

Risk and Protective Factors for Alcohol and Other Drug Problems in Adolescence and Early Adulthood: Implications for Substance Abuse Prevention

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The authors suggest that the most promising route to effective strategies for the prevention of adolescent alcohol and other drug problems is through a risk-focused approach. This approach requires the identification of risk factors for drug abuse, identification of methods by which risk factors have been effectively addressed, and application of these methods to appropriate high-risk and general population samples in controlled studies. The authors review risk and protective factors for drug abuse, assess a number of approaches for drug abuse prevention potential with high-risk groups, and make recommendations for research and practice.

In spite of general decreases in the prevalence of the nonmedical use of most legal and illegal drugs in recent years, the abuse of alcohol and other drugs during adolescence and early adulthood remains a serious public health problem (Adams, Blanken, Ferguson, & Kopstein, 1990). The consequences of drug abuse are acute on both a personal and a societal level. For the developing young adult, drug and alcohol abuse undermines motivation, interferes with cognitive processes, contributes to debilitating mood disorders, and increases risk of accidental injury or death. For the society at large, adolescent substance abuse extracts a high cost in health care, educational failure, mental health services, drug and alcohol treatment, and juvenile crime.

Added to the immediate personal and social costs of adolescent drug abuse are the longer range implications for youngsters who continue to abuse alcohol and drugs into adult life. Drug abuse is involved in one third to one half of lung cancer and coronary heart disease cases in adults (R. Blum, 1987). Alcohol and other drugs are major factors in acquired immunodeficiency syndrome (AIDS), violent crimes, child abuse and neglect, and unemployment. The problems associated with alcohol and other drug abuse carry costs in lost productivity, lost

life, destruction of families, and a weakening of the bonds that hold the society together.

Given the serious consequences of drug and alcohol abuse, considerable effort has been directed toward identifying effective treatment. Until recently, applied research in the substance abuse field has consisted primarily of experimental trials of various forms of treatment for alcohol and other drug abuse. The goal has been to identify ways to increase the effectiveness of treatment and to prevent relapse following treatment. Strategies ranging from self-help to aversive counterconditioning have been advocated and assessed.

Many of these studies have demonstrated how abstinence can be achieved, but long-term maintenance of abstinence has been more difficult. The reinforcing properties of alcohol and other drugs are themselves often reinforced by norms and behaviors of family members and others in the communities in which recovering people live. These combined reinforcements often overcome short-term treatment gains. According to the surgeon general: "For many drug-dependent persons, achieving at least brief periods of drug abstinence is a readily achievable goal. Maintaining abstinence, or avoiding relapse, however, poses a much greater overall challenge" (Surgeon general, 1988, p. 311).

Added to disappointment with the staying power of drug treatment is a growing recognition of the high cost of treatment and of the inability of existing treatment programs to keep up with increasing demand. In recent years, these considerations have stimulated interest in primary prevention of alcohol and other drug abuse.

This article focuses on the prevention of alcohol and other drug abuse among adolescents. A number of views have been advanced about what constitutes substance abuse when considering adolescents (Hawkins, Lishner, & Catalano, 1985). In this article, adolescent drug abuse is defined as the frequent use of alcohol or other drugs during the teenage years or the use of alcohol or other drugs in a manner that is associated with problems and dysfunctions. This conception of the problem is not

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meant to condone the infrequent use of alcohol or other drugs by teenagers, which is a violation of the law. The present definition simply reflects a recognition that a relatively large proportion of teenagers try alcohol or other drugs without becoming involved in the frequent use of these substances or developing drug-related problems (Newcomb & Bentler, 1988; Shedler & Block, 1990).

Cloninger and his colleagues (Cloninger, Bohman, Sigvardsson, & von Knorring, 1985; Cloninger, Sigvardsson, & Bohman, 1988) have identified two types of alcoholism. One type is associated with frequent impulsive-aggressive behavior and follows an early onset of alcohol use and alcohol problems in adolescence. This type of drug abuse is considered in this article. It is distinct from alcoholism that develops after age 25, which is not a focus of the current article.

Precursors of drug and alcohol problems have been described as risk factors for drug abuse. Risk factors occur before drug abuse and are associated statistically with an increased probability of drug abuse. A risk-focused approach seeks to prevent drug abuse by eliminating, reducing, or mitigating its precursors. This article suggests that a promising line for prevention research lies in testing interventions targeting multiple early risk factors for drug abuse.

A risk-focused approach in drug abuse prevention research and policy is warranted given the apparent success of this approach in reducing risk factors for problems as divergent as heart and lung disease (Bush et al., 1989; Vartiainen, Pallonen, McAlister, & Puska, 1990) and school failure (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikhart, 1984). The apparent failure of early prevention interventions, such as drug information programs that did not address known risk factors for drug abuse (Stuart, 1974; Weaver & Tennant, 1973), also argues for this approach.

Many of the risk factors for adolescent drug abuse also predict other adolescent problem behaviors (Hawkins, Jenson, Catalano, & Lishner, 1988). There is evidence that adolescent drug abuse is correlated with delinquency, teenage pregnancy, and school misbehavior and drop out (Elliott, Huizinga, & Menard, 1989; Jessor & Jessor, 1977; Zabin, Hardy, Smith, & Hirsch, 1986). Comprehensive risk-focused efforts probably can prevent other adolescent problem behaviors besides drug abuse.

If prevention of drug abuse (as defined above) is the goal, then risk factors salient for drug abuse rather than for the occasional use of alcohol or other drugs should be targeted. A relatively small proportion of adolescent drinkers or users are frequent or problem users (Johnston, O'Malley, & Bachman, 1988; Shedler & Block, 1990). The following review focuses on factors that have been shown to precede drug abuse.

Risk Factors for Adolescent Drug Abuse

Most studies to date have focused on small subsets of identifiable risk factors for drug abuse. There is little evidence available regarding the relative importance and interactions of various risk factors in the etiology of drug abuse, although current studies are seeking to measure a broader range of identified risk factors. At this time, it is difficult to ascertain, for instance, which risk factors or combination of risk factors are most virulent, which are modifiable, and which are specific to

drug abuse rather than generic contributors to adolescent problem behaviors. Current knowledge about the risk factors for drug abuse does not provide a formula for prevention, but it does point to potential targets for preventive intervention. Implications for intervention are considered in this article after a review of known risk factors for drug abuse in adolescence and early adulthood.

These risk factors can be roughly divided into two categories. First are broad societal and cultural (i.e., contextual) factors, which provide the legal and normative expectations for behavior. The second group includes factors that lie within individuals and their interpersonal environments. The principal interpersonal environments in children's lives are families, school classrooms, and peer groups. The risk factors have been described elsewhere (Hawkins, Lishner, Catalano, & Howard, 1986; Kandel, Simcha-Fagan, & Davies, 1986; Newcomb, Madadian, & Bentler, 1986; Simcha-Fagan, Gersten, & Langner, 1986) and are summarized here and in the left half of Table 1. This is not intended as a critical review of the methodologies of the studies but rather as an overview of the evidence currently available on risk factors for adolescent drug abuse.

Contextual Factors

Individuals and groups exist within a social context: the values and structure of their society. For example, shifts in cultural norms, in the legal definitions of certain behaviors, and in economic factors have been shown to be associated with changes in drug-using behaviors and in the prevalence of drug abuse. The following risk factors (1 through 4 below) exist in the broad social context:

1. *Laws and norms favorable toward behavior.* Recent research on the effects of laws on alcohol consumption has focused on three interventions by law: (a) taxation, (b) laws stating to whom alcohol may be sold, and (c) laws regarding how alcohol is to be sold.

Alcohol consumption is affected by price, specifically the amount of tax placed on alcohol at purchase (Levy & Shefflin, 1985). Cook and Tauchen (1982) found that increases in taxes on alcohol led to immediate and sharp decreases in liquor consumption and cirrhosis mortality.

Studies examining the relationship of minimum drinking age and adolescent drinking and driving have generally shown that lowering the drinking age increases teen drinking and driving and teen traffic fatalities and raising it decreases teen driving while intoxicated citations (DWIs) and deaths (Cook & Tauchen, 1984; Joks, 1988; Krieg, 1982; Saffer & Grossman, 1987).

Studies of restriction on how alcohol is sold have shown that allowing patrons to purchase distilled spirits by the drink increased the consumption of distilled spirits and the frequency of alcohol-related car accidents (Holder & Bloise, 1987). However, there was no increase in accidents involving males under the legal drinking age of 21 (Bloise & Holder, 1987).

Two general explanations of how laws affect the use of substances have been advanced. The first posits that laws reflect social norms and that use is largely a function of group norms (Watts & Rabow, 1983). Alcohol consumption rates vary among

(text continues on page 81)

Table 1
Risk Factors for Adolescent Substance Abuse With Corresponding Prevention Findings

Risk			Intervention		
Risk factor	Etiological study	Evidence (findings)	Implications	Study	Effects on risk factor or use/abuse (findings)
1. Laws and norms (a) Taxation	Levy & Sheflin, 1985	1% increase in tax on alcohol led to 1/2% decrease in consumption.	Raise taxes on alcohol	Levy & Sheflin, 1985; Cook & Tauchen, 1982; Saffer & Grossman, 1987	Higher alcohol taxes was related to decreases in consumption and accompanying effects.
(b) Laws regulating to whom liquor is sold	Cook & Tauchen, 1982	Increase in alcohol tax led to sharp decrease in consumption and cirrhosis mortality.	Increase and enforce age restrictions on purchase of alcohol	Decker et al., 1988; Krieg, 1982; Saffer & Grossman, 1987; Cook & Tauchen, 1982; Jokschi, 1988	Increasing age restrictions on alcohol purchases can reduce alcohol-related traffic fatalities.
	Saffer & Grossman, 1987	Higher taxes associated with lower teen drinking and fatalities. Higher tax more salient than drinking age.			
	Saffer & Grossman, 1987; Krieg, 1982; Cook & Tauchen, 1982; Jokschi, 1988	Higher drinking age associated with fewer teenage traffic fatalities, driving while intoxicated citations.			
(c) Laws regulating how liquor is sold	Holder & Blose, 1987; Blose & Holder, 1987	Liquor-by-the-drink sales increased consumption of distilled spirits but not proportion of drinkers in the population.	Discourage liquor-by-the-drink sales		
(d) Criminal laws making drugs illegal	Polich et al., 1984	Neither doubling of interdiction nor increased arrests of drug dealers would affect retail prices or availability of illegal drugs.	Deemphasize interdiction and criminal sanctions		
(e) Cultural norms		Alcohol consumption and other alcohol-related effects are associated with	Foster social norms opposing drug use	Johnson & Solis, 1983; Perry et al., 1988	Community health promotion associated with cessation or reduction of smoking.
	Watts & Rabow, 1983; Flasher & Maisto, 1984; Robins, 1984; Vaillant, 1983; Atkin et al., 1984	More exposure to ads promoting alcohol among teens reporting higher drinking levels.		Black, 1989	Saturation advertising accompanied increases in negative attitudes toward drugs, drug users; talking about drugs with parents, teachers, siblings among college students, children but less for 13-17-year-olds.
				Pentz, Brannon, et al., 1989; Moskowitz & Jones, 1988	Comprehensive school policies emphasizing prevention restrictions on opportunities for use may reduce smoking.

2. Availability	Gorsuch & Butler, 1976	Increased alcohol availability led to increases in drinking prevalence, amount of alcohol consumed, heavy use of alcohol.	Enforce drug and alcohol laws; resistance skills training	Hansen et al., 1988; Perry, 1986; Pentz, Dwyer, et al., 1989; Botvin, 1986; Klepp et al., 1986	Some social influence resistance programs include normative-change components, (e.g., depicting drug use as socially unacceptable, use of peer leaders to teach curriculum). For programs see Risk Factor 14.
	Maddahian et al., 1988; Dembo et al., 1979; G. D. Gottfredson, 1988	Availability affected use of alcohol and illegal drugs.		Robins, 1984; Johnston, 1991.	Norms antithetical to use are associated with reductions in prevalence of frequent marijuana, other illicit drug use. (Risk factors 1b, 2, 6, and 14 are related, all involving social influences to use. For studies and results see Risk Factor 14.)
3. Extreme economic deprivation	Bursik & Webb, 1982; Farrington et al., 1985	Poverty associated with childhood conduct problems, delinquency, chronic offenses.	Target intervention to economically disadvantaged children.	Lazar et al., 1982; Ramey et al., 1988; Seitz et al., 1985	Interventions with low-income families, including day care, preschool, parenting home visitors, health care, show promising effects on antisocial behavior in adolescence, aggression, special education placements, criminal involvement.
	Bachman et al., 1981; Zucker & Harford, 1983; D. M. Murray et al., 1987	Parental education and occupation positively correlated with teen alcohol and marijuana use.		Swift, 1988; Olds et al., 1986; Bronson et al., 1984; Pierson et al., 1983; Seitz et al., 1985	Early family support interventions have shown positive effects on child abuse, early school performance and attendance, family size, maternal employment.
	Robins & Ratcliff, 1979	Extreme poverty one of three factors increasing risk of adult alcohol and drug abuse in adults who were antisocial as children.		Berrueta-Clement et al., 1984	Follow-up of low-income 5-6-year-olds from Perry Pre-school Program at age 19 reveals less mental retardation, school drop-outs, crime, and welfare reliance and greater literacy, employment, college/vocational school for participants.

table continues

Table 1 (continued)

Risk factor	Risk		Intervention		Effects on risk factor or use/abuse (findings)
	Etiological study	Evidence (findings)	Implications	Study	
4. Neighborhood disorganization	Brook et al., 1990	Low socioeconomic status in childhood related to greater drug use in adolescence.			
	C.A. Murray, 1983; Herting & Guest, 1985; Wilson & Herrnstein, 1985; Fagan, 1988; Simcha-Fagan & Schwartz, 1986; Sampson et al., 1981; Sampson, 1986	Characteristics of neighborhoods such as population density, mobility, physical deterioration, low attachment, high crime are related to juvenile crime and drug trafficking.	Target families in high-risk neighborhoods	(See studies under Risk Factor 3, Economic deprivation)	
5. Physiological factors (a) Biochemical	Cloninger et al., 1988	Sensation seeking and low harm avoidance predict early-onset alcoholism.	Target youngsters with certain central nervous system disorders		
	Zuckerman, 1987; von Knorring et al., 1987; Tabakoff & Hoffman, 1988; Suwaki & Ohara, 1985; Schuckit, 1987	Sensation-seeking, early-onset alcoholism linked to platelet monoamine oxidase activity.	Target youngsters with certain central nervous system disorders or biochemical levels and with low socioeconomic status and central nervous system disorders		
(b) Genetic factors	Blum et al., 1990	Aldehyde dehydrogenase differences found in Asians with lower rates of alcoholism than controls.	Target youngsters with certain central nervous system disorders		
	Pollock et al., 1983	Genetic susceptibility to at least one form of alcoholism suggested by polymorphic pattern of dopamine D2 receptor gene.	Target interventions to children of alcoholics, especially boys		
	Schuckit et al., 1983; Schuckit, 1980; Schuckit & Rayes, 1979; Schuckit, 1987	More slow-wave electroencephalogram activity in children of alcoholics than non-alcoholics.			
	Kaji, 1960; Hrubec & Omenn, 1981	Differences between children of alcoholics and nonalcoholics in serum prolactin response, muscle response, and levels of acetaldehyde after administration of alcohol. Monozygotic twins were more than twice as likely as dizygotic twins to be concordant for alcoholism (all males).			

