Puerto Ricans. There were 650 girls (55%) and 540 boys (45%). The mean age of the participants was 14.07 ($SD = 1.31$), and they were interviewed at two points in time (1990 and 1995). Each time, both the adolescents and their mothers were interviewed. A structured questionnaire was used and participants were asked to answer questions about their personality attributes, peer and family relations, substance use, and demographic variables (see Table 1).

Colombian Youth Study. This was a longitudinal study of 1,504 Colombian adolescents living in two communities in South America: Baranquilla and Medellin. At the second wave there were 676 girls (49%) and 698 boys (51%). Eight hundred sixty participants were Mestizo, 401 were Spanish, and 71 were "other." Forty-two subjects did not report their ethnicity. The mean age of the participants was 15.11 ($SD = 1.74$). Baranquilla was selected because it is a large, urban area located on the coast of Colombia and represents the "costeño" (Caribbean-like) culture. Medellin was selected because it is a large commercial and industrial center and one of the centers of the drug business. Adolescents and their mothers were interviewed at two points in time (1996 and 1998). Approximately 2 years after the initial interview, a follow-up interview was conducted with 1,374 Colombian adolescents and young adults who had participated in the initial interview. Participants were asked to answer questions about various demographic variables and about their personality attributes, peer and family relations, and substance use. The instruments were translated into Spanish and then back into English by six translators. Four of the translators were native Colombians.

Measures

For each of the three studies, particular measures have been selected to reflect the major constructs of interest for the integrated analysis. The variables used in the integrated study and each of the separate studies, along with their sources, sample items, and Cronbach alphas are shown in Table 2. A body of research findings supports the reliability and validity of the measures (Brook et al., 1990; Cohen & Cohen, 1996; Jessor & Jessor, 1977; Schaefer, 1965).

The psychosocial dimensions selected for the integrated analysis parallel those that have emerged in our various studies as important predictors of drug use, delinquency, and psychopathology (Brook et al., 1990). In the domain of personality, which includes measures of the adolescent's traits, attitudes, and behaviors, we selected several measures of unconventionality (e.g., rebelliousness, sen-

sation seeking, and tolerance of deviance), a measure of ego integration, and depression. In the domain of family relations, we selected a number of adolescent measures dealing with the parent-child mutual attachment relationship, such as the youngster's identification with each parent and the affectionate relationship with each parent.

We included measures of the mother's, father's, and adolescent's smoking and alcohol use, as well as their illegal drug use. Parental legal drug use refers to smoking behavior, and adolescent legal drug use refers to smoking and alcohol use. Parental and adolescent illegal drug use refers to marijuana use. The measures of the parents' substance use were taken from the mother's interview, and the measures of the adolescent's substance use were taken from the adolescent's interview. The remainder of the measures were obtained from the adolescent's questionnaire.

In general, the scales were adapted and consisted of those items with the highest loading on the particular dimension of interest. Approximately 90% of the items were identical in meaning across the three studies. Given that the instrument in the Colombian study, and in some cases the Harlem study, was translated into Spanish, we cannot be absolutely certain that the meanings were identical for all items. However, we did back-translate from Spanish into English, and all items appeared to have the same meanings. Marijuana use has been found to be a necessary, but not sufficient, condition for the use of other illegal drugs (Kandel, 1975). Furthermore, marijuana use is stable over time and increases the risk of having problems with cigarettes, alcohol, marijuana, and other illegal drugs at a later point in time (Brook et al., 1999).

Finally, the dependent variable for the analyses in each study and in the comparative analysis was whether the youth used marijuana during the time period since the previous interview. The measure was dichotomized such that a zero indicated no marijuana use during the designated time period, and a "1" indicated marijuana use. Data were collected via self-reports, which have been found to be a reasonably valid means of investigating drug use (Harrison, 1997; Stacy, Widoman, Hays, & DiMatteo, 1985).

