Risk Factors for Drug Use among Adolescents: Concurrent and Longitudinal Analyses

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Abstract: We examined the concurrent and longitudinal associations between risk factors and substance use for a sample of high school students. Ten risk factors were defined that assessed numerous important personal and social areas of life. These factors were found to be associated with ever using, frequency of use, and heavy use of cigarettes, alcohol, cannabis, and hard drugs. Few effects were noted for nonprescription medication. No sex differences were evident for number of risk factors. Finally, the number of different risk factors was predictive of increases in use of all types of substances over a one-year period, after controlling for initial level of use. (*Am J Public Health* 1986; 76:525–531.)

Introduction

Drug use among adolescents and young adults has become quite widespread during the past 25 years, with many characterizing the increases as of epidemic proportions.[1] Although it is not too surprising that many teenagers have experimented at some time with various drugs, problems begin to arise when this experimental use becomes regular use or abuse. In a national survey,[2] 43 per cent reported at least one instance of heavy drinking (five or more drinks) during the past two-week period. In addition, 18 per cent reported at least weekly use of marijuana, and 6 per cent reported daily use.

A great deal of research effort has been devoted to understanding the etiology and antecedents of drug use during the teenage years.[3–5] Numerous factors have been implicated in the initiation and maintenance of adolescent drug use including parent drug use,[6,7] perceived adult drug use,[8,9] peer use,[10,11] poor grades in school,[12,13] poor relationship with parents,[14] low self esteem, depression, and psychological distress,[15,16] unconventionality and tolerance for deviance,[4,17] sensation seeking and the desire for novel and unusual experiences,[18,19] low sense of social responsibility,[20] a lack of religious commitment,[21] a lack of purpose in life,[22]* disruptive life events,* and early use of alcohol.[23]

However, many studies report findings that are inconsistent and difficult to integrate conceptually into a unified understanding of the causes of teenage drug use.[5,24] Kandel has suggested that stage theory can account for the apparent discrepancies among studies.[25–27] She posits that different sets of antecedent factors are assumed to precede progression through increasing levels of involvement with drugs.[28,29] However, validation of the particular sets of important factors necessary to progress from one stage to the next has met with some conflicting and contradictory results. For instance, Kaplan[16] found that self-derogation (low self-esteem) was an important predictive influence in the marijuana initiation stage, but this was not found by Jessor and Jessor[17] when studying the same transition point.

This confusion has led several researchers to suggest that there are probably many diverse paths to drug use and that looking for the definitive path or cause is doomed to failure since this may very well not exist.[30,31] Such a conclusion led Bry, *et al,* to consider drug abuse "a general instead of specific coping mechanism . . . its likelihood is dependent on how much rather than exactly what there is to cope with."[24] Based on this perspective for understanding initiation into adolescent drug use, Bry, *et al,* developed six risk factors that they demonstrated were quite useful in understanding levels of general drug use. In fact, increasing numbers of risk factors were linearly related to higher levels of general substance use.

The risk factor notion is one often used to understand susceptibility to infectious and other types of diseases and has been used widely by epidemiologists.[32–35] Although the analogy between an infectious disease and drug use is not perfect,[1] it provides an important technique and conceptual tool to understand the multiple causes and predictors of drug use and abuse. In this way, drug research is not locked into finding the definitive cause of substance use and can draw on diverse and even conflicting results to determine the magnitude of risk for becoming involved with drugs.

The study of Bry, *et al,*[24] had several obvious shortcomings, however. First, they used an index of general substance use that blurred distinctions between classes of drugs. Second, only six risk factors were considered—perhaps too few (given the low base-rate for each) to capture the full range of possible causal factors. Third, cutpoints defining a risk factor were determined on an empirical basis to maximize the association with substance use, rather than a conceptual hypothesis, and thus may not be replicable in other populations. Finally, theirs was a cross-sectional study and only demonstrated that risk factors were associated with adolescent drug use; no causal or etiological implications could be drawn.