6. Family drug behavior	Gurling et al., 1981	Concordance rates for alcoholism of 21% for monozygotic and 25% for dizygotic twins, when both males and females were included.			
	Goodwin et al., 1974; Goodwin et al., 1977; Bohman, 1978; Cadoret et al., 1980; Cadoret & Gath, 1978; Goodwin, 1985	Rates of alcoholism ranging from 18% to 27% found for adopted sons of alcoholics compared with 5% to 6% for adopted males without biological alcoholic parent.			
	Marley et al., 1986	About half of hospitalized alcoholics do not have a family history of alcoholism. Evidence from animal studies of heritability in predisposition to barbiturate and morphine abuse.			
	R. M. Murray & Stabenau, 1982	No consistent evidence for genetic transmission of alcoholism in females reported.			
	Cotton, 1979; Goodwin, 1985; Cloninger et al., 1985; Johnson et al., 1984; Kandel et al., 1978; McDermott, 1984	Parental and sibling alcoholism, use of illicit drugs increase risk of alcoholism, drug use initiation, drug abuse in children.	Target interventions to children whose parents or siblings are users/abusers	DeMarsh & Kumpfer, 1986	Narcotic- and polydrug-abusing parents given parenting skills training developed more effective discipline methods; their children had fewer behavior problems after treatment and reported decreased intention to smoke, use alcohol.
	Ahmed et al., 1984	Drug salience in the household best predictor of children's expectations to use and actual use of alcohol, tobacco, and marijuana.			(Social influence resistance interventions can also target family drug use. See studies and results under Risk Factor 14, association with drug-using peers.)
	Hansen et al., 1987	Parental modeling directly related to friends' use of drugs, which in turn was related to adolescent subjects' drug use.			
	Brook et al., 1988	Oldest brothers and parents each had independent effect on younger brother's use. Both drug modeling and drug advocacy by older brothers had independent effects and interacted with parental drug use to provide a risk/protective effect.			

Table 1 (continued)

Risk factor	Risk		Intervention		
	Etiological study	Evidence (findings)	Implications	Study	Effects on risk factor or use/abuse (findings)
7. Family management practices	Brook et al., 1990	Fathers' nondrug use, emotional stability enhanced effects of peer nonuse of drugs.	Teach family management skills to parents	Lazar et al., 1982; Ramey et al., 1988; Seitz et al., 1985; Berrueta-Clement et al., 1984; Swift, 1988; Patterson et al., 1982; Baum & Forehand, 1981; Alexander & Parsons, 1973; Klein et al., 1977; Patterson & Fleishman, 1979; Fleishman, 1981; Patterson & Reid, 1973; Peed et al., 1977; Tremblay et al., 1990; Pentz, Dwyer, et al., 1989	Early childhood interventions including a parenting skills component produced positive outcomes for high-risk, low-income children. Parent skills training improved family interaction, reduced child problem behaviors. Functional family therapy reduced delinquency for juvenile offenders; prevented delinquency for their siblings. Parenting skills training taught parents to monitor children's behavior, to use contingent discipline for undesired behavior, and to reward prosocial behavior. Parenting skills, social skills for kindergarten boys reduced school adjustment problems, delayed delinquent behaviors. Parents participated in Midwestern Prevention Project; 80% of experimental families involved in homework assignments. Parenting component not assessed separately, but program package associated with lowered rates of tobacco, alcohol, and marijuana use.
	McDermott, 1984; Hansen et al., 1987; Barnes & Welte, 1986; Brook et al., 1986; Jessor et al., 1980	Perceived parent permissiveness toward drug, alcohol use more important than actual parent drug use in determining adolescent drug, alcohol use.			
	Kandel & Andrews, 1987; Baumrind, 1983; Penning & Barnes, 1982	Lack of or inconsistent parental discipline, low parental educational aspirations for children predict initiation into drug use.			
	Ziegler-Driscoll, 1979; Kaufman & Kaufman, 1979	Overinvolvement by one parent accompanied by distance or permissiveness by the other associated with risk.			
	Baumrind, 1983	Parent authoritativeness related to children's prosocial, assertive behaviors; parent nondirectiveness, permissiveness associated with higher drug use.			
	Reilly, 1979	Common characteristics of families of adolescent drug abusers: negative communication patterns, inconsistent, unclear behavior limits, unrealistic parental expectations.			
	Norem-Hebeisen et al., 1984	Drug users saw fathers as more hostile, adversarial; parents as less caring, more rejecting.			
	Tec, 1974	Parental drug use in unrewarding family structure more linked to marijuana use than in a rewarding family context.			

<p>Brook et al., 1990</p> <p>Shedler & Block, 1990</p> <p>Brook et al., 1990</p>	<p>Parent-adolescent attachment related to less marijuana use.</p> <p>Quality of mothers' interactions with 5-year-olds related to marijuana use at 18.</p> <p>Psychological stability of mothers offset effects of peer drug use.</p>	<p>Biglan, Glasgow, et al., 1987</p> <p>Karoly & Rosenthal, 1977; Martin, 1977; Patterson et al., 1982; Walters & Gilmore, 1973</p> <p>Dishion et al., 1989</p>	<p>No effect on child smoking of four parent messages mailed home for students involved in social influence resistance program. Parent compliance level not measured.</p> <p>Parenting skills training reduced preadolescents' problem behaviors, suggesting that parenting skills training can buffer risk factor of childhood behavior problems.</p> <p>Parent training groups improved parent-child interaction, level of tobacco use, reduced depression for at-risk youths.</p> <p>(See studies on parent training, family interventions above, Risk Factor 7).</p>
<p>Baumrind, 1983; Penning & Barnes, 1982; Robins, 1980</p> <p>Wilson & Herrnstein, 1985</p> <p>McCord, 1979; Rutter & Giller, 1983; W. McCord & McCord, 1959; Porter & O'Leary, 1980; Hetherington et al., 1979; Wallerstein & Kelly, 1980; Simcha-Fagan et al., 1986</p> <p>Brook et al., 1978; 1980; Braucht et al., 1978; Penning & Barnes, 1982</p>	<p>Children from homes broken by marital discord are at higher risk of delinquency, drug use.</p> <p>No independent contribution of parents' marital dissolution to delinquent behavior.</p> <p>Family conflict stronger predictor of delinquency than family structure (intact parental marriage).</p> <p>Lack of parent-child closeness, lack of maternal involvement related to drug initiation.</p>	<p>Reduce family conflict; services to children whose families are in conflict</p>	<p>Strengthen family bonding</p>
<p>8. Family conflict</p>	<p>9. Low bonding to family</p>		<p>(Effective early childhood and family support programs and parent training programs have been found to increase parent-child bonding. See studies and findings under Risk Factors 3 (economic deprivation) and 7 (family management).</p>

table continues

Table 1 (continued)

Risk factor	Risk		Intervention		
	Etiological study	Evidence (findings)	Implications	Study	Effects on risk factor or use/abuse (findings)
10. Early and persistent problem behaviors	Hirschi, 1969 Elliott et al., 1985; Brook et al., 1990	Bonding inhibits delinquency. Family bonding interacts with peer variables to influence delinquency and drug use.			
	Jessor & Jessor, 1977; Kim, 1979; Norem-Hebeisen et al., 1984; Gorsuch & Butler, 1976; Selnow, 1987; Brook, 1987; Brook, 1990; Brook, Gordon, et al., 1986; Hundleby & Mercer, 1987	Family involvement and attachment discourage youth drug initiation and level of use.			
	Robins, 1978	More variety, frequency of child antisocial behavior portends adult antisocial behavior.	Intervene early with children with problem behaviors. Strategies include parent training, social competence training for children	Patterson et al., 1982; Baum & Forehand, 1981; Fleishman, 1981; Patterson & Reid, 1973; Peed et al., 1977	
	Lerner & Vicary, 1984	"Difficult" temperament in 5-year-olds contributes to drug problems in adulthood.			
	Shedler & Block, 1990	18-year-old frequent marijuana users had emotional distress in childhood.			
	Kellam & Brown, 1982; Lewis, Robins, & Rice, 1985; Nylander, 1979; Loeber, 1988; Spivack, 1983	Aggressiveness in boys age 5-7 predicts frequent drug use, delinquency in adolescence; drug problems in adulthood.			
	Loeber & Dishion, 1983	Only 30-40% of boys with problem aggressive behavior maintained it 4 to 9 years later.			
				Battistich et al., n.d.; Bierman & Furman, 1984; Gesten et al., 1982; Ladd, 1981; Ladd & Asher, 1985; Rotheram 1982b; Shure & Spivack, 1982; Bierman et al., 1987; Weissberg & Caplan, 1989; Weissberg et al., 1981; Weissberg & Allen, 1985	

11. Academic failure (a) Intelligence	Loeber, 1988; McCord, 1981; Barnes & Welte, 1986; Kandel, 1982 Loney et al., 1979	Early aggressive or antisocial behavior persisting into early adulthood predicts later adolescent aggressiveness, drug abuse and/or alcohol problems. Hyperactivity, attention-deficit disorder raises delinquency risk if combined with conduct problems.	Allen et al., 1976	No effects on adjustment of social competence skills intervention.
	Gittelman et al., 1985	Hyperactivity in children, especially accompanied by conduct problems, increases substance abuse risk in late adulthood.	Lochman, 1988	Aggressive boys given anger management program had lower alcohol, marijuana use, fewer negative consequences of alcohol at age 14 (3 years postintervention, compared with matched group of untreated boys). No positive 3-year follow-up effects on aggression or general deviance.
	Brook et al., 1990	Children who are irritable, distractible, have temper tantrums, fight with siblings, engage in delinquent acts more likely to use drugs in adulthood.	Ketchel & Bieger, 1989; Kim et al., 1989.	Social competence, skills training in 4th grade produced lower use of alcohol, cigarettes, marijuana, especially in Grades 5-7.
	G. D. Gottfredson, 1981	Intellectual ability and delinquency have inverse relationship, after controlling for socioeconomic status.	Target interventions toward some higher ability youths	
	Fleming et al., 1982	High reading and IQ scores in Grade 1 predicted earlier, more frequent adolescent alcohol use in African-American inner-city sample.		
	Kandel & Davies, 1991	Higher test performance associated with higher lifetime levels of cocaine use in young adults.		
	Block et al., 1988	Drug use in boys related to IQ decline from age 11 to age 18.		

table continues

Table 1 (continued)

Risk		Intervention		
Risk factor	Etiological study	Evidence (findings)	Implications	Study
(b) School failure	Jessor, 1976; Smith & Fogg, 1978; Robins, 1980	Failure in school predicted adolescent drug abuse, frequency and levels of use of illicit drugs.	Promote academic achievement in a variety of ways	Berrueta-Clement et al., 1984; Seitz et al., 1985; Horacek et al., 1987; Gottis, 1989; Lazar et al., 1982; Ramey et al., 1988
	Feldhusen et al., 1973	Early antisocial behavior may predict later academic failure.		
	Hundleby & Mercer, 1987	Good school performance reduced likelihood of frequent drug use in ninth graders.		
				Parent involvement led to improved academic effort, grades, attendance in students with low school commitment. Student achievement gains linked to teacher's active instruction, direct supervision of learning.
				Interactive teaching, proactive classroom management, and cooperative learning led to greater math achievement gains in seventh-grade students.
				Controlled studies showed positive effect of cooperative learning on achievement and attitudes toward school and peers.
				"Jigsaw" cooperative learning method did not prevent drug use.
				Tutoring of socially rejected, low-achieving fourth graders produced improvements in reading, math achievement and reduced peer rejection, disruptive behavior.
				Gains in student academic achievement demonstrated over 12-year period after creation of school governance and management teams in urban school district.
				Cooperative learning, classroom management, student-teacher motivation, parent contacts, interactive teaching, discipline prevention resulted in improved academic achievement.
				Comer, 1988
				Freiberg et al., 1989
				Coie & Krehbiel, 1984
				DeVries & Slavin, 1978; Madden & Slavin, 1983; Ziegler, 1981; Dolan et al. 1989
				Schaps et al., 1986
				Hawkins & Lam, 1987; Hawkins, Doueck, & Lishner, 1988
				Brophy & Good, 1986
				Blechman et al., 1981; Bien & Bry, 1980

12. Low commitment to school	Johnston et al., 1985	Use of a variety of drugs is significantly lower among students expecting to attend college.	Promote commitment to school	Felner & Adan, 1988; Felner, Adan, & Evans, 1987; Felner, Weissberg, & Adan, 1987	Intervention to ease transitions to middle, junior high, and high schools, with advocacy and schools-within-schools to decrease fragmentation. Participating students had better academic performance than nonparticipating student in the same schools.
	D. C. Gottfredson, 1988	4-6% of variance in truancy was associated with drug involvement, controlling for ethnicity, parent education, delinquency.		Blechman et al., 1981; Bien & Bry, 1980	Parent involvement improved effort and attendance of students with low school commitment.
	Kelly & Balch, 1971 Friedman, 1983	How much students like school related to levels of drug use. Time spent on homework, perception of relevance of course-work related to levels of drug use.		Hawkins & Lam, 1987	Teacher interactive teaching, proactive classroom management, cooperative learning resulted in higher commitment to school and fewer suspensions, expulsions in seventh-grade experimental compared with control classrooms.
				DeVries & Slavin, 1978; Madden & Slavin, 1983; Ziegler, 1981	Cooperative learning produced positive effects on attitudes toward school and peers.
				Hawkins, Doueck, & Lishner, 1988	Cooperative learning produced reductions in suspensions, expulsion among low achievers.
				D. C. Gottfredson, 1986	Multicomponent school program promoting shared decision making, student services, academic innovations produced lower rates of drug abuse, delinquency, alienation; higher rates of attachment to school, educational expectations, belief in school rules in experimental than comparison schools.

table continues

Table 1 (continued)

Risk factor	Risk		Intervention		
	Etiological study	Evidence (findings)	Implications	Study	Effects on risk factor or use/abuse (findings)
13. Peer rejection in elementary grades	Parker & Asher, 1987; Cote, 1990 Kellam et al., 1980	Low acceptance by peers seems to elevate risk for school problems and criminality. Children who had been aggressive as first graders or aggressive and shy had higher levels of drug use than those who were just shy.	Provide opportunities for socialization, social competence skills	D. C. Gottfredson & Cook, 1986a, 1986b Felner & Adan, 1988 Battistich et al., n.d.; Bierman & Furman, 1984; Gesten et al., 1982; Ladd, 1981; Ladd & Asher, 1985; Rotheram, 1982a, 1982b; Shure & Spivack, 1982; Weissberg & Caplan, 1989 Lochman, 1988	Curriculum restructuring increased positive self-concept, attachment to school, belief in rules, math scores; decreased school rate of delinquency, drug use, suspensions. School transition study (see Risk Factor 11b, above) results show lower absenteeism, drop out for participating students compared with nonparticipating students in the same schools. Social competency studies have produced positive effects on children's interpersonal behavior. (See Risk Factor 10.)
	Brook et al., 1986	Childhood traits of social inhibition, isolation, and aggression not associated with adolescent drug use stage, but aggression, lower inhibition, and lower isolation in adolescence associated with higher drug use stage.			In spite of positive alcohol and marijuana effects (see Risk Factor 10), there were no positive effects for aggressive behavior or general behavioral deviance at 3-year follow-up.
	Cairns et al., 1988; Hartup, 1983; Tremblay, 1988	Aggressiveness may be associated with acceptance by other aggressive peers who could foster drug use; similarly, socially rejected children may form friendships with other rejected children in adolescence, leading to later delinquent behavior.			