Plan of Analysis

For all three samples (total $N = 3,303$), the psychosocial variables were dichotomized to discriminate the 25% of adolescents who were in the highest-risk group compared with the remainder of the sample. This 25%/75% split was found previously to predict later problem behavior. Odds ratios were obtained from the combined studies with comparable predictors of drug use. We also ran the logistic regression analysis with a more stringent cut, consisting of marijuana use a few times a month or more. The dependent variable consisted of the following two groups: (a) no/infrequent marijuana use; and (b) marijuana use once a month or more. The findings were not appreciably different from those obtained

TABLE 2
Scales, Sources, and Sample Items

Variable	α	Source	Sample item
Personality, attitude, and behavior			
Rebelliousness	.63	Smith & Fogg, 1979	Do you sometimes enjoy seeing how much you can get away with? Do you feel guilty when you break a rule?
Sensation seeking	.56	Jackson, 1974, 1976 Zuckerman, Eysenck, & Eysenck, 1978	Do you like wild, uninhibited parties where almost anything goes? Do you like to take trips with no preplanned or definite routes, or timetables?
Delinquency	.72	Jessor & Jessor, 1977; Gold, 1966	How often have you had a serious fight at school or work? How often have you taken something not belonging to you worth more than \$5?
Intolerance of deviance	.76	Jessor & Jessor, 1977	How wrong do you think it is to get together with others to drink? How wrong do you think it is to take credit for someone else's work?
Church attendance	—	Brook et al., 1990	How often do you attend religious services?

Ego integration	.55	Brook et al., 1990	How true is it that you generally rely on careful reasoning in making up your mind? Do you rarely feel that you are about to go to pieces?
Depression	.70	Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974	Over the last few years, how much have you been bothered by feeling blue? Over the last few years, how much have you been bothered by feeling low in energy or slowed down?
Family relations			
Identification with mother	.90	Brook et al., 1990	How much do you admire your mother's moral character? How much do you want to be like your mother in your role as a parent?
Identification with father	.89	Brook et al., 1990	How much do you want to be like your father in your professional career? How much do you want to be like your father in your role as a parent?
Affection from mother	.74	Schaefer, 1965	How true is it that your mother hugged and kissed you good-night when you were small? Does your mother often praise you?
Affection from father	.81	Schaefer, 1965	How true is it that your father frequently shows his love for you?
Discipline from mother	.74	Brook et al., 1990	How true is it that your mother acts cold and unfriendly when you do something she does not like?

when the dependent variable had a 25%/75% split. Consequently we present the analysis with a 25%/75% dichotomy for the dependent variable.

Interactions between the psychosocial and demographic variables (the youth's age and gender, the parent's education level, and whether or not the father was living with the child) were examined. The dependent variable was the adolescent's illegal drug use. Less than 5% of the interactions with the demographic variables (e.g., gender) were significant. Nevertheless, the youth's age and sex, the parents' educational levels (assumed to be an indicator of SES), and whether or not the father was living with the child were all statistically controlled.

Results

In addition to the integrated analysis, consisting of data from the Childhood Etiologic, Colombian Youth, and Minority Youth studies, analyses were conducted on the data from each individual study as well. Table 3 shows the odds ratios obtained from the logistic regression analysis, demonstrating comparable risk factors for drug use for the integrated analysis as well as for the three separate studies.

In the integrated analysis, all of the personality risk factors significantly increased the odds of marijuana use. Furthermore, measures of unconventional-ity (e.g., rebelliousness, delinquency) more than doubled the odds of marijuana use, and measures of high conventionality (i.e., intolerance of deviance and church attendance) and measures of low pathology (i.e., ego integration) decreased the odds of marijuana use in the integrated analysis as well as in each of the three studies. Depression, however, significantly increased the odds of later marijuana use only in the integrated analysis and in the individual analysis of the Colombian Youth Study.

With regard to family factors, we found that parental identification, both maternal and paternal, decreased the odds of marijuana use in the integrated analysis as well as in each of the three studies. A less consistent pattern emerged for the other family variables, where maternal affection lowered the odds of marijuana use in the integrated analysis and in the Childhood Etiologic and Minority Youth studies, and paternal affection reduced the odds of marijuana use in the Minority Youth Study. Regarding punitive discipline, paternal, but not maternal, discipline increased the odds of subsequent marijuana use in the integrated analysis and in the Colombian Youth Study. One of the strongest family predictors of marijuana use in the integrated analysis was parental marijuana use. Additionally, parental marijuana use predicted adolescent marijuana use in the individual studies as well.

We also examined several peer variables that might play a role in the participants' marijuana use. The analysis indicated that peer deviance increased the odds of marijuana use in both the integrated analysis and in the individual studies. Consistent with this finding, peer smoking and marijuana use increased the

odds of the adolescents' own marijuana use as well. In contrast, having high-achieving peers significantly reduced the odds of marijuana use in the integrated analysis and in the Colombian and Minority Youth studies.