In this study, we are able to address many of these problems. We examine a wider range of risk factors whose cutpoints are determined on a combination of theoretical and empirical bases. The association between risk factors and drug use are tested for five types of drug substances including cigarettes, alcohol, cannabis, hard drugs, and nonprescription medications. Finally, we use longitudinal data to determine whether in fact the presence of these risk factors precedes increased drug use.

Methods

Subjects

Participants in this project were 994 adolescents in the 10th, 11th, and 12th grades in high school as the third wave of data in Year 4 of a longitudinal study of adolescent drug

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use. Data had been obtained two times previously from the same individuals in Years 1 and 2 of the study. No data were collected in Year 3, and the majority of the analyses presented are based on the third wave (Year 4) data. Of the 994 subjects, 791 provided usable data in the fourth wave (Year 5) of the study. The main focus of this paper is on the Year 4 data, with the exceptions that one risk factor (early alcohol use) was based on Year 1 responses; the Year 5 data were used to evaluate the effect of risk factors over time.

In Year 1 of the study, 1,634 students in grades seven, eight, and nine of 11 Los Angeles County schools provided data. Written informed consent was obtained from their parents, and all participants were informed of a grant of confidentiality given by the US Justice Department legally protecting all responses. Further descriptions of the sampling method can be found elsewhere.[3,36]

Of the initial sample, 994 students participated in Year 4, representing a 61 per cent retention rate from Year 1. Thirty-four per cent of the sample were male; 66 per cent were female. About 40 per cent were in the 10th grade, 36 per cent in the 11th grade, and 24 per cent in the 12th grade in Year 4 of the study. In terms of ethnicity, about 61 per cent of the sample were White and the remaining 39 per cent were from Black (15 per cent), Latino (17 per cent), and Asian (7 per cent) backgrounds.

Drug Use

In Years 4 and 5, identical frequency of drug use measures were given to all subjects. Each respondent indicated frequency of use during the past six months for 26 different drug substances. Responses were given on seven-point anchored rating scales that included no use (0), once or twice (1), a few times (2), once a month (3), once a week (4), once a day (5), and more than once a day (6). The substances were averaged into five categories based on previous factor analyses[37] and the nature of the substance. Two substances were excluded because of no clear pattern of inclusion (caffeine and amyl nitrate). These five substance use categories, assessed at both Year 4 and Year 5, included cigarettes (one item), alcohol (the average of beer, wine, and liquor frequencies), cannabis (the average of marijuana and hashish frequencies), hard drugs (the average of 14 substances including sedatives, barbiturates, amphetamines, LSD, cocaine, heroin, and PCP), and nonprescription medication (the average of over-the-counter sleeping pills, stimulants, cough medicine, and cold/allergy medicine).

These drug use category scales were used as dependent, outcome factors for the independent influence of the risk factors. In several of the analyses, ever use scales and heavy use (abuse) scales were also formed from the drug use category responses. For instance, reported ever use of alcohol included any non-zero response to beer, wine, or liquor use frequency items during the past six months. Nonuse of alcohol would require a zero (no use) response to all three items (beer, wine, and liquor). Heavy use of alcohol, cigarettes, cannabis, and nonprescription medication was defined as daily or more use (response categories 5—once a day, or 6—more than once a day) of any substance in these categories. Since hard drug use is much less prevalent, heavy use of hard drugs was defined as weekly or more use of any hard drug substance. In sum, for each of the five substance use categories, there were three types of response classifications: 1) ever use during the past six months; 2) average frequency of use during the past six months; and 3) heavy use during the past six months.

Risk Factors

Ten risk factors were used in this project. Six of them were quite similar to those used by Bry, *et al.*[24] low grade point average, lack of religiosity, early alcohol use, low self-esteem, psychopathology, and poor relationship with parents. Four other risk factors were included, based on a review of the literature cited above. These reflect a lack of social conformity (deviance), sensation seeking, perceived peer drug use, and perceived adult drug use.