14. Association with drug-using peers

Barnes & Welte, 1986; Kandel, 1978, 1986; Kandel & Andrews, 1987; Elliott et al., 1985; Jessor et al., 1980; Brook et al., 1990; Newcomb & Bentler, 1986; Byram & Fly, 1984	Peer use of substances is among the strongest predictors of substance use among youth.	Social influence resistance skills; social competence skills (see also Risk Factors 1, 2, and 6)	Botvin, 1986; Bukoski, 1986; Flay, 1985; Moskowitz, 1989; Tobler, 1986	Reviews of social influence resistance strategies have found modest but significant reductions in the onset and prevalence of cigarette smoking for groups receiving training in comparison with untrained controls.
	Influence of peers on drug use stronger than that of parents for Whites, African-Americans, Asians, Hispanics.		McAlister et al., 1980; Botvin, 1986; Hansen et al., 1988; Pentz, Dwyer, et al., 1989; Perry, 1986; Johnson et al., 1984	Social influence strategies showed beneficial effects in preventing or delaying the onset of alcohol and marijuana use.
Harford, 1985	Nondrinking African-American youths reported fewer drinking friends than African-American youths who drank.			
Dembo et al., 1979	Friends' use of alcohol and marijuana was related to use by African-American and Puerto Rican youths.		Botvin et al., 1990; Klepp et al., 1986; McAlister, 1983; D. M. Murray et al., 1984	Social influence resistance training groups led by peers achieved greater reductions in drug use than non-peer-led groups.
Brook et al., 1990	The most powerful linkage in causal pathway to marijuana nonuse was association with non-drug-using peers.		Botvin et al., 1989	Life skills training to prevent smoking for African-American urban junior high students resulted in fewer posttest smokers in treatment than control group on the basis of adjusted means for smoking status in past month. Six-year follow-up of social influence resistance smoking prevention program found no overall differences between program and control groups. Early program effects (Grade 8) had disappeared by Grade 12.

table continues

15. Alienation and rebelliousness	Jessor & Jessor, 1977; Kandel, 1982; Penning & Barnes, 1982; Jessor et al., 1980; Robins, 1980	Alienation from dominant societal values, low religiosity positively related to drug use, delinquent behavior.	Promote prosocial involvement	Schaps et al., 1986	<p>Follow-up of study comparing four smoking prevention strategies (three variations of social influences model and a health consequences model) and no intervention. Two to 5 years postintervention, mixed results favored peer-led social influences program (without videos) in restraining smoking for baseline nonsmokers and experimenters. At 5 and 6-year follow-up, differences had disappeared, with no program effects.</p> <p>Smoking prevention program for children of blue-collar families compared skills-based with discussion-based and control groups. Skills-based program had lower use rates for participants at 6, 12, 18, and 24 months follow-up.</p> <p>Social influences smoking prevention program; two levels of intervention, one comparison condition. Two- and 4-year follow-up reported lower monthly smoking rates for intervention over comparison schools. By 8-year follow-up, only effects for baseline nonsmokers were evident. Operating a school store (combined with cross-age tutoring) did not prevent drug use in predominantly White middle-class eighth, ninth graders.</p> <p>There is some evidence that intensive programs that empower high-risk youths to master new skills are associated with improved behavior and achievement.</p>
	Jessor & Jessor, 1977; Kandel, 1982; Penning & Barnes, 1982; Jessor et al., 1980; Robins, 1980	Alienation from dominant societal values, low religiosity positively related to drug use, delinquent behavior.	Promote prosocial involvement	Schaps et al., 1986	<p>Follow-up of study comparing four smoking prevention strategies (three variations of social influences model and a health consequences model) and no intervention. Two to 5 years postintervention, mixed results favored peer-led social influences program (without videos) in restraining smoking for baseline nonsmokers and experimenters. At 5 and 6-year follow-up, differences had disappeared, with no program effects.</p> <p>Smoking prevention program for children of blue-collar families compared skills-based with discussion-based and control groups. Skills-based program had lower use rates for participants at 6, 12, 18, and 24 months follow-up.</p> <p>Social influences smoking prevention program; two levels of intervention, one comparison condition. Two- and 4-year follow-up reported lower monthly smoking rates for intervention over comparison schools. By 8-year follow-up, only effects for baseline nonsmokers were evident. Operating a school store (combined with cross-age tutoring) did not prevent drug use in predominantly White middle-class eighth, ninth graders.</p> <p>There is some evidence that intensive programs that empower high-risk youths to master new skills are associated with improved behavior and achievement.</p>
	Bachman et al., 1981; Kandel, 1982; Smith & Fogg, 1978	Rebelliousness, resistance to traditional authority positively related to drug use, delinquent behavior.	Promote prosocial involvement	Tobler, 1986	<p>Follow-up of study comparing four smoking prevention strategies (three variations of social influences model and a health consequences model) and no intervention. Two to 5 years postintervention, mixed results favored peer-led social influences program (without videos) in restraining smoking for baseline nonsmokers and experimenters. At 5 and 6-year follow-up, differences had disappeared, with no program effects.</p> <p>Smoking prevention program for children of blue-collar families compared skills-based with discussion-based and control groups. Skills-based program had lower use rates for participants at 6, 12, 18, and 24 months follow-up.</p> <p>Social influences smoking prevention program; two levels of intervention, one comparison condition. Two- and 4-year follow-up reported lower monthly smoking rates for intervention over comparison schools. By 8-year follow-up, only effects for baseline nonsmokers were evident. Operating a school store (combined with cross-age tutoring) did not prevent drug use in predominantly White middle-class eighth, ninth graders.</p> <p>There is some evidence that intensive programs that empower high-risk youths to master new skills are associated with improved behavior and achievement.</p>

<i>table continues</i>

Table 1 (continued)

Risk factor	Risk		Intervention		
	Etiological study	Evidence (findings)	Implications	Study	Effects on risk factor or use/abuse (findings)
16. Attitudes favorable to drug use	Jessor & Jessor, 1977; Jessor, 1976; Paton & Kandel, 1978	High tolerance of deviance, resistance to authority, strong need for independence, normlessness linked with drug use.			
	Shedler & Block, 1990	Interpersonal alienation at age 7 predicted frequent marijuana use at 18.			
17. Early onset of drug use	Kandel et al., 1978; Krosnick & Judd, 1982; Smith & Fogg, 1978	Initiation into substance use is preceded by values favorable to its use.	Foster antidrug-use attitudes and norms.		(See studies and results under Risk Factors 1e and 14 for social resistance and cultural norms interventions.)
	Rachal et al., 1982; Kandel, 1982; Fleming et al., 1982; Robins & Pryzbeck, 1985	Misusers of alcohol begin drinking earlier than users; earlier onset of drug use predicts greater and more persistent use of more dangerous drugs.	Direct intervention to younger children and their parents; target risk factors developmentally before initiation of drug use		(See Risk Factors 3 and 7 for early childhood, parent support, parent training interventions.)
	Brunswick & Boyle, 1979; O'Donnell & Clayton, 1979; Kandel et al., 1976	Earlier initiation of drug use increases probability of deviant activities. Later onset of drug use predicts lower drug involvement and higher probability of discontinuation of use.			

different ethnic groups—for example, in association with differences in the extent to which members find consumption socially acceptable (Flasher & Maisto, 1984; Vaillant, 1983).

The second view of the law's effect focuses on supply and demand. As noted above, legal restrictions that influence the availability or price of alcohol or other drugs, such as taxation or laws regarding sales, appear to limit consumption.

Legal restrictions on the purchase of alcohol and norms unfavorable toward alcohol use clearly are associated with a lower prevalence of alcohol abuse. Conversely, laws and norms that express greater tolerance for the use of alcohol are associated with a greater prevalence of alcohol abuse. Johnston (1991) has suggested a similar relationship between norms regarding illegal drugs and the prevalence of illegal drug abuse.

2. *Availability.* The availability of drugs is dependent in part on the laws and norms of society. Nevertheless, availability is a separable factor. Whether or not particular substances are legal, their availability may vary and is associated with use. Research has shown that when alcohol is more available, the prevalence of drinking, the amount of alcohol consumed, and the heavy use of alcohol all increase (Gorsuch & Butler, 1976).

With regard to illegal drugs, Maddahian, Newcomb, and Bentler (1988) found in an adolescent sample that two measures of drug availability were significantly related to the use of cigarettes, alcohol, marijuana, and other illegal drugs, even after controlling for the amount of money available to the subjects. Dembo, Farrow, Schmeidler, and Burgos (1979) reported that the availability of drugs affected substance use indirectly among junior high school youths. G. D. Gottfredson (1988) found that drug availability varied in different schools and that drug availability influenced the use of drugs beyond the influence of individual characteristics of subjects.

3. *Extreme economic deprivation.* Indicators of socioeconomic disadvantage, such as poverty, overcrowding, and poor housing, have been shown to be associated with an increased risk of childhood conduct problems and delinquency (Bursik & Webb, 1982; Farrington et al., 1990). However, research on social class and drug use has not always confirmed popular stereotypes. A slight positive correlation between parental education and high school seniors' marijuana use has been reported (Bachman, Lloyd, & O'Malley, 1981). R. A. Zucker and Harford (1983) found that parental occupational prestige and education were positively related to teenage drinking. D. M. Murray, Richards, Luepker, and Johnson (1987) found that mother's occupation was positively correlated with monthly alcohol use, heavy alcohol use, and marijuana use among seventh-grade students. The 1988 National Household Survey on Drug Abuse revealed significantly higher lifetime prevalence rates for marijuana use among those with some college education as compared with those who had less than a high school education (Adams et al., 1990). In contrast, Robins and Ratcliff (1979) found that extreme poverty, though not lower-class status per se, was one of three factors that increased the risk of adult antisocial behavior, including alcoholism and illegal drug use, among children who were highly antisocial in childhood.

In summary, whereas there appears to be a negative relationship between socioeconomic status and delinquency, a similar relationship has not been found for the use of drugs by adolescents. Only when poverty is extreme and occurs in conjunction

with childhood behavior problems has it been shown to increase risk for later alcoholism and drug problems.

4. *Neighborhood disorganization.* Neighborhoods with high population density, lack of natural surveillance of public places (C. A. Murray, 1983), high residential mobility, physical deterioration, low levels of attachment to neighborhood (Herting & Guest, 1985), and high rates of adult crime also have high rates of juvenile crime (Wilson & Herrnstein, 1985) and illegal drug trafficking (Fagan, 1988). Simcha-Fagan and Schwartz (1986) assessed the contextual effects of neighborhood on delinquency and found that community economic level and community disorder—criminal subculture were significantly related to officially recorded delinquency.

When neighborhoods undergo rapid population changes, victimization rates increase, even after accounting for race and age differences (Sampson, 1986; Sampson, Castellano, & Laub, 1981). Neighborhood disorganization has been hypothesized to contribute to a deterioration in the ability of families to transmit prosocial values to children (W. McCord & McCord, 1959; Reiss, 1986; Shaw & McKay, 1969). Although few studies of neighborhood disorganization have explicitly examined its relationship with drug abuse, a deterioration in parental socialization and supervision associated with neighborhood disorganization could also be expected to produce high rates of drug involvement. More research is required to determine the effects of neighborhood disorganization on adolescent drug abuse.

Individual and Interpersonal Factors

Certain characteristics of individuals and of their personal environments are associated with a greater risk of adolescent drug abuse. These characteristics are summarized below as Risk Factors 5 through 17.

5. *Physiological factors.* Sensation seeking and low harm avoidance predict early-onset alcoholism (Cloninger et al., 1988). Poor impulse control in childhood predicts frequent marijuana use at age 18 (Shedler & Block, 1990). Zuckerman (1987) has suggested that sensation seeking is linked biochemically to platelet monoamine oxidase (MAO) activity, which has also been found to be associated with early-onset alcoholism (Tabakoff & Hoffman, 1988; von Knorring, Orelund, & von Knorring, 1987).

The enzyme aldehyde dehydrogenase (ALDH), important in the decomposition of ethanol in the body (Li, 1977), has also been linked to alcoholism. Asians without one ALDH enzyme drink less and have lower rates of alcoholism than controls (Harada, Agarwal, Goedde, & Ishikawa, 1983; Schuckit, 1987; Suwaki & Ohara, 1985).

Researchers have also studied differences in genetically mediated biological responses to alcohol among children of alcoholics and nonalcoholics. Pollock, Volavka, and Goodwin (1983) reported more slow-wave activity on the electroencephalogram (EEG) for children of alcoholics compared with children of nonalcoholics. Schuckit, Parker, and Rossman (1983) found differences in children of alcoholics and children of nonalcoholics in serum prolactin response to administration of alcohol. Schuckit (1980) reported greater muscle relaxation in response to ethanol, and Schuckit and Rayes (1979) found in-

creased levels of acetaldehyde after administration of alcohol in sons of alcoholics when compared with sons of nonalcoholics.

Researchers have sought to assess the independent contribution of genetic factors to the development of alcoholism through twin and adoption studies. Kaij (1960) and Hrubec and Omenn (1981) found that among males, monozygotic twins were more than twice as likely as dizygotic twins to be concordant for alcoholism, although in a study of both females and males, Gurling, Clifford, and Murray (1981) reported concordance rates for alcoholism of 21% in monozygotic and 25% in dizygotic twins.

Adoption studies in Denmark, Sweden, and the United States have provided more consistent evidence for genetic transmission of alcoholism in males, reporting rates of alcoholism ranging from 18% to 27% for the adopted sons of alcoholics compared with only 5% to 6% for adopted males without a biological alcoholic parent (Bohman, 1978; Cadoret, Cain, & Grove, 1980; Cadoret & Gath, 1978; Goodwin et al., 1974; Goodwin, Schulsinger, Moller, Mednick, & Guze, 1977). No consistent evidence for genetic transmission of alcoholism in females has been reported (R. M. Murray & Stabenau, 1982).

Note that the adoption studies suggesting a genetic factor in male alcoholism also reveal that less than 30% of the sons of alcoholics themselves become alcoholic. Furthermore, about half of hospitalized alcoholics do not have a family history of alcoholism (Goodwin, 1985), suggesting that factors other than genetic predisposition also contribute to alcoholism.

It is beyond the scope of this article to review thoroughly the recent developments in this area of alcoholism studies. Research continues to point toward differences in physiological responses to ethanol among sons of alcoholics (Schuckit, 1987) and to other possible genetic and biochemical "markers" of risk for alcoholism (K. Blum et al., 1990; Tabakoff & Hoffman, 1988). Early-onset alcoholism that is associated with impulsivity and aggression apparently has a partial foundation in individual physiological characteristics.

Little research has been conducted on genetic predisposition and the abuse of drugs other than alcohol in humans, although there is evidence from animal studies of a heritability in predisposition to barbiturate and morphine abuse (Marley, Miner, Wehner, & Collins, 1986).

6. Family alcohol and drug behavior and attitudes. Families affect children's drug use behaviors in a number of ways. Beyond the genetic transmission of a propensity to alcoholism in males, family modeling of drug using behavior and parental attitudes toward children's drug use are family influences related specifically to the risk of alcohol and other drug abuse. Poor parenting practices, high levels of conflict in the family, and a low degree of bonding between children and parents appear to increase risk for adolescent problem behaviors generally, including the abuse of alcohol and other drugs (Brook, Brook, Gordon, Whiteman, & Cohen, 1990). In this section, the family risk factors specific to alcohol and other drug abuse are reviewed. Family factors more generally predictive of adolescent problem behaviors are reviewed in subsequent sections.

Parental and sibling alcoholism (Cloninger, Bohman, Sigvardsson, & von Knorring, 1985; Cotton, 1979; Goodwin, 1985) and illegal drug use (G. M. Johnson, Schoutz, & Locke, 1984) increase the risk of alcoholism and drug abuse in chil-

dren. Parental drug use is associated with initiation of use by adolescents (G. M. Johnson et al., 1984; Kandel, Kessler, & Margulies, 1978; McDermott, 1984) and with frequency of marijuana use (Brook et al., 1990). Similar findings have been reported for adolescent drinking habits (Rachal et al., 1982; R. A. Zucker, 1979). G. M. Johnson et al. (1984) found that parental use of marijuana was associated with adolescents' use of other illegal drugs, including cocaine and barbiturates.