Finally, the participants' own legal drug use (i.e., smoking, alcohol) increased the odds that they would engage in later marijuana use. The use of legal drugs by the adolescent was among the strongest predictors of later marijuana use in each of the three studies.

Overall, there was great consistency in the results from each of the three studies. Based on the odds ratios, 16 of the 23 predictors were significant in the integrated analysis as well as in each of the three studies. Only one predictor (maternal discipline) did not emerge as significant in any of the analyses (i.e., integrated or individual study analyses).

Discussion

To our knowledge, this study presents the first systematic prospective examination of the degree to which a number of different psychosocial risk factors are predictive of marijuana use, with data derived from three studies conducted in two different countries. Adolescent smoking, drinking, and a number of psychosocial risk factors for drug use were identified as replicable predictors of marijuana use in the three studies conducted across different times and in different places. These results are sufficiently robust to have emerged in different ethnic groups, cities, countries, and times.

The personality and behavioral attributes that were the strongest predictors of marijuana use were measures of unconventionality (e.g., rebelliousness, delinquency). In accord with previous research, aspects of the parent-child relationship were associated with adolescent marijuana use as well (Barrera et al., 1993; Wills & Cleary, 1996). Parental identification (both mother and father) decreased the odds of marijuana use in each of the three studies, as well as in the integrated analysis. Overall, these findings are consistent with family interactional theory (Brook et al., 1990). The findings extend earlier research (Brook et al., 1990) and indicate that identification with parents is important in different countries and at different time periods. In contrast, some differences between the maternal and paternal risk factors emerged. Maternal affection insulated the youngster from marijuana use in the integrated analysis and in both studies conducted in the United States. Father affection, on the other hand, was related to the adolescents' marijuana use only in the Minority Youth Study. With respect to the parental variables of control, maternal discipline was not a significant predictor of adolescent marijuana use. However, paternal discipline was found to be as important in the integrated analysis and in the Colombian Youth Study. In sum, identification with either the mother or father insulates the adolescent from marijuana use. Overall, the parental roles diverge with respect to (a) maternal affection, which is a stronger protective factor than paternal affection; and (b) paternal punitive dis-

TABLE 3
The Odds Ratios (OR) and 95% Confidence Intervals (CI) Indicating the Likelihood of Marijuana Use
as a Function of Earlier Psychosocial Variables

Risk factors	Marijuana use			
	Integrated Study	Colombian Youth Study	Minority Youth Study	Childhood Etiologic Study
Personality factors				
Rebelliousness				
OR	2.04	2.43	2.01	2.04
CI	1.73-2.40***	1.84-3.20***	1.53-2.61***	1.43-2.93***
Sensation seeking				
OR	1.84	1.80	1.91	2.51
CI	1.55-2.19***	1.36-2.40***	1.43-2.54***	1.67-3.76***
Delinquency				
OR	2.32	3.05	2.40	2.38
CI	1.96-2.75***	2.28-4.08***	1.80-3.19***	1.64-3.44***
Intolerance of deviance				
OR	0.64	0.64	0.59	0.40
CI	0.53-0.77***	0.46-0.89**	0.43-0.81**	0.27-0.60***
Church attendance				
OR	0.65	0.66	0.63	0.61
CI	0.55-0.77***	0.50-0.89**	0.47-0.85**	0.44-0.84**
Ego integration				
OR	0.52	0.55	0.44	0.57
CI	0.43-0.63***	0.40-0.76***	0.31-0.62***	0.41-0.81**
Depression				
OR	1.25	1.67	1.21	0.99
CI	1.05-1.48**	1.26-2.23***	0.91-1.61	0.69-1.42

Family factors					
Mother identification					
OR	0.65	0.66	0.61	0.64	
CI	0.55-0.78***	0.48-0.90**	0.46-0.81***	0.45-0.92*	
Father identification					
OR	0.62	0.64	0.62	0.58	
CI	0.52-0.75***	0.46-0.88**	0.44-0.85**	0.41-0.83**	
Mother affection					
OR	0.65	0.84	0.68	0.56	
CI	0.54-0.77***	0.63-1.11	0.50-0.94*	0.38-0.83**	
Father affection					
OR	0.86	0.98	0.72	0.78	
CI	0.71-1.03†	0.69-1.38	0.52-0.98*	0.56-1.09	
Mother discipline					
OR	1.19	1.14	1.17	1.00	
CI	1.00-1.41	0.85-1.55	0.87-1.57	0.72-1.40	
Father discipline					
OR	1.36	1.62	1.11	1.39	
CI	1.14-1.61***	1.21-2.17**	0.83-1.48	0.97-2.00†	
Mother smoking					
OR	1.54	1.18	1.89	1.75	
CI	1.32-1.80***	0.90-1.53	1.46-2.44***	1.28-2.39***	
Mother marijuana use					
OR	4.55	3.08	5.96	2.56	
CI	3.20-6.47***	1.36-6.97**	3.80-9.36***	1.04-6.32*	
Father smoking					
OR	1.11	0.86	1.42	1.39	
CI	0.96-1.30	0.67-1.11	1.10-1.84**	1.02-1.90*	
Father marijuana use					
OR	2.63	1.79	3.10	3.01	
CI	2.04-3.38***	1.08-2.97*	2.22-4.34***	1.36-6.66**	