To be effective indicators of risk-proneness, risk factors should have a similar and relatively low base rate in the general population, but not so low as to be nondiscriminating between individuals. Except for grade point average, all the other nine risk factors were defined as the quartile (25 per cent) of subjects indicating risk-proneness. Since the multiple occurrence of infrequent events is even less likely, increasing risk factors should represent fewer and fewer people. Since heavy use of any drug substances is a relatively infrequent phenomenon (usually less than 25 per cent of any general population), most individuals should have no risk factors. The cut-point is theoretically based (although empirically implemented, based on subject data) and should be more readily replicable across studies than those whose cut-points are chosen empirically and may thus depend on sample-specific characteristics. The Appendix provides a summary of the characteristics of the 10 risk factors' measurements.

At Year 1, 87 per cent of the students reported any use of alcohol. Of those who used alcohol (at least once), 10 per cent had only used beer, 7 per cent only wine, and 1 per cent only liquor. The majority (54 per cent) had tried all three types of alcohol. Because of the contaminating effect of using an alcohol-related risk factor (Year 1) to predict later alcohol use (in Year 4 or 5), this factor was systematically removed from the sum of risk factors scale when being used to predict any alcohol-related category (e.g., heavy alcohol use).

All ten risk factors were scored in a dichotomous manner: Zero if the risk factor criterion was not met, and one if the criterion was met. The ten risk factor 0–1 scores were then summed into a single number of risk factors variable that ranged from zero to ten. An examination of the distribution of this variable indicated that very few subjects had eight, nine, or ten risk factors. As a result, these individuals were grouped together with the seven risk factor group and thus represented a group having seven or more risk factors.

Attrition Effects

For the cross-sectional analyses, it is important to determine the nature of the sample attrition between Year 1 and Year 4, when 39 per cent of the sample was lost. Stepwise multiple regression was used to predict retention in the study at Year 4 by a variety of variables assessed at Year 1. The predictor pool included sex of the subject, 13 drug use measures, and 25 personality traits. Huba and Bentler[3] provide a description of these variables. The best seven variables that were selected accounted for less than 4 per cent of the variance of drop-out or retention in the study. Those who remained in the study used less marijuana, less cigarettes, more beer, and were more cheerful, more law abiding, more trusting, and less diligent than those who dropped out.

For the longitudinal analyses, a similar set of analyses was used to determine the extent and nature of the attrition in sample size between Years 4 and 5 of the study, when 203 subjects were lost. Stepwise multiple regression analysis was used to find if any of the five substance use scales, the risk factor variable, sex of the subject, or 23 personality traits

TABLE 1—Number of Risk Factors Reported by Los Angeles Students, Grades 10–12, According to Sex

Number of Risk Factors	Total Sample (%)	Sex	
		Male (%)	Female (%)
	N = 994	N = 334	N = 660
0	214 (22)	60 (18)	154 (23)
1	203 (20)	67 (20)	136 (21)
2	163 (16)	65 (20)	98 (15)
3	148 (15)	45 (14)	103 (16)
4	122 (12)	43 (13)	79 (12)
5	72 (7)	28 (8)	44 (7)
6	70 (4)	15 (5)	25 (4)
7 or more	32 (3)	11 (3)	21 (3)

(discussed extensively elsewhere[3]) assessed in Year 4 could predict dropping-out or retention in the study at Year 5. The resulting equation accounted for 2 per cent of the variance in dropping-out, and indicated that those who remained in the study used less cannabis and were more extroverted than those who dropped-out.

Based on these analyses, it was concluded that the loss of subjects was only marginally systematic and that the results should thus not be unduly biased. More extensive drop-out analyses of other variables, supporting this general conclusion, are available elsewhere.[38]

Results

General Distribution of Risk Factors

Table 1 provides the breakdown of risk factors by the number and per cent of students having them. There are no differences of consequence by sex. The average number of risk factors reported was 2.31: 2.44 by males and 2.25 by females.