Ahmed, Bush, Davidson, and Iannotti (1984) examined the effects of parental modeling of drug use on children's expectations to use drugs and on their drug use. In a study of 420 children in grades kindergarten (K) to 6, they found "salience," a measure of the number of household users of a drug and the degree of children's involvement in parental drug-taking behavior, to be the best predictor of both expectations to use and actual use of alcohol. Salience was also a predictor of children's cigarette and marijuana use. The importance of number of household users varied across substance. As the number of family members who used alcohol or marijuana increased, so did the probability that the child used or expected to use these substances. For cigarette smoking, having one household member who smoked cigarettes almost doubled the probability that a child smoked or expected to smoke, but additional smokers in the home did not increase this probability further.

Note that Hansen et al.'s (1987) structural equation modeling analyses using cross-sectional data indicated indirect, but not direct, effects of parental modeling of drug use on children's drug use in early adolescence. Parental modeling was directly related to friends' use of drugs, which, in turn, was related to subjects' drug use. This finding is consistent with the findings of Brook et al. (1990), whose combined longitudinal and cross-sectional studies revealed that nondrug use and emotional stability in fathers enhanced the effect of peer nonuse of drugs and that psychological stability in mothers offset the effects of peer drug use.

Brook, Whiteman, Gordon, and Brook (1988) examined the role of older brothers in younger brothers' drug use and found that older brothers' advocacy of drugs and modeling of drug use were both associated with younger brothers' use. They also observed an interaction pattern in which some of the negative effects of parental drug use were offset by the older brothers' nonuse. Older brothers' and peers' drug modeling both were more strongly associated with younger brothers' use than was parental modeling of drug use.

McDermott's (1984) research indicated that although parental drug use and adolescent drug use are related, suggesting the modeling effect discussed above, permissive parental attitudes toward drug use as perceived by youths may be of equal or greater importance than actual parental drug use in determining the adolescent's use of drugs. This finding is consistent with Hansen et al.'s (1987) results. Similarly, Barnes and Welte (1986) found that parental approval of drinking was a significant predictor of the amount of alcohol consumed by teenage drinkers, and Brook, Gordon, Whiteman, and Cohen (1986) found that parental tolerance of drug use predicted adolescent drug use. This relationship has been shown for Whites, Hispanics, African Americans, Native Americans and Asian Americans (Jessor, Donovan, & Windmer, 1980).

7. Poor and inconsistent family management practices.

Kandel and Andrews (1987) found that lack of maternal involvement in activities with children; lack of, or inconsistent, parental discipline (see also Baumrind, 1983; Penning & Barnes, 1982); and low parental educational aspirations for their children predict initiation of drug use. Stanton (1979), Kaufman and Kaufman (1979), and Ziegler-Driscoll (1979) suggested that familial risk factors include a pattern of overinvolvement by one parent and distance or permissiveness by the other.

Differences between the effects of mothers' and fathers' disciplinary techniques were observed by Brook et al. (1990). Maternal control techniques were more important than paternal techniques in explaining adolescent marijuana use. Specifically, mothers' control patterns that included setting clear requirements for responsible behavior led to less marijuana use, and mothers' use of guilt to control was correlated with greater drug use.

Baumrind (1983) classified parenting styles as authoritative, authoritarian, or permissive and found that children who were highly prosocial and assertive generally came from authoritative families. She found that parental nondirectiveness or permissiveness contributed to higher levels of drug use. Reilly (1979) found that common characteristics of families with adolescent drug abusers included negative communication patterns (criticism, blaming, lack of praise), inconsistent and unclear behavioral limits, and unrealistic parental expectations of children.

Shedler and Block (1990) found that the quality of mothers' interaction with their children at age 5 distinguished children who were frequent users of marijuana at age 18 from those who had only experimented with marijuana use. Mothers of children who became frequent users were relatively cold, underresponsive, and underprotective with their children, giving their children little encouragement but pressuring them to perform in tasks.

Norem-Hebeisen, Johnson, Anderson, and Johnson (1984) also found that the quality of adolescents' relationships with their parents was related to patterns of drug use. Generally, drug users perceived their fathers as more hostile, rejecting, and adversarial than did nonusers.

The evidence suggests an independent contribution of family interactions to adolescent drug use, separate from the effects of parental drug use. Tec (1974) found that parental drug use in a rewarding family structure only slightly promoted frequent marijuana use but that in a unrewarding context, there was a clear association between levels of drug use by parents and their children.

In summary, the risk of drug abuse appears to be increased by family management practices characterized by unclear expectations for behavior, poor monitoring of behavior, few and inconsistent rewards for positive behavior, and excessively severe and inconsistent punishment for unwanted behavior.

8. Family conflict. Although children from homes broken by marital discord are at higher risk of delinquency and drug use (Baumrind, 1983; Penning & Barnes, 1982; Robins, 1980), there does not appear to be a direct independent contribution of "broken homes" to delinquent behavior (Wilson & Herrnstein, 1985). Conflict among family members appears more important in the prediction of delinquency than does family structure per se (Farrington, Gallagher, Morley, Ledger, &

West, 1985; McCord, 1979; Rutter & Giller, 1983). Rutter and Giller have noted that parental conflict is associated with antisocial behavior in children even when the home is unbroken (see also W. McCord & McCord, 1959; Porter & O'Leary, 1980) and that even in samples in which all homes are broken, the extent of family conflict is associated with the likelihood of antisocial behavior in the children (see also Hetherington, Cox, & Cox, 1979; Wallerstein & Kelly, 1980). Similarly, Simcha-Fagan, Gersten, and Langner (1986) found that the use of heroin and other illegal drugs was strongly associated with parental marital discord. In summary, children raised in families high in conflict appear at risk for both delinquency and illegal drug use.

9. Low bonding to family. Parent-child interactions characterized by lack of closeness (Brook, Lukoff, & Whiteman, 1980; Kandel et al., 1978) and lack of maternal involvement in activities with children (Braucht, Kirby, & Berry, 1978; Penning & Barnes, 1982) appear to be related to initiation of drug use. Conversely, positive family relationships—involvement and attachment—appear to discourage youths' initiation into drug use (Brook et al., 1986; Gorsuch & Butler, 1976; Jessor & Jessor, 1977; Kim, 1979; Norem-Hebeisen et al., 1984; Selnow, 1987). Hundleby and Mercer (1987) found that adolescents' reports of parental trust, warmth, and involvement explained small portions of the variance in the extent of tobacco, alcohol, and marijuana use.

Bonding to family may inhibit drug involvement during adolescence in a manner similar to the way in which family bonding inhibits delinquency (Hirschi, 1969). Brook et al. (1990) pointed to the salience of parent-child attachment in describing the pathways to marijuana use frequency in their combined longitudinal and cross-sectional studies. They reported a causal pathway in which parental internalization of traditional values led to the development of strong parent-child attachment; this mutual attachment led to the child's internalization of traditional norms and behavior, which in turn led the youngster to associate with non-drug-using peers, which led to nonuse.

10. Early and persistent problem behaviors. The greater the variety, frequency, and seriousness of childhood antisocial behavior, the more likely antisocial behavior is to persist into adulthood (Robins, 1978).

A longitudinal study of 5-year-olds followed into adulthood (Lerner & Vicary, 1984) found that a difficult temperament, including frequent negative mood states and withdrawal, contributes to drug problems. Children characterized by withdrawal responses to new stimuli, biological irregularity, slow adaptability to change, frequent negative mood expressions, and high intensity of positive and negative expressions of affect more often became regular users of alcohol, tobacco, and marijuana in adulthood than "easy" children, who evidenced greater adaptability and positive affect early in life. Similarly, Shedler and Block (1990) found that frequent marijuana users at age 18 were characterized in childhood by emotional distress. Lerner and Vicary (1984) suggested that the negative mood and withdrawal responses of the difficult child may be analogous to the depression and social alienation frequently reported for drug abusers (Knight, Shephard, & Bryson, 1974;

Paton & Kandel, 1978; Paton, Kessler, & Kandel, 1977; Smith & Fogg, 1978).

Brook et al. (1990) found that children who were irritable, easily distractible, had temper tantrums, fought often with siblings, and engaged in predelinquent behavior were more likely to use drugs in adolescence.

Aggressive behavior in boys appears to signal another path toward later antisocial behavior. Aggressiveness in boys as early as ages 5–7 (Grades K–2) has been found to predict later antisocial behavior including frequent drug use in adolescence (Kellam & Brown, 1982), drug problems in adulthood (Lewis, Robins, & Rice, 1985; Nylander, 1979), and delinquency in adolescence (Loeber, 1988; Spivack, 1983). However, early aggressiveness is not invariably followed by serious antisocial behavior. Approximately 30% to 40% of the boys engaged in maladaptive, aggressive behaviors continue that behavior 4 to 9 years later (Loeber & Dishion, 1983).

Few youths develop highly physically aggressive behaviors in late childhood or adolescence if not engaged in such behaviors in earlier childhood, and most boys grow out of early aggressive behaviors. However, if aggressive behavior continues into early adolescence (age 13), it is a relatively strong predictor of continued aggressive behavior in late adolescence as well as of later alcoholism (Loeber, 1988; McCord, 1981). Furthermore, if antisocial behavior persists and becomes more varied in early adolescence to include fighting and school misbehavior, drug abuse is more likely (Barnes & Welte, 1986; Kandel, 1982). Barnes and Welte found that school misconduct was one of the three most important predictors of alcohol-related problems in a study of subjects from six ethnic groups in Grades 7–12.

Hyperactivity and attention-deficit disorders have been shown to increase risk for delinquency when combined with conduct problems including aggression (Loney, Kramer, & Milich, 1979). Gittelman, Mannuzza, and Bonagura (1985) found a higher prevalence of substance abuse disorders in late adolescence among subjects diagnosed as hyperactive in childhood. As with delinquency, those at highest risk were those with both hyperactivity and conduct disorders. The Gittelman et al. finding that hyperactivity, without accompanying conduct problems, predicts an increased risk of substance abuse has not been replicated. However, it suggests further investigation into the relationship between attention-deficit disorders, conduct problems, and substance abuse.

11. Academic failure. Although there is an inverse relationship between intellectual ability and delinquency after controlling for socioeconomic status and race (G. D. Gottfredson, 1981), a similar relationship has not been reported for drug use, in spite of the covariation in delinquent and drug-using behaviors. In fact, in an African-American inner-city sample, higher scores on reading readiness and IQ tests in Grade 1 predicted earlier and more frequent use of alcohol in adolescence (Fleming, Kellam, & Brown, 1982). Similarly, in a national probability sample, high intelligence, as assessed by the Armed Forces Qualifying Test, was associated with higher lifetime levels of cocaine use among young adults age 19–26 (Kandel & Davies, 1991).

Nevertheless, failure in school has been identified as a predictor of adolescent drug abuse (Jessor, 1976; Robins, 1980). Poor school performance has been found to predict frequency

and levels of use of illegal drugs (Smith & Fogg, 1978). Holmberg (1985), in a longitudinal study of 15-year-olds, reported that truancy, placement in a special class, and early drop out from school were prognostic factors for drug abuse. In contrast, outstanding performance in school reduced the likelihood of frequent drug use among a ninth-grade sample studied by Hundleby and Mercer (1987).

What is not clear from the existing research is when, developmentally, poor school achievement becomes a stable predictor of drug abuse. The available evidence suggests that social adjustment is more important than academic performance in the early elementary grades in predicting later drug abuse. Early antisocial behavior in school may predict both academic failure in later grades (Feldhusen, Thurston, & Benning, 1973) and later drug abuse. Academic failure in late elementary grades may exacerbate the effects of early antisocial behavior or contribute independently to drug abuse.

12. Low degree of commitment to school. A low degree of commitment to education also appears to be related to adolescent drug use. Annual surveys of high school seniors by Johnston, O'Malley, and Bachman (1985) show that the use of hallucinogens, cocaine, heroin, stimulants, sedatives, or nonmedically prescribed tranquilizers is significantly lower among students who expect to attend college than among those who do not plan to go on to college. G. D. Gottfredson (1988) found that truancy for both boys and girls was associated with drug involvement, after accounting for effects of ethnicity, parental education, and delinquency. Factors such as how much students like school (Kelly & Balch, 1971), time spent on homework, and perception of the relevance of course work are also related to levels of drug use (Friedman, 1983), indicating a negative relationship between commitment to education and frequent drug use among junior and senior high school students.

13. Peer rejection in elementary grades. Although it would be premature to posit a direct link between peer rejection and substance abuse, low acceptance by peers seems to put an adolescent at risk for school problems and criminality (Coie, 1990; Kupersmidt, Coie, & Dodge, 1990; Parker & Asher, 1987), which are also risk factors for substance abuse (Hawkins, Lishner, Jensen, & Catalano, 1987).

Little research has been done on the direct link between peer rejection and substance use, but traits of the child that have been associated with peer rejection—aggressiveness, shyness, and withdrawal—have been examined for their relationship to drug use. For example, Kellam, Ensminger, and Simon (1980) found that children who had been shy in first grade reported low levels of involvement in drug use, whereas those who had been aggressive or had shown a combination of aggressiveness with shyness in first grade had the highest levels of use. Brook et al. (1986) found that childhood traits relevant to peer rejection—social inhibition, isolation from peers, and aggression against peers—were not significantly associated with adolescent drug use stage. However, aggression against peers during adolescence was associated with stage of use, and teenagers who were less socially inhibited and less isolated from peers were likely to be at a more advanced stage of use.

These studies suggest that the link between peer rejection and subsequent drug use may not be a simple one. Shyness, by isolating a child from his or her peers, may protect the child

against drug use by eliminating one source of influence to use: drug-using peers. Aggressiveness, on the other hand, though resulting for some children in exclusion from groups of conventional peers, may be associated with acceptance by other aggressive and perhaps delinquent peers who could foster drug use (Cairns, Cairns, Neckerman, Gest, & Gairepy, 1988). Hartup (1983) suggested that rejected children form friendships with other rejected children during the preadolescent years and that these friendship groups become delinquent during adolescence. However, this process is as yet unconfirmed (Tremblay, 1988).

14. *Association with drug-using peers.* Peer use of substances has consistently been found to be among the strongest predictors of substance use among youth (Barnes & Welte, 1986; Brook et al., 1990; Elliott, Huizinga, & Ageton, 1985; Jessor et al., 1980; Kandel, 1978, 1986; Kandel & Andrews, 1987). Studies among specific ethnic groups confirm this relationship. Newcomb and Bentler (1986) reported that the influence of peers on adolescent drug use was stronger than that of parents for Whites, African Americans, Asian Americans and Hispanic Americans. Similar findings were reported by Byram and Fly (1984). Harford (1985) found that African-American youths who did not drink alcohol reported fewer school friends who drank than did those who drank, and Dembo et al. (1979) found that friends' use of alcohol and marijuana was related to a youth's own use for both African-American and Puerto Rican-American youths.

15. *Alienation and rebelliousness.* Alienation from the dominant values of society (Jessor & Jessor, 1977; Kandel, 1982; Penning & Barnes, 1982), low religiosity (Jessor et al., 1980; Kandel, 1982; Robins, 1980), and rebelliousness (Bachman et al., 1981; Kandel, 1982) have been shown to be positively related to drug use and delinquent behavior. Shedler and Block (1990) found that interpersonal alienation measured at age 7 predicted frequent marijuana use at age 18. Similarly, high tolerance of deviance (Jessor & Jessor, 1977), a strong need for independence (Jessor, 1976), and normlessness (Paton & Kandel, 1978) have all been linked with drug use. All these qualities would appear to characterize youths who are not bonded to society.