(table continues)

cipline, which is a stronger risk factor than maternal discipline. These findings are in accord with traditional roles in which the mother serves more as a giver of emotional support and the father serves more as a disciplinarian (Jersild, Brook, & Brook, 1978).

As others have found (Ary et al., 1993; Aseltine, 1995; Duncan et al., 1996; Needle et al., 1986), parental illegal drug use was very important in predicting adolescents' drug use. The findings are in accord with Bandura's social learning theory, wherein the youngsters model their behavior after that of their parents (Bandura, 1997). It is interesting to note that the importance of modeling is significant not only in the United States but in other cultures as well. Another possible interpretation is that adolescents whose parents use marijuana might be genetically predisposed to develop drug-prone personality traits that are then related to marijuana use. As noted by True and colleagues (True et al., 1999), future research should investigate the impact of genetic influences as well as the interaction of genetic and environmental influences on the adolescent's marijuana use.

In addition to the family variables, peer deviance was also important in predicting adolescent marijuana use. Our findings regarding the importance of peers are consistent with the findings of others (Newcomb & Bentler, 1986; Oetting & Beauvais, 1987a, 1987b). According to Oetting's peer cluster theory (Oetting & Beauvais, 1987b), peers serve to establish the attitudes, beliefs, and group norms for drug behavior. Finally, one of the most robust predictors of subsequent marijuana use was the adolescent's own use of legal drugs (tobacco and alcohol), which is also consistent with other research (Kandel, 1975).

A few differences among the studies emerged. Differences in relation to the role of parenting and adolescent depression as risk factors could be attributed to methodological factors. Such factors may include differences between times, among samples, and between cultures.

Given the longitudinal nature of the study, we are in a better position to identify the developmental mechanisms relating to drug use because temporal priority can be established. We have controlled for some of the basic background factors (age, gender, father's education, and intact family). Nevertheless, there is considerable diversity among the three samples. Despite this diversity among the studies, the universality of the findings across time and place indicates that the risk factors identified in this study are important in diverse settings during different time periods, for both genders, and among different cultural/ethnic populations. Such replications are especially convincing as they suggest that the mechanisms have generality rather than that they apply only to specific situations. As noted by Bronfenbrenner and his colleagues, broadening the diversity in method and setting, and over time, can prevent us from "looking more and more at less and less" (Bronfenbrenner, Kessel, Kessen, & White, 1986).

We have identified a number of important risk factors that should assist in guiding drug prevention and treatment efforts. Reduction of the multiple psy-

chosocial risk factors identified in the integrated analysis and in each of the separate studies should be most effective. In addition, decreasing the prevalence of smoking behavior and alcohol use would go a long way to reducing marijuana use among adolescents and young adults. Given that these factors are operative in different cities, in two very different cultures, at different developmental stages, and at separate time periods, our findings are remarkably robust and have broad implications for prevention and treatment programs.