As expected from the theoretical basis for choosing cut-points, the modal group for number of risk factors was zero, representing 22 per cent of the total sample. Percentage of subjects decreased consistently with increasing number of risk factors, with only 1 per cent receiving eight or more.

The total number of risk factors was correlated with the five substance use categories for males and females separately. The correlations for each sex were compared for each of the five substances using the Fisher r – to – z transformation. These five comparisons indicated that risk factors were similarly associated with five types of drug use for males and females (data available on request to authors). For these reasons, the remaining analyses were conducted on the total sample of men and women combined as done in other studies.[39]

It is frequently noted that males tend to use drugs more often and more heavily than females.[2] Thus, it is possible that gender may also be a risk factor for drug use. A series of hierarchical multiple regression analyses were run that first entered the 10 risk factors and then gender. These analyses were performed for each of the five substance use categories. In each of the analyses, gender did not notably increase the accountable variance of the regression equation. Incremental variance attributed to gender beyond the risk factors for cigarettes was 0.7 per cent, 0.1 per cent for alcohol, 0.1 per cent for cannabis, 0.8 per cent for nonprescription medication, and 0.2 per cent for hard drugs.

Associations with Individual Risk Factors

Certain risk factors may be more important than others. In order to determine which are the least and most important, each risk factor was correlated with the five substance use scales. For each risk factor, these five correlations were averaged. In increasing order of averaged correlations, these were: poor self esteem (.07), psychological distress (psychopathology: (.09), poor academic achievement (.11), low religiosity (.13), poor relationship with parents (.16), sensation seeking (.16), early alcohol use (.22), adult drug use (.30), deviance (.31), and peer drug use (.41). Since each risk factor contributed to substance use, when taken separately, all were retained in the risk factor total score.

Ever Use of Substance Categories

Percentage of subjects who have ever used each of the five substance use categories were broken down into number of risk factors. These results are presented in Table 2. Overall, 42 per cent reported using cigarettes, 81 per cent reported using alcohol, 51 per cent reported using cannabis, 28 per cent reported using hard drugs, and 70 per cent reported using nonprescription medication at least once during the past six months.

For all substance categories, except nonprescription medication, number of risk factors discriminated the per cent of ever users. For instance, although the average per cent of cannabis users for the total sample was 51 per cent, only 22 per cent of those with zero risk factors used cannabis, whereas 94 per cent of those with seven or more risk factors used cannabis. Similar differences were apparent for all other substance use categories except for nonprescription medication. Overall, the number of users increased systematically with number of risk factors.

Average Frequencies of Substance Use

Figure 1 presents the average frequency of drug use reported for each number of risk factors for each of the five substance use categories. As is evident in the Figure, all substances increased in frequency of use by increasing number of risk factors up to six (Results of ANOVAs and linear tests for trend confirming what is obvious from the figure are available on request from the authors). Between six and seven risk factors, cigarette use slightly decreased, but this was not evident for the other drugs. Apparently, those with seven risk factors did not increase their level of use for soft drugs (e.g., cigarettes), perhaps in favor of harder drugs (e.g., cannabis and hard drugs).

Heavy Drug Users

Table 3 presents the breakdown of per cent of heavy drug users by number of risk factors. For the total sample, 14 per cent reported heavy use of cigarettes, 2 per cent reported heavy use of alcohol, 8 per cent reported heavy use of cannabis, 3 per cent reported heavy use of hard drugs, and 3 per cent reported heavy use of nonprescription medication. The percentage of heavy users of cigarettes, alcohol, cannabis, and hard drugs is directly related to the number of risk factors. For example, only 1 per cent of the subjects with zero risk factors reported heavy (daily or more) use of cannabis, whereas 56 per cent of those with seven or more risk factors reported heavy use of cannabis. Similar dramatic differences were apparent for heavy use of cigarettes, alcohol, and hard drugs. No effects are noted for nonprescription medication.