16. *Attitudes favorable to drug use.* Research also has shown a relationship between drug use initiation and specific attitudes and beliefs regarding drugs. Initiation into use of any substance is preceded by values favorable to its use (Kandel et al., 1978; Krosnick & Judd, 1982; Smith & Fogg, 1978).

17. *Early onset of drug use.* Early onset of drug use predicts subsequent misuse of drugs. Rachal et al. (1982) reported that misusers of alcohol appear to begin drinking at an earlier age than do users. The earlier the onset of any drug use, the greater the involvement in other drug use (Kandel, 1982) and the greater the frequency of use (Fleming, Kellam, & Brown, 1982). Earlier initiation into drug use also increases the probability of extensive and persistent involvement in the use of more dangerous drugs (Kandel, 1982) and the probability of involvement in deviant activities such as crime and selling drugs (Brunswick & Boyle, 1979; O'Donnell & Clayton, 1979). Robins and Przybeck (1985) found that the onset of drug use before the age of 15 was a consistent predictor of drug abuse in the samples they studied. Conversely, a later age of onset of drug use has been shown to

predict lower drug involvement and a greater probability of discontinuation of use (Kandel, Single, & Kessler, 1976).

Implications of Research on Risk

A risk-focused prevention approach requires identification of those risk factors to be addressed. Unfortunately, all the information needed to select the most promising risk factors for intervention is not yet at hand. Experimental research is needed to discover which risk factors are causal and which are spurious in the etiology of drug abuse. Only by addressing risk factors in experimental trials and observing the effects on drug abuse can one determine whether a precursor of drug abuse is causally related to drug abuse. Experimental prevention research is therefore necessary both to understand the etiology of drug abuse and to determine which risk factors should be targeted in prevention policy and programs.

Several general conclusions regarding risks for drug abuse can be drawn, which have implications for prevention. First, the risk factors reviewed above have been shown to be stable over time in spite of changing norms. For example, despite general changes in norms regarding the use of drugs such as marijuana over the past 20 years (Johnston, O'Malley, & Bachman, 1989), studies conducted in different times and places have shown these factors to predict adolescent drug abuse relatively consistently. This suggests the risk factors' stability as predictors and their viability as targets for preventive work.

Second, risk factors from several domains predict drug abuse. Some factors are characteristics of the individual; others are characteristics of families and their interactions, schools and classroom experiences, peer groups, and broader community, legal, economic, and cultural factors.

Third, different risk factors are salient at different periods of development. For example, poor academic achievement in Grades 1 and 2 does not appear to be a stable predictor of teenage drug abuse (Kellam & Brown, 1982), though poor achievement in the later grades predicts drug abuse. Aggressiveness at ages 5-7 predicts later drug abuse and, if it continues, becomes more strongly predictive of drug abuse with increasing age.

Fourth, there is evidence that the more risk factors present, the greater the risk of drug abuse (Bry, McKeon, & Pandina, 1982; Newcomb et al., 1986). Rutter (1980) found a multiplicative effect of added risk factors on the likelihood of childhood psychopathology, and Newcomb, Maddahian, Skager, and Bentler (1987) reported a similar contribution of combinations of different risk factors to overall risk for adolescent drug use. It is plausible that a greater length of exposure to environmental risk factors exacerbates risk as well. Current research focuses on how risk factors interact in the etiology of drug abuse (Loeber & Stouthamer-Loeber, 1986). Greater precision in estimating how much various risk factors contribute to drug abuse will help to focus prevention efforts on those risk factors that are most virulent.

A risk-focused prevention approach does not require that risk factors be manipulated directly. It may be impossible to reduce or change certain risk factors directly through preventive intervention. In these instances, the goal of prevention efforts will be to mediate or moderate the effects of the identified but non-

manipulable risk factors. A family history of alcoholism, for example, may be difficult or impossible to change. Nevertheless, it may be possible to moderate the effects of a family history of alcoholism by intervening with children who are at risk because of their exposure to this environment. One task of risk-focused prevention research is to determine which risk factors can be manipulated, which risk factors cannot be changed but can be mediated or moderated, and which risk factors cannot be affected at all.

Protective Factors Against Drug Abuse

Because some risk factors for drug abuse may be resistant or impossible to change, the results of research on protective factors are important for prevention policy. Protective factors mediate or moderate the effects of exposure to risk (Cowen & Work, 1988; Garmezy, 1985; Rutter, 1985; Werner, 1989). To the extent that protective factors are identified that inhibit drug abuse among those at risk, strategies can seek to address risk by enhancing these protective factors. Research with populations exposed to multiple risks has identified substantial subgroups of individuals who are able to negotiate risk exposure successfully, escaping relatively unscathed (Werner, 1989). These observations have led to interest in the etiological importance of factors that may protect against health problems including drug abuse.

Concepts of vulnerability and resiliency have been advanced to identify the extent of individual susceptibility to risk (Rutter, 1985). Vulnerability denotes intensified susceptibility to risk; resiliency is the ability to withstand or surmount risk. From this perspective, protection involves enhancing resilient responses to risk exposure. The hypothesis is that certain characteristics or conditions mediate or moderate the effects of exposure to risk, thereby reducing the vulnerability and enhancing the resiliency of those at risk and protecting them from undesirable outcomes. To illustrate, Werner and Smith (1982) found that in rural Kauai, Hawaii, being raised in a small family with low conflict, having high intelligence, and being a firstborn child buffered the effects of extreme poverty and other risk factors for poor educational, economic, and health outcomes.

For the concept of protective factors—as distinct from risk factors—to be useful, it must apply to differences in outcomes among individuals exposed to the same risks. Though some have viewed protective factors simply as the opposite of those variables identified as risk factors (Labouvie & McGee, 1986), this conception does not appear particularly useful. Designating two distinct constructs (e.g., risk and protective factors) to distinguish extreme levels of a single variable bearing a linear relationship to drug abuse adds little. It is not necessary to postulate protective factors if better outcomes are observed in those not exposed to risk. On the other hand, if protective factors are viewed as sources of differences in response to a given amount of exposure to risk, the construct stimulates attention to nonlinear and interactive relationships among risk and protective factors.

In urging a focus on protective mechanisms, Rutter (1985) described *interactive processes* to identify multiplicative interactions or synergistic effects, in which one variable potentiates the effect of another. The idea of identifying protective processes or specifying particular interactions among variables

that produce an enduring shield or resilience in the face of risk for negative outcomes has direct relevance for risk-focused drug abuse prevention. It suggests that the goals of risk-focused prevention may be accomplished both through direct efforts at risk reduction and through the enhancement of protective factors that moderate or mediate the effects of exposure to risk. Preventive work that seeks to address risk factors for drug abuse must clearly hypothesize how a particular intervention is expected to address risk: by directly eliminating or reducing a risk factor or by mediating or moderating its effects through the enhancement of protective factors or processes.

Little research has focused specifically on protection against adolescent drug abuse defined in this way. However, recently Brook et al. (1990) identified two mechanisms by which protective factors reduce risk for adolescent drug use. The first is a “risk/protective” mechanism through which exposure to risk factors is moderated by the presence of protective factors. They reported that the risk posed by drug-using peers was moderated by a strong attachment or bond between parent and adolescent and by parent conventionality. The second is a “protective/protective” mechanism through which one protective factor potentiates another protective factor, strengthening its effect. They reported that a strong bond of attachment between adolescent and father enhanced the effects of other protective factors such as adolescent conventionality, positive maternal characteristics, and marital harmony in preventing drug use.

In related research areas, Garmezy (1985) has identified protective factors among children exposed to extreme stress because of highly disturbed family circumstances. These include a child's own positive temperament or disposition, a supportive family milieu, and an external support system that encourages and reinforces the child's coping efforts and strengthens them by inculcating positive values. Rutter (1985) has suggested that resilient children display a repertoire of social problem solving skills and belief in their own self-efficacy.

In designing interventions to reduce the negative effects of identified risk factors, it is important to focus attention on the potential positive effects of such protective factors. The available evidence suggests that to be viable, a prevention strategy requires attention to risk and protective factors related to individual vulnerability, poor child rearing, school achievement, social influences, social skills, and broad social norms, all of which are implicated in the development of adolescent drug abuse. Because risks are present in several social domains and cumulate in predicting drug abuse, multicomponent prevention strategies focused on reducing multiple risks and enhancing multiple protective factors hold promise. Such strategies would be designed to build up protection while reducing risk.

Each risk factor targeted should be addressed during the developmental period at which it begins to stabilize as a predictor of subsequent drug abuse. Interventions must also target populations at greatest risk—groups and individuals who are exposed to a large number of risk factors—if the prevalence of drug abuse, as defined here, is to be reduced through prevention efforts. Although intervention with people who are not exposed to multiple risk factors may delay or prevent the onset of drug use in the general population, a desirable goal in its own right, it may fail to reduce significantly the prevalence of drug abuse.

The evidence suggests a developmentally adjusted, multiple-component risk-reduction strategy that cuts across traditional health, education, and human service delivery systems. The strategy must reach those at highest risk by virtue of exposure to multiple risk factors. It must address the most significant risk factors faced by those groups. Finally, the strategy may explicitly seek to increase protective factors as mediators or moderators against risks that cannot be changed by intervention.

Using Theory to Guide Prevention Research and Practice

To design a multicomponent intervention strategy that seeks to reduce multiple risk factors and simultaneously enhance protective factors among those exposed to risk, it is useful to be guided by a theory of causation and prevention. Theory supplies the explanatory framework for the observed evidence regarding risk and protective factors for drug abuse by hypothesizing causal relationships among these variables that lead toward or away from drug abuse. Theory is also useful in guiding the design of complementary prevention interventions in different social units when multiple interventions are desired. To guide prevention interventions, theory should (a) identify the factors that predict drug abuse, (b) explain the mechanisms through which they operate, (c) identify the factors that influence these mechanisms, (d) predict points to interrupt the course leading to drug abuse, and (e) specify the interventions to prevent onset of drug abuse (Kazdin, 1990).

It is not our goal to review theories of drug abuse (see Lettieri, Sayers, & Pearson, 1980, for a review). Nevertheless, an example illustrates how theory can provide clear direction for preventive interventions of the type described here.

As noted by Kazdin (1990), our delinquency and drug abuse prevention efforts have been grounded in the social development model (Farrington & Hawkins, 1991; Hawkins & Lam, 1987; Hawkins & Weis, 1985). An integration of control theory (Hirschi, 1969) and social learning theory (Bandura, 1977), the social development model emphasizes the role of bonding to prosocial family, school, and peers as a protection against the development of conduct problems, school misbehavior, truancy, and drug abuse. This concept of bonding is closely related to the concept of attachment as defined by Bowlby (1969, 1973) and as observed by Brook et al. (1990) to inhibit adolescent drug abuse. It is also consistent with Garmezy's (1985) identification of familial and external support and value systems as protective factors against exposure to stress in childhood.

Four elements of social bonding have been shown to be inversely related to drug use. These are strong attachment to parents (Brook, Brook, et al., 1990; Brook, Gordon, et al., 1986; Hundleby & Mercer, 1987; Jessor & Jessor, 1977; Norem-Hebeisen et al., 1984); commitment to schooling (Friedman, 1983; Johnston, Bachman, & O'Malley, 1981; Kim, 1979; Krohn & Massey, 1980); regular involvement in church activities (Schlegel & Sanborn, 1979; Wechsler & McFadden, 1979); and belief in the generalized expectations, norms, and values of society (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979; Krohn & Massey, 1980). Research has not yet determined whether these elements of social bonding are best viewed simply as the oppo-

site extremes of variables already identified as risk factors for drug abuse (e.g., low commitment to schooling and alienation and rebelliousness) or whether social bonding represents a distinct protective factor capable of buffering the effects of other risk factors such as a family history of alcoholism or extreme poverty. Further research on this question is needed.

The social development model specifies hypotheses regarding the processes that produce bonding to a social unit. Interactions among (a) opportunities for involvement offered in each social unit, (b) the skills used by individuals in these social units, and (c) the reinforcements offered in these units are hypothesized to produce social bonds of attachment, commitment, and belief in the values of the social units in which young people develop (see Catalano & Hawkins, 1986).

Guided by this social development perspective, our own risk-focused prevention work has two purposes: (a) to understand better the processes by which risk and protective factors contribute to the etiology of drug abuse in adolescence and (b) to test promising approaches to prevent adolescent drug abuse. We hypothesize that children who develop strong bonds to social units holding norms antithetical to drug abuse will be less likely to abuse drugs.

To enhance social bonding, we manipulate social settings and individual capacities using the principles of social learning theory in developmentally appropriate ways. For example, in the school setting, we train teachers in methods of proactive classroom management, interactive teaching, and cooperative learning, including students in peer teaching. The explicit, theory-driven objectives of these intervention elements are (a) to make available opportunities for children to be involved in prosocial activities, (b) to provide skills needed to undertake these activities successfully, and (c) to provide positive reinforcement for successful involvement. All of these objectives serve the broader goal of strengthening bonding to the social unit, in this case the school. From a social development perspective, the same three objectives guide interventions with parents, day-care providers, youth ministers, recreation workers, and others participating in the socialization of children. The framework of the social development model thus fosters a multicomponent prevention approach, grounded in knowledge of risk and protective factors and consistent in goals, across a variety of social settings.

Current Risk-Focused Drug Prevention

During the 1960s and 1970s there was little explicit attention to risk or protective factors for drug abuse in the design and development of preventive interventions. More recent research on drug abuse prevention has focused on risk reduction, but has not included attention to multiple risk or protective factors and, for the most part, has not addressed risk factors that appear developmentally before the age of likely drug use initiation. Most recent prevention research has targeted only two risk factors for drug abuse, both of which are most salient just at the point of drug use initiation: (a) laws and norms favorable to drug use and (b) social influences to use drugs. Approaches targeting these risk factors are designed for a relatively quick "return," in that if they are effective, they should reduce or curtail drug use immediately. Prevention approaches that target these risk fac-

tors are summarized below; the right half of Table 1 summarizes the effects of these approaches on the risk factors addressed.

Supply Manipulation, Interdiction, and Enforcement Strategies

Attention to the laws and norms of society related to the use of alcohol and other drugs is clearly warranted, given the link between these factors and rates of alcoholism and drug abuse. If reduction of the prevalence of abuse of drugs is the goal, the evidence does not support those who advocate the legalization of currently illegal drugs such as marijuana and cocaine (Clayton, in press). Rather, the evidence supports efforts to limit behavior that is inconsistent with existing legal sanctions. This has been attempted through efforts to control the supplies of both legal and illegal drugs.

Since the repeal of prohibition, the supply of alcohol has been manipulated in several ways, including taxation, age restrictions on consumption, restrictions on hours of purchase, and restrictions on liquor-by-the-drink sales. As noted earlier, restricting availability and increasing the price of alcohol by increasing taxes on the purchase price can reduce rates of alcohol abuse as indicated in rates of cirrhosis of the liver and alcohol-related traffic fatalities. Although increasing age restrictions on alcohol purchases and restrictions on liquor-by-the-drink sales appears less effective than taxation in limiting alcohol abuse, these strategies also have shown desirable effects in reducing alcohol-related traffic fatalities (Blose & Holder, 1987; Decker, Graitcer, & Schaffner, 1988; Krieg, 1982).