REFERENCES

- Ary, D. V., Tildesley, E., Hops, H., & Andrews, J. (1993). The influence of parents, siblings, and peer modeling and attitudes on adolescent use of alcohol. *International Journal on Addictions*, 28, 853–880.
- Aseltine, R. H. (1995). A reconsideration of parental and peer influences on adolescent deviance. *Journal of Health and Social Behavior*, 36, 103–121.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Barrera, M., Jr., Chassin, L., & Rogosch, F. (1993). Effects of social support and conflict on adolescent children of alcoholic and nonalcoholic fathers. *Journal of Personality and Social Psychology*, 64, 602–612.
- Baumrind, D., & Moselle, K. A. (1985). A developmental perspective on adolescent drug abuse. *Advances in Alcohol and Substance Abuse* 4(3/4), 41–68.
- Bronfenbrenner, U., Kessel, F., Kessen, W., & White, S. (1986). Toward a critical social history of developmental psychology. *American Psychologist*, 41(11), 1218–1230.
- Brook, D. W., & Brook, J. S. (1992). Family processes associated with alcohol and drug abuse. In E. Kaufman & P. Kaufman (Eds.), *Family therapy of drug and alcohol abuse* (2nd ed., pp. 15–33). Needham Heights, MA: Allyn & Bacon.
- Brook, J. S., Brook, D. W., Gordon, A. S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: A family interactional approach. *Genetic, Social, and General Psychology Monographs*, 116(2), 111–267.
- Brook, J. S., Kessler, R. C., & Cohen, P. (1999). The onset of marijuana use from preadolescence and early adolescence to young adulthood. *Developmental Psychopathology*, 11(4), 901–914.
- Brook, J. S., Whiteman, M., Gordon, A. S., & Brook, D. W. (1984). Identification with paternal attributes and its relationship to the son's personality and drug use. *Developmental Psychology*, 20, 1111–1119.
- Brook, J. S., Whiteman, M., Gordon, A. S., & Brook, D. W. (1986). Father-daughter identification and its impact on her personality and drug use. *Developmental Psychology*, 22, 403–414.
- Clayton, S. (1991). Gender differences in psychosocial determinants of adolescent smoking. *Journal of School Health*, 61(3), 115–120.
- Cohen, P., & Cohen, J. (1996). *Life values and adolescent mental health*. Mahwah, NJ: Erlbaum.
- Derogatis, L. R., Lipman, R. S., Rickels, K., Uhlenhuth, E. H., & Covi, L. (1974). The Hopkins Symptoms Checklist (HSCL): A self-report symptom inventory. *Behavioral Science*, 19, 1–15.
- Donovan, J. E. (1996). Problem-behavior theory and the explanation of adolescent marijuana use. *Journal of Drug Issues*, 26(3), 379–404.
- Doumas, D., Margolin, G., & John, R. (1994). The intergenerational transmission of aggression across three generations. *Journal of Family Violence*, 9(2), 157–175.
- Duncan, T. E., Duncan, S. C., & Hops, H. (1996). The role of parents and older siblings

- in predicting adolescent substance use: Modeling development via structural equation latent growth methodology. *Journal of Family Psychology*, 10, 158–172.
- Eisenberg, N., & Fabes, R. A. (1992). Emotion regulation and the development of social competence. In M. S. Clark (Ed.), *Review of personality and social psychology*, 14: *Emotion and social behavior* (pp. 119–150). Newbury Park, CA: Sage.
- Elliot, D. S., Huizinga, D., & Menard, S. (1989). *Multiple problem youth: Delinquency, substance use, and mental health problems*. New York: Springer-Verlag.
- Farrington, D. P., Byron, L., & LeBlanc, M. (1982). Personality and delinquency in London and Montreal. In J. Gunn & D. P. Farrington (Eds.), *Abnormal offenders, delinquency, and the criminal justice system* (pp. 153–201). Chichester, UK: Wiley.
- Farrington, D. P., & Loeber, R. (1999). Transatlantic replicability of risk factors in the development of delinquency. In P. Cohen, C. Slomkowski, & L. N. Robins (Eds.), *Historical and geographical influences in psychopathology* (pp. 299–329). Mahwah, NJ: Erlbaum.
- Gold, M. (1966). Undetected delinquent behavior. *Journal of Research in Crime and Delinquency*, 3, 27–46.
- Greenberg, M. T., Siegel, J. M., & Leitch, C. J. (1983). The nature and importance of attachment relationships to parents and peers during adolescence. *Journal of Youth and Adolescence*, 12, 373–386.
- Hansen, W. B., Graham, J. W., Sobel, J. L., Shelton, D. R., Flay, B. R., & Johnson, C. A. (1987). The consistency of peer and parent influences on tobacco, alcohol, and marijuana use among young adolescents. *Journal of Behavioral Medicine*, 10, 559–579.
- Harrison, L. (1997). The validity of self reported drug use in survey research: An overview and critique of research methods. In L. Harrison & A. Hughes (Eds.), *The validity of self reported drug use: Improving the accuracy of survey estimates* (pp. 17–36). Rockville, MD: NIDA.
- Jackson, D. N. (1974). *Personality research form*. Goshen, NY: Research Psychologists Press.
- Jackson, D. N. (1976). *Jackson Personality Inventory*. Port Huron, MI: Research Psychologists Press.
- Jersild, A. T., Brook, J. S., & Brook, D. W. (1978). *The psychology of adolescence* (3rd ed.). New York: Macmillan.
- Jessor, R., Donovan, J. E., & Costa, F. M. (1991). *Beyond adolescence: Problem behavior and young adult development*. New York: Cambridge University Press.
- Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth*. New York: Academic Press.
- Kandel, D. B. (1975). Stages in adolescent involvement in drug use. *Science*, 190, 912–914.
- Kandel, D. B. (1996). The parental and peer contexts of adolescent deviance: An algebra of interpersonal influences. *Journal of Drug Issues*, 26(2), 289–315.
- Moffitt, T. E., Caspi, A., Silva, P. A., & Stouthamer-Loeber, M. (1995). Individual differences in personality and intelligence are linked to crime: Cross-context evidence from nations, neighborhoods, genders, races, and age cohorts. In J. Hagen (Ed.), *Delinquency and disrepute in the life course* (pp. 1–34). Greenwich, CT: JAI Press.
- Needle, R., McCubbin, H., Wilson, M., Reineck, R., Lazar, A., & Mederer, H. (1986). Interpersonal influence in adolescent drug use: The role of older siblings, parents, and peers. *International Journal of the Addictions*, 21, 739–766.
- Newcomb, M. D., & Bentler, P. M. (1986). Substance use and ethnicity: Differential impact of peer and adult models. *Journal of Psychology*, 120, 83–95.
- Oetting, E. R. & Beauvais, F. (1987a). Common elements in youth drug abuse: Peer clusters and other psychosocial factors. *Journal of Drug Issues*, 17, 133–151.