TABLE 2—Number of Risk Factors by Ever Use of Five Substances during the Past Six Months

Number of Risk Factors	Per Cent Reported Use				
	Cigarettes	Alcohol	Cannabis	Hard Drugs	Nonprescription Medications
0	20	64	22	7	66
1	36	72	34	14	69
2	34	86	50	22	70
3	48	91	65	36	70
4	62	95	71	45	71
5	64	96	72	53	74
6	73	97	88	68	77
7 or more	75	100	94	78	75
TOTAL	42	81	51	28	70

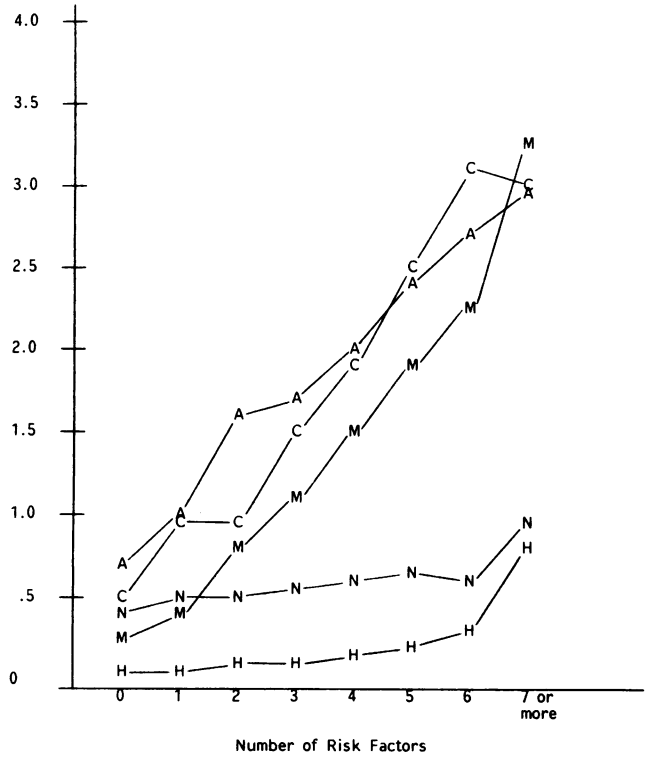

FIGURE 1—Frequency of Substance Use by Number of Risk Factors

Magnitude of Risk

Magnitude of risk for heavy drug use was calculated for cannabis and hard drugs by dividing the observed frequency (for each number of risk factors) by the expected frequency in general and then multiplying by 100.

Figure 2 presents the magnitude of risk for heavy use of cannabis. Those with zero risk factors were one-fifth less likely to use cannabis on a daily basis than the total sample, whereas those with seven or more risk factors were almost seven times more likely to be heavy users of cannabis compared to the sample in general. There is clearly an increasing magnitude of risk for each increasing number of risk factors.

Figure 3 presents the analogous results for heavy use of hard drugs (defined as weekly or more use). Those with three or fewer risk factors were less likely than the total sample to be heavy hard drug users, whereas those with five or more were more likely to be weekly or more users of hard drugs; those with seven or more risk factors were over nine times as likely to be heavy users of hard drugs compared to the general sample.

Effects of Risk Factors Over Time

The previous results indicated clearly that, at one point in time, the number of risk factors were associated with ever using a substance, frequency of using a substance, and heavy use of a substance. These effects were most apparent for cigarettes, alcohol, cannabis, and hard drugs, and to a much lesser extent nonprescription medication. However, these analyses do not confirm whether risk factors are in fact associated with the increase in drug use over time.