This evidence might appear to imply that supply manipulation strategies such as drug interdiction and arrests of drug dealers would have a similar desirable effect on the abuse of illegal drugs by raising the price of these drugs to the user. However, existing evidence does not support this contention. Analysis by the Rand Corporation resulted in the conclusion that neither a doubling of interdiction nor increased arrests of drug dealers would affect retail prices or the availability of illegal drugs (Polich, Ellickson, Reuter, & Kahan, 1984). Data from the Drug Enforcement Administration confirm this conclusion. In spite of an increase in federal spending on interdiction and law enforcement from \$1.807 billion in 1986 to \$3.770 billion in 1989, the average street price of cocaine fell from \$100 to \$75 dollars per gram during the same period. Although at some level well beyond current spending, interdiction and enforcement might reduce drug supplies and drive up prices, the fiscal costs, effects on U.S. international trade, and constraints on individual rights required would be excessive. Moreover, in this scenario, if demand for illegal drugs were not reduced, it is plausible that domestic producers of synthetic drugs would step in to fill demand as interdiction began to reduce drug supplies, thus continuing to hold down prices to users.

In our view, the most powerful effect of interdiction and enforcement activities is to communicate general social norms of disapproval for the distribution and use of illegal drugs. Social norms antithetical to use appear associated with reductions in the prevalence of the frequent use of marijuana (Robins, 1984) and other illegal drugs (Johnston, 1991). Supply-reduction strategies communicate an important message to citizens but

should not be expected, by themselves, to eliminate illegal drug supplies, to significantly raise the price of illegal drugs, or to eliminate drug abuse. Those who are at greatest risk of drug abuse by virtue of low social bonding to society may view the relative benefits of drug dealing and drug use as worth the risks of apprehension. The prevention of alcohol and other drug abuse among those at greatest risk requires attention to the factors that distinguish these people. The risk factors encountered by these persons at highest risk must be addressed to reduce the demand for illegal drugs.

Changing Social Norms

A second approach currently emphasized is changing social norms about drug- and alcohol-influenced behaviors. The approach includes "Just Say 'NO!'" activities, community coalitions against drugs, media campaigns, and certain policy changes.

C. A. Johnson and Solis (1983) and Perry, Klepp, and Shultz (1988) reviewed a number of community health promotion programs aimed at reducing cardiovascular disease by changing smoking and other risk-related behaviors. These programs included involvement of the mass media, risk-factor screening programs, and education programs for adults and youths. They have been associated with lower smoking onset rates among youths (Perry, Klepp, & Shultz, 1988) and cessation or reduction of smoking (C. A. Johnson & Solis, 1983).

Of particular interest in this area is the influence of advertising on drug use. There is some indication that higher exposure to "life-style" ads promoting alcohol consumption is found among adolescents who report higher levels of drinking (Atkin, Hocking, & Block, 1984).

The media and advertising industries have cooperated in a national project to encourage negative attitudes toward the use of illegal drugs through the use of antidrug advertising. Results of mall intercept surveys indicate that saturation advertising in 10 markets was accompanied by significant normative changes over a 1-year period (Black, 1989). College students and children were more negative in their attitudes toward drugs, viewed drug users less positively, and perceived less drug use among their friends in 1988 compared with 1987. Moreover, in areas that received saturation advertising, 9% to 15% more children reported conversations about drugs with parents, teachers, and siblings in 1988 than did in 1987. In the balance of the United States, there were no increases in such communications. Teenagers age 13 through 17 showed the fewest changes in attitudes in association with saturation advertising, though they became more positive in their views toward nonusers and perceived greater risks from marijuana and cocaine use (Black, 1989). Of course, these differences could have been produced by other factors operating in communities sufficiently concerned about drug abuse that their broadcast media would run a saturation-advertising campaign against drugs.

Social norms regarding the use of specific drugs and their attendant risks and benefits can change over a relatively short period of time. From 1978 to 1983, the proportion of the nation's high school seniors who perceived there to be a great health risk associated with the regular use of marijuana rose from 38% to 63%. Over the same period, the proportion of the

nation's seniors who used marijuana daily dropped from 10.7% to 5.5% (Johnston, 1985).

An important question for study concerns the role of broadly focused norm-change efforts, such as media campaigns, in producing such changes in norms and the frequent use of drugs. Studies are needed that examine how these efforts affect children at greatest risk for drug abuse. It is not known how children who come from poorly managed families, who have failed in school, who are aggressive, or who have lost commitment to school respond to "Just Say 'NO!'" or other antidrug messages in the media or in their personal social environments.

Changes in social norms have also been codified in school policies regarding drug-using behavior (Moskowitz & Jones, 1988). Recent studies of school policies regulating smoking have shown that more comprehensive policies, which emphasize prevention of use and restrictions on opportunities for use in or near school grounds, appear to reduce the amount of smoking by students (Pentz, Brannon, et al., 1989), although effects on smoking prevalence are less consistent. These policies appear to affect smoking behavior primarily through the clear specification of norms regarding smoking rather than through the enactment of punitive consequences for policy violations, which have not shown effects in reducing smoking (Pentz, Brannon, et al., 1989). Additional research is needed on the effectiveness of school policies in preventing or reducing the use of drugs other than tobacco and on the effects of such policies on those at highest risk for drug abuse.

Social Influence Resistance Strategies

As noted earlier, among the strongest correlates of teenage drug-using behavior is association with others who use drugs. If the relationship between association with drug-using peers and drug-using behavior is actually causal, the manipulation of a factor that accounts for a great deal of variance in drug use would hold promise for producing significant reductions in adolescent drug use.

Prevention strategies focused on social influences to use drugs also are appealing from a cost-effectiveness perspective. Because peer influence to use drugs is salient developmentally at the point of onset of drug use, long delays are not required before effects of such interventions can be observed.

The most heavily researched strategy for addressing social influences to use drugs is classroom-based skills training for adolescents in Grades 5 through 10, most often Grades 6 and 7. The training teaches students through instruction, modeling, and role play to identify and resist influences to use drugs and, in some cases, to prepare for associated difficulties and stresses anticipated in the process of resisting such influences (Botvin, 1986). Grounded in social learning theory (Bandura, 1977), social influence resistance strategies view drug use as a socially acquired behavior, initiated and reinforced by drug-using others (Bukoski, 1986).

Whereas all programs of this type offer skills in resisting social influences to use drugs, many also seek to promote norms negative toward drug use (Hansen, Johnson, Flay, Graham, & Sobel, 1988; Perry, 1986). These normative-change components have included efforts to depict drug use as socially unacceptable; identification of short-term negative conse-

quences of drug use; the provision of evidence that drug use is not as widespread among peers as children may think; encouragement for children to make public commitments to remain drug free; and, in some instances, the use of peer leaders to teach the curriculum (Botvin, 1986; Klepp, Halper, & Perry, 1986).

Social influence resistance approaches also have been combined with training in problem-solving and decision-making skills, skills to increase self-control and self-efficacy, adaptive coping strategies for relieving stress and anxiety, interpersonal skills, and general assertive skills (Botvin, 1986; Flay, 1985). In this regard, Botvin's skills training program has combined elements of both social influence resistance training and social competence skills training discussed later (Botvin & Wills, 1985). Recent projects have also combined classroom-based social influence resistance curricula with mass-media programming and parent involvement strategies in comprehensive interventions seeking to change norms toward drug use and increase resistance to drug-prone influences among adolescents (Pentz, Dwyer, et al., 1989).

Most published studies of social influence resistance strategies have found modest but significant reductions, in comparison with controls, in the onset and prevalence of cigarette smoking after training (see Botvin, 1986; Bukoski, 1986; Flay, 1985; Moskowitz, 1989; D. M. Murray, Davis-Hearn, Goldman, Pirie, & Luepker, 1988; Tobler, 1986, for reviews). A few studies have reported beneficial effects of the strategy in preventing or delaying the onset of alcohol or marijuana use (Botvin, 1986; Ellickson & Bell, 1990; Hansen et al., 1988; McAlister, Perry, Kilien, Slinkard, & Maccoby, 1980; Pentz, Dwyer, et al., 1989).

Student- or peer-led social influence resistance training interventions have achieved greater reductions in drug use, compared with interventions led by teachers (Botvin, Baker, Filazola, & Botvin, 1990; Klepp et al., 1986; McAlister, 1983; D. M. Murray, Johnson, Luepker, & Mittelmark, 1984). This difference may reflect greater fidelity in implementation of the curriculum by peer leaders (resulting in greater skill acquisition by students; Botvin et al., 1990), or the finding may reflect peer leaders' stimulation of classroom norms antithetical to drug use.

A number of research issues remain to be addressed regarding the effects of social influence focused intervention. One question is whether smoking prevention programs, without content specific to other drugs such as alcohol or marijuana, have effects on the use of these drugs. Some studies suggest there may be a generalized effect of these prevention programs on alcohol and marijuana use by subjects (G. M. Johnson et al., 1984; McAlister et al., 1980). A related question is raised by Ellickson and Bell (1990), who sought to extend the social influence model of smoking prevention to alcohol and marijuana. Results were mixed. Modest reductions in drinking for students at three risk levels were observed immediately after the teen-led version of the program but disappeared at 1-year follow-up. Exposure to the curriculum was associated with reductions in smoking among baseline experimenters but increases in smoking among baseline smokers. Curriculum exposure was also associated with reductions in both initiation and current use of marijuana. The investigators speculate that the apparent effectiveness of social influence approaches for tobacco and mari-

juana may reflect the generalized social norms against those two substances but for alcohol social influence training is less effective because society has not developed a consensus against its use.

Biglan, Glasgow, et al. (1987), on the other hand, found no generalization of effects to alcohol or marijuana use of a smoking refusal skills training program. Others have found that cognitive and interpersonal skills training interventions reduced tobacco use but had no effects on alcohol, marijuana, or other drug use (Gersick, Grady, & Snow, 1988). More research is needed to determine whether preventing the onset of an early behavior in a sequence, such as smoking in the progression of drug use initiation, has effects on later behaviors in the sequence.

Another question is whether classroom-based social influence resistance interventions have significant effects on adolescents at greatest risk for drug abuse. In most social influence resistance studies, risk groups have been defined by different levels of baseline use, usually in smoking behavior (i.e., regular tobacco users, occasional tobacco users, and nonusers; Ellickson, Bell, Thomas, Robyn, & Zellman, 1988). Although this approach can reduce smoking among students with parents and friends who smoke (Botvin & Wills, 1985), few assessments are available of effects on those at greatest risk for drug abuse by virtue of exposure to multiple risk factors earlier in development.

Some social influence focused studies have looked at the effects of preventive interventions on groups with special demographic characteristics that may be related to higher risk. Botvin et al. (1989) addressed a special population of urban African-American youngsters with a smoking prevention program that was based on life skills training using cognitive behavioral techniques. Of several smoking outcomes examined, the only significant effect observed was a smaller proportion of smokers at posttest in the treatment than in the control group on the basis of adjusted means for smoking status in the past month. Some intervention effects were also observed for cognitive and attitude variables such as knowledge of smoking consequences and normative expectations.

In another study designed to examine effects on a specific population, Schinke, Botvin, et al. (1988) tested a social competence/skills building intervention designed with cultural relevance for Native American adolescents. They found at posttest and 6-month follow-up that subjects who received the intervention improved more than control subjects on measures of substance use knowledge, attitudes and interactive skills, and self-reported rates of tobacco, alcohol and drug use.

The same group of investigators examined still another special population, children of blue-collar families, using a school-based social skills smoking prevention program (Schinke, Bebel, Orlandi, & Botvin, 1988). Lower use rates were observed and validated among pupils who received the skills-based intervention (as compared with discussion-based groups and control groups) at 6, 12, 18, and 24 months follow-up. Although they have isolated particular populations and baseline users, none of the social influence intervention studies have examined whether program effects vary for groups characterized by multiple risk factors predictive of heavy drug use.

Another question regarding social influence resistance pro-

grams involves the durability of effects. Evidence from a number of recent studies points to deterioration of initially positive program effects as early as 2 to 3 years and as long as 8 years postintervention (Botvin et al., 1990; Flay et al., 1989; Hansen et al., 1988; D. M. Murray, Pirie, Luepker, & Pallonen, 1989). Long-term results from the North Karelia Youth Smoking Prevention Project (Vartiainen, Pallonen, McAlister, Koskela, & Puska, 1983, 1986; Vartiainen et al., 1990) offer a somewhat more promising picture, with 4-year results favoring the schools given two versions of the social influence intervention over matched comparison schools. At 8 years postintervention, only baseline nonsmokers showed significant program effects (Vartiainen et al., 1990).

That program participants may have equal or higher rates of substance use than program controls by 2 years after intervention raises the question of whether social influence focused interventions will have effects on drug abuse as defined here. To date, virtually no prevention studies targeting drug abuse have followed subjects long enough to assess effects in late adolescence or early adulthood.

Even if they are successful in reducing the prevalence of teenage drug use, social influence resistance strategies may have no significant effect on the prevalence of teenage drug abuse as we have defined it. The lifetime prevalence of alcohol use among U.S. high school seniors in 1987 was 92.2%, but only 4.8% used alcohol daily (Johnston et al., 1988). Social influence resistance programs could show positive effects in reducing the prevalence of alcohol use in the general population without affecting this 5% at greatest risk for alcohol-related problems.

Although social influence focused interventions have been most widely tested, many of these same questions apply to interventions targeting other risk factors. To address these questions, research methodologists must grapple with the complexities of the multiple risk factors and causal pathways implicated in substance abuse etiology.

Methodological Challenges for Risk-Based Intervention Research

Although it is not our purpose to offer a methodological evaluation of specific prevention studies, a number of research issues that pertain to risk-focused investigations should be considered when weighing the evidence, individually and cumulatively, from the studies available (Moskowitz, 1989). Risk-focused prevention studies require research designs that address threats posed by mixed units of analysis, differential attrition, and differential implementation as well as the interpretive challenge presented by heterogeneous effects across risk groups and along the developmental life course. Careful theoretical specification and multiple and varied statistical analysis techniques can be used to meet these challenges.

Mixed units of analysis. In many published studies of social influence resistance programs, the basic premise of experimental design—that the randomized experimental unit is the unit of analysis—is violated. Schools or classrooms are generally the unit of random assignment to experimental or control condition, but the unit of analysis often used is individual students. School or classroom differences are thus confounded with program effects on individuals (Biglan & Ary, 1985). Some studies

have addressed this problem by assigning multiple schools or classrooms to each condition, then analyzing at the classroom level (Biglan, Severson, et al., 1987; Botvin, Baker, Renick, Filazzola, & Botvin, 1984; Hansen et al., 1988; Pentz, MacKinnon, et al., 1989).

When scarce resources impose limits on the number of units that can be randomly assigned, some alternative solutions have been suggested. Randomized block and factorial designs can be used to stratify schools by factors known to affect key outcomes (McKinlay, Stone, & Zucker, 1989). Alternatively, to account for variability attributable to the school, multiple investigators conducting similar studies with different populations in comparable or contrasting school settings could build a collective case for the general effectiveness of a given approach. Clear specification of the relevant features of the school settings and careful attention to implementation integrity would be critical elements of this approach. Dwyer et al. (1989) have proposed the use of linear regression models fit to aggregated data to assess bias in standard errors when individual data are analyzed but schools are assigned to conditions. D. M. Zucker (in press) has argued that use of the individual as the unit of analysis when classrooms or schools are the units of assignment will always lead to positively biased tests, compromising the internal validity of analyses. D. M. Murray, Hannan, and Zucker (1989) and D. M. Murray and Hannan (1990) have concluded from this that the most prudent course remains ensuring that the unit of analysis and unit of assignment are the same.

Classroom and school effects should be carefully examined when analysis at the level of assignment to conditions is precluded by small samples. The relative importance of classroom context variables and individual-level variables, along with their potential interactions, can be addressed directly using contextual analysis. Such an approach requires a clear theory-driven specification of the nature of the predicted contextual effects (Bursik, in press). This requirement, however, poses a problem for current school-based research, in which the contribution of school and classroom variables, both to risk and to intervention effectiveness, are not well understood or coherently organized in theory.