- Oetting, E. R., & Beauvais, F. (1987b). Peer cluster theory, socialization characteristics and adolescent drug use: A path analysis. *Journal of Counseling Psychology, 34*(2), 205–213.
- Patterson, G. R., DeBaryshe, B. D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist, 44*, 329–335.
- Pulkkinen, L., & Tremblay, R. E. (1992). Patterns of boys' social adjustment in two cultures and at different ages: A longitudinal perspective. *International Journal of Behavior and Development, 15*, 527–553.
- Rutter, M. (1990). Psychosocial resilience and protective mechanisms. In J. E. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein, & S. Weintraub (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 181–214). New York: Cambridge University Press.
- Schaefer, E. S. (1965). Children's report of parental behavior: An inventory. *Child Development, 36*, 413–424.
- Smith, G. M., & Fogg, C. P. (1979). Psychological antecedents of teenage drug use. In R. Simmons (Ed.), *Research in community and mental health: An annual compilation of research* (Vol. 1, pp. 87–102). Greenwich, CT: JAI.
- Stacy, A. W., Widoman, K. F., Hays, R., & DiMatteo, M. R. (1985). Validity and self-reports of alcohol and other drug use: A multivariate-multimethod assessment. *Journal of Personality and Social Psychology, 49*, 219–232.
- Thompson, K. M., & Wilsnack, R. W. (1984). Drinking and drinking problems among female adolescents. Patterns and influences. In S. C. Wilsnack & L. J. Beckman, (Eds.), *Alcohol problems in women* (pp. 37–65). New York: Guilford.
- True, W. R., Heath, A. C., Scherrer, J. F., Xian, H., Lin, N., Eisen, S. A., et al. (1999). Inter-relationship of genetic and environmental influences on conduct disorder and alcohol and marijuana dependence symptoms. *American Journal of Medical Genetics, 88*(4), 391–397.
- Wills, T. A., & Cleary, S. D. (1996). How are social support effects mediated? A test of parental support and adolescent substance abuse. *Journal of Personality and Social Psychology, 71*(5), 937–952.
- Zoccolillo, M., Price, R., Jr., Ted, J. I., & Hwu, H. G. (1999). Antisocial personality disorder: Comparisons of prevalence, symptoms, and correlates in four countries. In P. Cohen, C. Slomkowski, & L. N. Robins (Eds.), *Historical and geographical influences on psychopathology* (pp. 249–278). Mahwah, NJ: Erlbaum.
- Zuckerman, M., Eysenck, S., & Eysenck, H. J. (1978). Sensation seeking in England and America: Cross-cultural, age, and sex comparisons. *Journal of Consulting and Clinical Psychology, 46*(1), 139–149.

Received September 20, 2000