In order to test whether risk factors actually predict changes in later drug use, longitudinal data obtained in Year 5 of the study were used. The partial correlations between Year 4 risk factors and Year 5 substance use frequency, while controlling for Year 4 substance use, were used to determine the predictive value of the risk factor variable. These partial correlations are presented in Table 4 for each substance category. For each substance, two partial correlations are given: the first controls for the same substance in Year 4, and the second controls for all five Year 4 substance use scales.

Year 4 risk factors were clearly related to increased use of all substances between Years 4 and 5. The strongest effects were for alcohol and hard drugs, whereas the weakest effect (although yielding a $P < .01$) was for cigarettes. These risk factors predicted increased substance use of all types over a one-year period, when controlling for earlier use of the same substance and all or other types of drugs. However, the magnitude or accountable variance in the relationships was relatively small, ranging from less than 1 per cent to slightly higher than 7 per cent. Nonetheless, given that prior drug use is the most powerful predictor of later use, risk factors increased predictive understanding over and beyond this strong relationship.

Discussion

The risk factor approach is useful in understanding vulnerability to substance use. The number of risk factors was linearly associated with increased percentage of drug users, frequency of drug use, and heavy drug use (abuse). These findings corroborate and substantially extend the preliminary work of Bry, *et al*,[24] and suggest that a risk factor model of substance use is not unlike other epidemiological entities that follow patterns of vulnerability and susceptibility

TABLE 3—Number of Risk Factors by Heavy Use of Five Substances during the Past Six Months

Number of Risk Factors	Per Cent Heavy Use[a]				
	Cigarettes	Alcohol	Cannabis	Hard Drugs	Nonprescription Medications
0	4	0	1	0	2
1	7	1	2	2	3
2	9	3	6	1	2
3	18	4	9	1	5
4	17	2	12	3	3
5	33	10	18	4	7
6	43	7	23	10	0
7 or more	34	0	56	28	3
TOTAL	14	2	8	3	3

[a]Heavy use for cigarettes, alcohol, cannabis, and nonprescription medication is daily use or more; whereas heavy use for hard drugs is weekly use or more.