Homogeneity of effect across levels of risk. When sample size is sufficiently large, researchers can investigate directly the differential effects of intervention on groups at different levels of risk. When subgroups are not large enough for such analysis, Dwyer et al. (1989) have proposed statistical methods, using conditional proportional odds models with interaction between intervention dummy variable and baseline behavioral level. Although this solution is proposed for assessing differential effects across baseline drug use levels, it may be applicable to other quantifiable risk factors as well.

Systematic attrition. Problems of attrition are acute in school-based studies that are designed to follow longitudinal cohorts of individual students but use the school or classroom as the unit of random assignment. The external validity of results from social influence resistance evaluations has been compromised in many studies by systematic attrition of those at highest risk for drug abuse. Many published studies of this type have not addressed attrition, reporting results only for subjects remaining in experimental and comparison classrooms (Biglan, Severson, et al., 1987). Where attrition has been investi-

gated, studies have consistently shown that subjects with a higher mean rate of tobacco smoking and marijuana use are most likely to be lost at follow-up (Biglan, Severson, et al., 1987; Hansen et al., 1988), raising questions as to the generalizability of reported results to those at greatest risk. Several solutions to this problem have been proposed. McKinlay et al. (1989) recommend the "intention-to-treat" approach, in which all subjects in the original cohort are retained for the analysis to avoid the bias of differential attrition and preserve the integrity of the randomization. Alternatively, direct observation of the effects of missing data because of attrition may be obtained by including a dummy-coded variable for subjects lost to the study in the analysis (Raymond, 1987).

Intervention implementation and intensity. Studies should also address questions of differential intervention implementation and intensity (McKinlay et al., 1989). By randomly and independently selecting samples of classrooms or schools at each point in time, variable doses of the intervention may be examined (e.g., length of exposure, level of teacher training, variety of media used). All intervention studies demand systematic attention to implementation integrity. We have proposed and used three steps in examining implementation: (a) collection of data to assess degree of implementation, (b) reporting of data on implementation for each dimension of the interventions, and (c) inclusion of implementation data in the tests of efficacy (Hawkins, Abbott, Catalano, & Gillmore, 1991; Hawkins & Lam, 1987).

Measuring developmental change and intervention effects. Designs nesting cross-sectional intervention studies within longitudinal panel studies have special relevance and appeal for risk-focused prevention work. Such designs are well suited to explore questions of group differences as well as change over time, thus providing for tests of intervention effectiveness and for estimation of developmental sequences. Cross-sequential designs, conceived particularly to study developmental problems (Schaie, 1965; Tonry, Ohlin, & Farrington, 1991), allow estimation of age, cohort, and period effects, thereby producing data on both the development of and changes in drug risk and use patterns over time and on the effects of interventions across cohorts of adolescents (Hawkins, Abbott, et al., 1991).

A major challenge for social influence resistance studies at this time is to overcome methodological weaknesses. Much work is proceeding along the lines described above. Meanwhile, the failure of social influence strategies to establish durability of effects or to show consistent results with substances other than tobacco, as well as the questions remaining about the strategies' effects on drug abuse as opposed to initiation or occasional use, suggests that a second major line of prevention research should be pursued.

Social influence resistance approaches address risk factors salient developmentally just before or simultaneous with initiation of drug use. It is not known whether these approaches can protect children made most vulnerable by previous exposure to other risk factors. For example, a social influence resistance program that demonstrated significant reductions in tobacco use for baseline experimenters and nonsmokers was actually associated with increases in tobacco use for baseline smokers (Ellickson & Bell, 1990). These youngsters, having already defined themselves as part of a smoking subculture with attach-

ments to tobacco-using peers, may have rejected drug resistance skills as antithetical to their social group identity. Learning skills to resist prodrug social influences may be a necessary but not sufficient element of prevention for children who have been "set up" for drug involvement by exposure to earlier individual, family, or community risk factors (Block, Block, & Keyes, 1988; Shedler & Block, 1990). This possibility suggests a search for intervention strategies that have been effective in reducing other factors, developmentally earlier than social influences to use drugs, that predict drug abuse. Such strategies should be investigated for their long-term effects in preventing drug abuse.

Prevention Approaches Targeting Early Risk Factors

The following strategies merit attention from drug abuse prevention researchers, both because they address risk factors seen to occur before drug initiation and because they use intervention methods that have demonstrated positive effects. The appeal of many of these interventions is strengthened by the fact that they target risk factors implicated in a range of disorders, including drug abuse as well as antisocial behavior, delinquency, and later adult criminality. These interventions have shown positive effects on targeted risk factors in controlled intervention trials using experimental or quasi-experimental designs. As noted below, in some of the studies the interventions appear to have increased protective factors against drug abuse in populations at high risk.

1. *Early childhood and family support programs.* Several interventions focusing on the prenatal and early infancy periods with a variety of components ranging from health care; nutrition; child care; social support for mothers; educational, career, and family planning services; and home visits from health or social service workers have produced significant differences between high-risk-program and control- or comparison-group families. Positive intervention effects have been reported on child abuse and neglect (Olds, Henderson, Chamberlin, & Tatelbaum, 1986; Swift, 1988), early academic performance (Bronson, Pierson, & Tivnan, 1984), maternal employment and smaller family size, child's higher rate of school attendance and lower rate of school special services, as well as lower mother-rated antisocial behavior and lower teacher-rated aggression (Pierson et al., 1983; Seitz, Rosenbaum, & Apfel, 1985).

Early childhood education has produced reductions in risk factors for drug abuse. Horacek, Ramey, Campbell, Hoffmann, and Fletcher (1987) randomly assigned socially and economically deprived children, at infancy and again at kindergarten, to intervention or control groups, allowing evaluation of the effects of different amounts of intervention. They successfully identified at birth children at high risk for school failure. Rates of retention in grade for high-risk children in the control group were almost four times higher than for an average-risk group of peers. The intervention significantly reduced grade retention and improved test scores in math and reading, showing a greater impact on children who had participated in both intervention phases. The high-risk children who received the most intervention achieved a rate of grade advancement nearly equal to that of the average-risk group.

The Perry Preschool Project focused on enhancing the intellectual and social development of 3- and 4-year-old African-American children from backgrounds of extreme poverty. The experimental intervention reduced academic failure, adolescent pregnancy rates, and criminal behavior when randomly assigned experimental and control subjects were followed up and compared at age 19 (Berrueta-Clement et al., 1984). The experimental program consisted of daily participation in a preschool over a 1-to-2-year period and weekly home visits by trained teachers to teach mothers skills in child management. By age 19, experimental preschool participants had lower arrest rates and fewer arrests as well as lower rates of self-reported fighting. They had higher rates of secondary school completion, lower rates of placement in special education classes, and higher grade point averages than their randomly assigned control counterparts. Other studies of early childhood education programs have shown similar positive effects on children's intellectual development (Gotts, 1989; Lazar, Darlington, Murray, Royce, & Snipper, 1982; Ramey, Bryant, Campbell, Sparling, & Wasik, 1988).

These findings suggest that early childhood and parent support programs can buffer the effects of extreme poverty and neighborhood disorganization by reducing three risk factors for adolescent substance abuse: childhood behavior problems, family management problems, and academic failure. Research is needed to evaluate the long-term effectiveness of early childhood and family support programs for high-risk subgroups in preventing adolescent drug abuse.

2. *Programs for parents of children and adolescents.* Controlled studies have shown that family management problems and child behavior problems can be reduced through parenting skills training and functional family therapy. Parenting skills training has produced short-term improvements in family interaction and reductions in children's problem behaviors (Baum & Forehand, 1981; Patterson, Chamberlain, & Reid, 1982). Parenting skills training combined with social skills training for disruptive kindergarten boys reduced school adjustment problems and delayed the onset of delinquent behavior (Tremblay et al., 1990). Functional family therapy has reduced delinquency among juvenile offenders (Alexander & Parsons, 1973) and prevented it among their siblings (Klein, Alexander, & Parsons, 1977).

Most systematic evaluations of parent training have involved children with conduct problems. Parenting skills training focused on teaching parents to monitor their children's behavior, to use moderate contingent discipline for undesired behavior, and to consistently reward prosocial behavior (Patterson & Fleischman, 1979) has resulted in increases in parent-child attachment, decreases in children's skill deficits, and decreases in the children's targeted behavior problems (Fleischman, 1981; Patterson & Reid, 1973; Peed, Roberts, & Forehand, 1977). Randomized experimental tests of parenting skills training have shown significant reductions in preadolescents' problem behaviors when compared with controls (Karoly & Rosenthal, 1977; Martin, 1977; Patterson et al., 1982; Walters & Gilmore, 1973). These results suggest that parenting skills training can buffer the risk of childhood behavior problems for adolescent drug abuse by reducing family management problems and increasing family bonding.

To date, little experimental research on the effectiveness of parent training for drug abuse prevention has been conducted. In one study, parenting skills training was tested with parents who were narcotic and polydrug abusers participating in treatment programs. A preliminary evaluation reported that parents were successfully trained to develop more effective discipline methods, that their children had fewer behavior problems after treatment, and that the children reported decreased intentions to smoke and use alcohol (DeMarsh & Kumpfer, 1986), although the effects of the intervention on the children's actual drug use was not reported. These preliminary results suggest that parents whose children are at high risk by virtue of parental addiction can be successfully taught parenting skills. Another study with a sample of youths at risk for substance abuse has reported preliminary positive trends for parent-training treatment groups on parent-child interaction, levels of tobacco use, and reduction of depression (Dishion, Kavanagh, & Reid, 1989).

Parent involvement has been shown to be beneficial in improving academic effort, grades, and attendance of students evidencing low commitment to school (Bien & Bry, 1980; Blechman, Taylor, & Schrader, 1981). Bry (1982) reported a reduction in juvenile justice system involvement of experimental subjects receiving an intervention package consisting of (a) a parenting program involving regular contacts with the family emphasizing training and encouragement for parents to reward school progress, (b) teacher goal setting for students, and (c) a schedule of rewards for students' goal attainment. These findings suggest that a promising method for increasing parental involvement is through training and reinforcement for parents to promote the classroom performance of their children.

Biglan, Glasgow, et al. (1987) found no effects on children's smoking of four parent messages mailed to the homes of students, designed to reinforce social influence resistance skills and commitment to nonsmoking taught in a classroom curriculum. However, no implementation assessment was conducted, and it is not clear that parents used the mailed messages. The chosen intervention method may not have been sufficiently potent to enlist parental participation.

Pentz, Dwyer, et al. (1989) involved parents in the experimental drug abuse prevention package tested in the Midwestern Prevention Project. The classroom prevention curriculum included 10 homework assignments in which students were expected to involve their parents using active interviews and role plays. Using interview data from teachers, the authors estimated that 80% of the experimental families participated in the homework assignments. The experimental program was associated with lowered prevalence rates of tobacco, alcohol, and marijuana use, although the independent contribution of the parenting component was not assessed.

The existing evidence suggests the promise of parenting skills training and involvement approaches for preventing adolescent drug abuse. Training adjusted to the developmental stage of the child should help parents develop skills to (a) set clear expectations for behavior, (b) monitor and supervise their children, (c) consistently reinforce prosocial behavior, (d) create opportunities for family involvement, and (e) promote the development of their children's academic, social, and refusal skills. Acquisition and use of these skills by parents in managing their

families could be expected to reduce children's behavior problems in preschool and elementary school years, to increase children's academic performance in elementary and middle school, and to empower children to deal effectively with social influences to use drugs encountered in late elementary and middle school grades.

Problems of nonparticipation, attrition, and implementation in parenting skills training programs have been well documented (Bry, 1983; Fraser, Hawkins, & Howard, 1988; Grady, Kelin, & Boratynski, 1985; Hawkins, Catalano, Jones, & Fine, 1987; Perry, Crockett, & Pirie, 1987; Perry, Luepker, et al., 1988). Parenting training interventions for parents of preschool, elementary, and middle school children that seek to overcome these difficulties should be tested in experimental drug abuse prevention trials.

3. Social competence skills training. The evidence that aggression and other behavior problems in the early elementary grades is associated with an increased risk of later drug abuse has stimulated suggestions that educational strategies seeking to enhance the social competencies of youngsters during childhood could reduce the risk of later drug abuse (Hawkins, Jensen, Catalano, & Lishner, 1988). It has been argued that children who are aggressive, disruptive, and rejected by peers in elementary grades are deficient in basic interpersonal skills that can be taught (Spivack & Shure, 1974).

Advocates of skills training for interpersonal competence cite evidence that socially competent children engage in less school misbehavior and have better cognitive skills in such areas as basic problem solving essential for academic achievement (Asher & Renshaw, 1981). They assert that learning certain basic moral values like concern for the rights and needs of others is essential to the development of prosocial behavior (Battistich, Solomon, Watson, & Schaps, n.d.) and that children from families in which family management practices are poor and family conflict is great do not learn basic interpersonal competencies at home.

Social competence promotion approaches have used a variety of methods. For example, socially rejected youths have been taught and coached in social interaction skills to increase the frequency of their social interactions (Ladd & Asher, 1985), and classroom instruction has been used to teach cognitive processes and behavioral skills to handle interpersonal problems (Weissberg & Allen, 1985). Such methods have been implemented in programs of widely varying duration, with samples ranging from all students at a particular grade level to identified students with behavior problems. They have been tested with inner-city, low-income samples (Shure & Spivack, 1982) as well as with White middle-class samples (Rotheram, 1982a). To date, most of these tests have focused on proximal outcomes such as school adjustment rather than on drug use behavior. Some studies have found positive effects immediately after training for both suburban and inner-city samples (Weissberg et al., 1981).

Social competence promotion approaches have yielded varying results. Some investigators have reported positive effects on interpersonal behavior (Battistich et al., n.d.; Bierman & Furman, 1984; Bierman, Miller, & Stabb, 1987; Gesten et al., 1982; Ladd, 1981; Ladd & Asher, 1985; Rotheram, 1982b; Rotheram, Armstrong, & Booraem, 1986; Shure & Spivack, 1982; Weiss-

berg & Caplan, 1989). Others have found no effects on adjustment (Allen, Chinsky, Larcen, Lochman, & Selinger, 1976).

There is promising evidence for social competence promotion as a drug abuse prevention strategy. Social competence promotion has shown a significant impact both on students' willingness to try nondrug or nonalcohol options when confronted with problem situations and on the certainty of their intention not to use drugs or alcohol, when compared with a matched control group (Ketchel & Bieger, 1989). Kim, McLeod, and Palmgren (1989) evaluated the effects of an intervention in 4th grade on students in Grades 5 through 12. The program consisted of one session a week for 9 weeks focusing on social skills. In the last session, students applied the skills learned to drug use choices. Across all grade levels, students showed significantly lower use of alcohol, cigarettes, and marijuana compared with students who had not participated in the program. The largest impact was found in Grades 5 through 7; the intervention's positive effects declined rapidly at 9th grade.

Lochman (1988) provided an anger management program during school hours for boys identified as aggressive by their teachers. The program included role playing, goal setting, videotaped modeling to develop self-statements, social problem solving skills to cope with anger arousal, and group-produced videotapes illustrating alternative ways of coping with an anger-arousing situation. When compared with a matched (though not randomly assigned) comparison group of untreated aggressive boys, the treated subjects were found to have significantly lower rates of alcohol and marijuana use as well as fewer negative consequences of alcohol use at age 14, 3 years after the intervention.

This is an important area for additional prevention research. If school-based social competence promotion strategies reliably reduce aggressive and other problem behaviors as well as frequent and problem drug use during adolescence, they represent a viable prevention strategy.