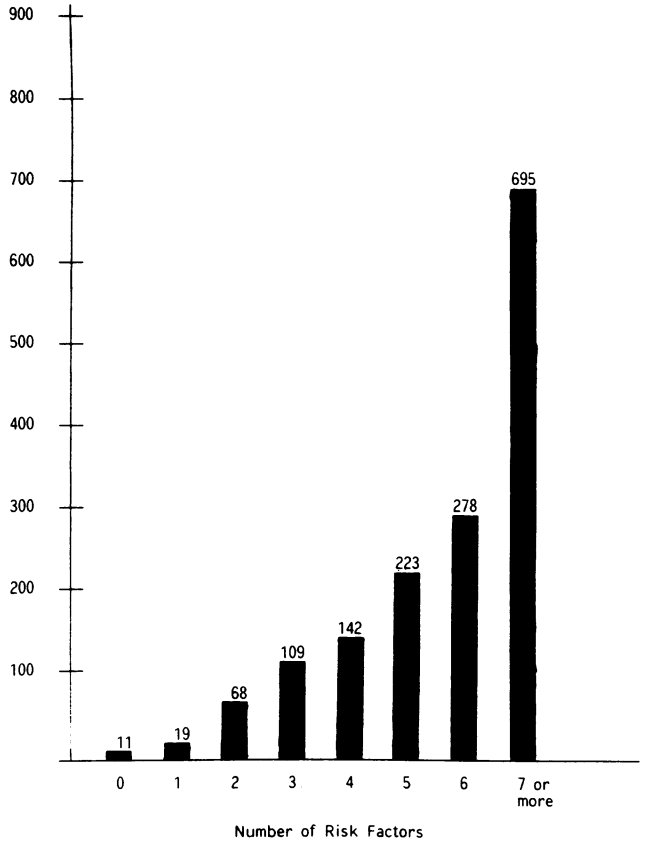

FIGURE 2—Magnitude of Risk for Daily Cannabis Use by Number of Risk Factors

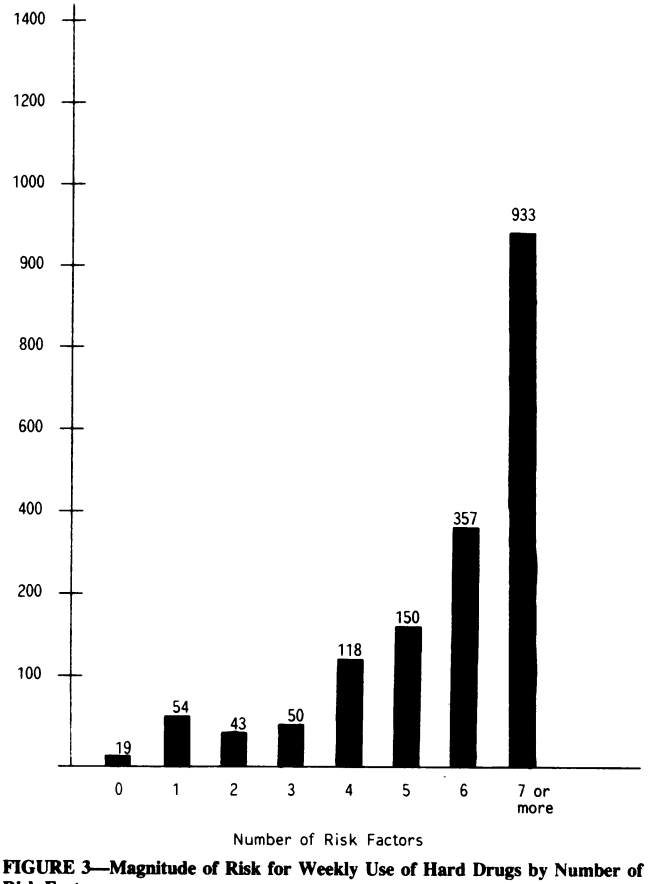

FIGURE 3—Magnitude of Risk for Weekly Use of Hard Drugs by Number of Risk Factors

due to increased exposure to risk, as evident in studies of depression,[40] heart disease,[32-35,41] lung cancer,[42] problem behavior in children,[43] and mental illness.[44]

Conceptually, the findings support a multiple pathway model of drug use, where several different factors may lead to the same result of substance use and abuse. In other words, there is not one particular and specific reason that accounts for all types of drug use and is applicable to all types of drug abusers. This view supports previous reviews of the drug abuse literature which have typically found a variety of etiological or predisposing factors to substance use that elude parsimonious conceptual integration.[5,45,46]

Conversely, few risk factors are associated with less substance use. This implies that there may be a prophylactic effect to minimal exposure to risk factors that may innoculate an individual against using drugs to cope with future life stresses. Adolescence can be considered a critical period for the formation of coping behavior and responses, such as using drugs to deal with stress, peer pressure, and emotional distress.[47] If this behavior is not learned during adolescence due to infrequent exposure to risk, there may be a good chance that drugs will not be used later in life to handle distress.[48] One implication is that drug prevention programs should focus upon reducing exposure to risk factors and modifying the factors that are already present.

At least two cautions must be considered when evalu-

TABLE 4—Risk Factors as Antecedents of Increased Drug Use Over a One-Year Period

Drug Substances	Partial Correlation between Risk Factors and Later Drug Use: Controlling for the Same Initial Drug Use	Controlling for All Initial Drug Use
Cigarettes	.10	.08
Alcohol	.19	.18
Cannabis	.12	.09
Hard Drugs	.26	.14
Nonprescription Medication	.14	.10

ating the results of this study. First, the findings are based on self-report data and may be influenced by the veracity of the respondents, particularly in respect to sensitive questions dealing with grade point average, deviant behavior, and exposure to peer and adult drug use. However, all participants were quite aware that none of their responses could be used for any purpose other than this study and were legally protected by a grant from the United States Government. In addition, recent evidence has suggested that even self-report data about sensitive issues such as drug use are quite valid based on multitrait-multimethod analyses of independent ratings.[49] The second caution relates to the prediction of drug use by the risk factors over time. Although it is quite possible that the risk factors, in fact, directly contribute to increased drug use, it is possible that other unmeasured factors may account for the increased drug use.