A question for future research is the age of children for whom such interventions are most effective. To illustrate, from about age 5, aggressiveness in boys predicts later deviance including drug abuse (Kellam & Brown, 1982). Few boys appear to become seriously aggressive if they did not manifest aggressive behavior in childhood. However, aggression declines in prevalence with age. Some boys desist from aggressive behavior between the ages of 5 and 14. Social competence promotion strategies that seek to reduce aggressiveness among young boys run the risk of false-positive error, in that they may target for intervention some youngsters who will not show later deviant outcomes (Loeber & Dishion, 1983). Conversely, programs that wait to intervene until aggression has crystallized as a pattern of behavior may minimize false-positive errors in identifying those at high risk for later drug abuse, but these interventions may have less chance of successfully eliminating the aggressive behavior and other problems of adjustment and achievement produced by aggressive behavior during the elementary school grades. Lochman's (1988) research, which showed lower rates of drug involvement at 3-year follow-up among aggressive boys who received problem-solving-skills training at age 11, did not show similar positive effects on aggressive behavior or general behavioral deviance at 3-year follow-up.

4. *Academic achievement promotion.* Three strategies have

shown positive effects on the risk factors of academic achievement and problem behaviors in school and thus hold promise for preventing drug abuse. The strategies include early childhood education, as previously discussed (Berrueta-Clement et al., 1984), alterations in classroom teachers' instructional practices in elementary and middle schools (Hawkins, Doueck, & Lishner, 1988; Hawkins & Lam, 1987), and academic tutoring of low achievers (Coie & Krehbiel, 1984). The latter two are discussed here:

a. *Alterations in classroom instructional practices.* The use of certain methods of instruction in classrooms has been shown in experimental and quasi-experimental studies to improve achievement and social bonding to school and to reduce student misbehavior. A number of studies have linked achievement gains to the amount of active instruction and direct supervision of learning efforts that teachers provide to students (Brophy & Good, 1986). Classroom teachers' use of a package of instructional methods consisting of interactive teaching, proactive classroom management, and cooperative learning resulted in significantly greater achievement gains in math and in levels of commitment to school and in significantly lower rates of suspensions and expulsions from school among urban seventh-grade students in experimental classrooms when compared with control classrooms (Hawkins & Lam, 1987).

Cooperative learning methods have been included in some classroom interventions seeking to enhance achievement and commitment to school. An intervention targeting children starting preschool attempted to bring all children in the study up to grade level by third grade (Slavin, Madden, Karweit, Liverman, & Dolan, 1990). The program focused on language development, academic readiness, and improved self-concept with preschool and kindergartners. In Grades 1 through 3, the intervention replaced pull-out programs and special education classes with in-class tutors and alternative classroom strategies, including grouping of students across grades by ability. The program's effects were evaluated by comparison with a matched school and with individually matched students within the control school. The results showed significantly higher test scores for intervention students at all grade levels.

Freiberg, Brady, Swank, and Taylor (1989) found positive results on academic achievement from a program combining cooperative learning strategies with improved classroom management, student and teacher motivation, parent contacts, interactive instruction, and discipline prevention. Students in five target schools were compared with the students of five matched controls. At the end of the 1½-year intervention, students in the test schools surpassed the control students on standardized test scores in every subject.

In the most effective cooperative-learning approaches, students of differing abilities and backgrounds work together in small groups of 4 to 6 children to master the curriculum material, and they receive recognition as a team for the performance of all members of the group. Cooperative-learning strategies have been designed to encourage students to help and support peers of diverse ability, ethnicity, and background toward the achievement of academic success.

Controlled studies have shown positive effects of cooperative learning on achievement and attitudes toward school and peers (DeVries & Slavin, 1978; Dolan, Kellam, & Brown, 1989; Mad-

den & Slavin, 1983; Ziegler, 1981) and, in combination with other instructional methods, have produced reductions in rates of suspension and expulsion from school among low achievers (Hawkins, Doueck, & Lishner, 1988). However, the use of the "Jigsaw" cooperative learning method did not prevent drug use in the Napa Project (Schaps, Moskowitz, Malvin, & Schaeffer, 1986).

Cooperative learning methods hold promise for changing peer influence patterns in schools, for reducing academic failure, and for increasing commitment to school and attachment to prosocial others. Given these effects on risk factors for drug abuse, cooperative learning should be investigated further for drug abuse prevention effects in spite of the apparent lack of effect of the "Jigsaw" method in the Napa Project.

b. Tutoring. Individual tutoring for low achievers with behavior problems has been used in conjunction with, as well as separately from, social competence skills training approaches discussed earlier (Coie & Dodge, 1988). Coie and Krehbiel (1984) found that even without social skills training, tutoring of socially rejected, low-achieving fourth graders reduced peer rejection and disruptive behavior in the classroom and produced significant improvements in reading and math achievement.

The existing evidence suggests that both improvements in methods of instruction used by teachers in mainstream classrooms and individualized tutoring programs hold promise for reducing academic failure and problem behaviors of children. Both types of intervention with children in elementary and junior high school grades should be studied for effects in preventing adolescent drug abuse.

5. Organizational changes in schools. Schools with the highest rates of student misbehavior and drug abuse are typically "demoralized" organizations (G. D. Gottfredson, 1988). Such schools are likely to have great difficulty implementing strategies such as improved classroom teaching, tutoring programs, or parental involvement in promoting students' classroom performance. Because school organizational characteristics appear to be related to student behavior, achievement, and bonding to school and because they influence the ability of schools to implement changes that might prevent drug abuse, they are factors that should be considered potential targets for drug abuse prevention efforts.

There is evidence that school organizational factors can be changed to reduce drug abuse risk factors (Comer, 1988; D. C. Gottfredson, 1986, 1988). In one school (D. C. Gottfredson & Cook, 1986a, 1986b) a program of curriculum restructuring, increased opportunities for student involvement, greater school-faculty-community integration, and changes in school discipline procedures resulted in significant changes. Despite implementation problems resulting from district staff cuts, comparison with a control school showed increases in positive self-concept, attachment to school, and belief in rules as well as higher standardized test scores in math. Significant decreases were found in the school's rates of delinquency, drug use, and suspensions.

In another study, D. C. Gottfredson (1986) evaluated an intervention that included (a) the establishment of an organizational structure to facilitate shared decision making and management in schools, (b) the use of curriculum and student concerns specialists, (c) academic innovations including cooperative learn-

ing, reading, and test-taking programs and career exploration, and (d) direct services to targeted high-risk students to increase academic involvement and achievement, including individual treatment plans, behavioral objectives, and monthly monitoring by specialists.

High-risk students in participating schools were randomly assigned to treatment and control groups. At the end of 3 years of intervention, students in experimental schools reported lower rates of drug use, delinquent behavior, and alienation and higher rates of attachment to school, educational expectations, and belief in school rules when compared with students in comparison schools. However, the direct services for targeted high-risk students did not produce significant effects on risk factors or behavior (D. C. Gottfredson, 1986).

Comer (1988) demonstrated positive gains in student academic achievement over a 12-year period after the creation and support of school governance and management teams in two New Haven schools serving predominantly low-income African-American populations. The teams consisted of principal, parents, teachers, and a mental health worker and developed and implemented comprehensive school plans for academics, social activities, and special programs. Consistent schoolwide gains were achieved in scores on standardized reading and math tests in comparison with national norms, though control or comparison schools were not used.

Felner and his colleagues (Felner, Adan, & Evans, 1987; Felner, Ginter, & Primavera, 1982; Felner, Weissberg, & Adan, 1987) have altered the school environment for students making normal transitions from elementary to middle or junior high schools or from these to high schools. The intervention kept groups of transitioning students together in homeroom and core courses in circumscribed schools-within-a-school, in which all homeroom and core teachers' classrooms were within close proximity to one another. In addition, the homeroom teacher served as an advocate-counselor for all students in his or her homeroom, contacting each homeroom student's family before the school year began and serving as a counseling link for homeroom students, their parents, and the rest of the school (Felner & Adan, 1988). The intervention produced positive effects on academic performance, absenteeism, and school drop out when participating students were compared with nonparticipating students in the same schools.

These results indicate that altering the organizational characteristics of schools can reduce risk factors for drug abuse as well as drug use itself. Organizational change in school management and the school environment should be further investigated for drug abuse prevention effects.

6. Youth involvement in alternative activities. Activities in the school setting that provide opportunities for youths to participate in contributing—roles such as involvement in school government, experience-based career education programs in which students are provided hands-on opportunities to learn about the world of work, and tutoring programs in which students are enlisted to help other students—have been hypothesized to increase commitment to school and reduce alienation and rebelliousness. When such activities have been provided for adolescents, the emphasis has been on active involvement (i.e., shifting the student's role from consumer of information to producer of some benefit). From a risk-focused perspective, this

strategy might be expected to increase commitment to school and to reduce the likelihood of violation of school standards of behavior, including proscriptions against drug use.

Similarly, it has been suggested that physically challenging risk-taking activities, such as those offered by Outward Bound programs, might provide effective drug-free alternatives to those at risk for drug use by virtue of the personal characteristics of high novelty seeking and low harm avoidance.

Evidence for the effectiveness of such approaches in preventing drug abuse is mixed. Neither cross-age tutoring nor operating a school store prevented drug use among predominantly White middle-class students in eighth and ninth grades in the Napa Project (Schaps et al., 1986). On the other hand, there is some evidence that when delivered at high intensity, alternative programs that empower high-risk subjects to master new skills are associated with improved behavior and achievement (Tobler, 1986). Programs such as Outward Bound, which provide risk-taking challenges as opportunities to learn skills, could be enhanced by continuation interventions designed to build mastery over the environments in which youths routinely function. These latter approaches should be investigated further for drug abuse prevention effects.

7. Comprehensive risk-focused programs. Because drug abuse is a phenomenon influenced by multiple risk factors, its prevention may be most effectively accomplished by a combination of interventions promoting consistent prevention principles across units of socialization. Comprehensive prevention programs that combine multiple interventions focused on different sources of social influence have shown beneficial effects on smoking (Puska et al., 1982).

Pentz and her colleagues (Pentz, Dwyer, et al., 1989) have tested a multicomponent communitywide program involving a curriculum of social influence resistance skills training for students in Grades 6 or 7 that includes (a) homework assignments to be conducted with parents, (b) booster sessions in the year after initial intervention, (c) organizational and training opportunities for parents in positive parent-child communication skills and in reviewing school policies, (d) training of community leaders to organize drug abuse prevention task forces, and (e) news coverage. The multicomponent program produced lower prevalence rates of weekly cigarette (−8%), alcohol (−4%), and marijuana (−3%) use after the 2nd-year intervention (Pentz, Dwyer, et al., 1989) and significantly lower prevalence of monthly cigarette (−6%) and marijuana (−3%) use 3 years after the initial school intervention, though the prevalence of alcohol use was not significantly reduced at this measurement point (C. A. Johnson et al., 1989). The comprehensive intervention appears to have been equally effective in lowering tobacco and marijuana use prevalence among those at risk because of exposure to parental drug use, drug-using peers, and early initiation of use (C. A. Johnson et al., 1989). Although the unique contribution of each individual component in this comprehensive program has not been determined, the results indicate that a multiple-component strategy focused on reducing risks is more effective in reducing drug use prevalence than is mass-media coverage alone.

Similarly, research on a comprehensive teacher-, parent-, and peer-focused prevention program grounded in the social development model has shown that the comprehensive program pro-

duced significantly lower rates of school suspension and expulsion among seventh-grade experimental subjects (Hawkins, Doueck, & Lishner, 1988), significantly lower prevalence of early aggression among second-grade subjects (Hawkins, Von Cleve, & Catalano, 1991), and significantly lower prevalence of self-reported delinquency (−6.7%) and alcohol use (−6.6%) by Grade 5 among children exposed to the comprehensive program in Grades 1–4 in comparison with controls (Hawkins et al., in press). The intervention consisted of (a) teacher training in methods of classroom management and instruction consistent with the principles of the social development model, (b) training for parents in developmentally adjusted curricula focused on development of family management skills consistent with the social development principles, and (c) involvement of student subjects in classroom-based peer teaching and skill development. The results suggest that by promoting consistent opportunities and expectations for prosocial behavior at home and school, by enhancing skill development, using peer involvement and teaching and parent monitoring, and by stressing positive reinforcements for prosocial involvement from family, school, and peers, the incidence of early initiation of drug use and delinquency can be reduced. Analysis indicates that these outcomes are accompanied by effects on family- and school-bonding variables that are hypothesized in the theory on which the comprehensive program is based (Hawkins et al., in press).

Summary

A risk-focused approach to drug abuse prevention holds promise for identifying effective prevention strategies. Implementing and testing approaches that seek to reduce or buffer the effects of known antecedents of adolescent drug abuse will increase our knowledge of which are causally related to drug abuse and what prevention strategies reliably address these risk factors.

Research has identified these antecedents of adolescent drug abuse: laws and norms favorable toward drug use; availability of drugs; extreme economic deprivation; neighborhood disorganization; certain physiological characteristics; early and persistent behavior problems including aggressive behavior in boys, other conduct problems, and hyperactivity in childhood and adolescence; a family history of alcoholism and parental use of illegal drugs; poor family management practices; family conflict; low bonding to family; academic failure; lack of commitment to school; early peer rejection; social influences to use drugs; alienation and rebelliousness; attitudes favorable to drug use; and the early initiation of drug use. There is some evidence that certain factors including personal attributes and a social bond to conventional society may protect against drug abuse, though more research is needed to determine the relationships between risk and protective factors as related to adolescent drug abuse.

Evidence from studies of the etiology of adolescent drug abuse suggests that a viable prevention model would include simultaneous attention to a number of risk factors in different social domains to be addressed during the developmental period when each begins to stabilize as a predictor of subsequent drug abuse. The evidence further suggests that prevention efforts target populations at greatest risk of drug abuse because of

their exposure to a large number of risk factors during development. A theory of adolescent drug abuse that accounts for the existing empirical evidence regarding risk and protective factors for adolescent substance abuse should be used to organize and integrate the complex work of developing and testing prevention interventions.

Most drug abuse prevention efforts have addressed two risk factors for adolescent drug abuse: laws and norms favorable to drug use and social influences to use drugs. These efforts include supply manipulation, interdiction and enforcement strategies, efforts to change social norms regarding drug use, and social influence resistance skills training. Of these approaches, social influence resistance strategies have been evaluated most extensively for preventive effects in controlled studies.

Several available studies of social influence resistance skills training for drug abuse prevention have produced short-term effects on rates of drug initiation, including reductions in smoking and, in a few cases, in alcohol and marijuana use. Although such results are promising, the limits of these programs should be considered. Peer influence resistance skills training methods do not change the basic developmental conditions experienced by children. Although these methods have shown short-term effects on the incidence of drug initiation in the general population, they may have little effect on drug abuse among higher risk groups. Children who are at highest risk for adolescent drug abuse by virtue of poor family management, early and persistent behavior problems, low bonding to family, academic failure, and low commitment to school may be unmotivated to refuse or avoid drug use by late childhood.

If the goal is to reduce drug abuse and its accompanying social and health problems among children at high risk, it is important to test preventive approaches that have successfully addressed risk factors present earlier in child development. Promising risk-focused approaches that should be investigated for drug abuse prevention effects are early childhood education and early family support, parent training, school-based social competence promotion, school-based academic competence promotion, and school organizational change strategies. Recent studies indicate that coherent multiple-component or comprehensive strategies, including but not limited to social influence resistance, hold significant promise for preventing drug abuse and its attendant costs. These approaches should be implemented in varying combinations and settings, and their effects on the initiation, use, and abuse of drugs should be studied further in controlled field experiments.

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