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APPENDIX

TABLE A-1—Cut-Points for Ten Risk Factors

Risk Factor	Variable Range	Cut-Point	Year of Assessment	Per Cent of Sample with Risk
Poor Academic Achievement (low grade point average)	A–F	D or F	4	4
Low Religiosity (low religious commitment)	4–20	≤ 12	4	25
Early Alcohol Use	1–5	≥ 4	1	27
Poor Self-esteem (low self-acceptance)	4–20	≤ 13	4	24
Psychopathology (depression)	4–20	≥ 11	4	24
Poor Relationship With Parents	4–20	≥ 14	4	27
Deviance (lack of law abidance)	4–20	≥ 11	4	28
Sensation Seeking	23–74	≥ 54	4	26
Peer Drug Use	8–34	≥ 16	4	25
Adult Drug Use	9–39	≥ 20	4	24

Grade Point Average—All students indicated their current grade point average in high school during the past year. All subjects who reported an "F" or "D" average were given one risk factor. A, B, and C responses were not considered risk factors.

Religiosity[3]—Each of four items in this scale was assessed on a five-point anchored bipolar scale. The lower end of this four-item scale, representing low religiosity, was used as a cut-point for a risk factor. Responses to the combined four items ranged from 4 to 20, and those scoring 12 or less were given a risk factor.

Early Alcohol Use—Frequency of use for beer, wine, and liquor were averaged, and all those reporting regular or many times of use were given a risk factor. A five-point frequency of use rating scale (never tried, only once, a few times, many times, and regularly) was used in Year 1, in contrast to the seven-point scales used in Years 4 and 5. Responses of "many times" and "regularly" would seem to indicate rather frequent use. Scaling issues for these items are discussed elsewhere.[37]

Poor Self-esteem—All subjects were given a four-item scale of self-acceptance.[3] All subjects scoring less than 14 were given a risk factor for this variable, which represented 24 per cent of the sample.

Psychopathology—Subjects were given a four-item depression scale.[39] Those scoring more than 10 were give a risk factor. Since the psychopathology scale[50] was designed to measure normal variations in depressed mood, those receiving a risk factor on this variable may be characterized as experiencing some degree of psychological distress rather than a case of psychopathological depression.

Poor Relationship with Parents—Subjects were given a four-item scale that assessed their relationship with their parents.[38] The scale ranged from 4 to 20, and 27 per cent of the sample were given a risk factor for having a poor relationship with their parents.

Deviance—All subjects in Year 4 were given a four-item scale of law abidance.[51] Twenty-eight per cent of the sample scored low on law abidance[40] and were given a risk factor.

Sensation Seeking—Subjects completed the short version of the Sensation Seeking Scale.[18,52,53] All subscales were summed and the top 26 per cent were defined as high sensation seekers and given one risk factor.

Peer Drug Use—All subjects were asked to indicate the number of their friends or peers they knew who used cigarettes, liquor, cocaine, PCP, cannabis, inhalants, pills, and/or heroin. Responses to these eight items were summed into a continuous measure of peer drug use and the top 25 per cent were given a risk factor.

Adult Drug Use—All subjects were asked to indicate the number of adults they know who used cocaine, tranquilizers, beer/wine, liquor, cannabis, nonprescription medicine to get high, heroin, and got stoned on drugs. Responses to these seven items were summed and the top 24 per cent were given a risk factor, due to high perceived exposure to adult drug users.