

ROLE OF PERCEIVED ACCESS AND HARM IN MARIJUANA USE AMONG  
ADOLESCENTS

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A three-pronged substance abuse prevention intervention was undertaken by a Midwestern, suburban community. Analysis of the long-term impact of the intervention revealed a reduction in alcohol use among students. However, student marijuana use was not impacted as positively. This interdependence between the use of alcohol and marijuana has been reported in the literature, but the role of cognitive factors has not been adequately studied. The current study examined the role of perceived access to alcohol and marijuana and perceived harm associated with alcohol and marijuana use on marijuana use. Data were collected from 11,542 8<sup>th</sup> - 12<sup>th</sup> grade students in 1998, 2000, and 2003. Data were examined via two sets of logistic regression analyses investigating (1) the role of alcohol use and access to alcohol and marijuana in past month and lifetime marijuana use and (2) the role of alcohol use and perceptions of harm associated with alcohol and marijuana use in past month and lifetime marijuana use. Results revealed that (a) participants indicating no alcohol use were more likely to report past month and lifetime marijuana use, (b) among older students access to marijuana played a role in past month and lifetime marijuana use only when access to alcohol was limited, (c) perceived harm associated with marijuana played a role in lifetime marijuana use only when perceptions of harm associated with alcohol were low.

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## Chapter 1

### INTRODUCTION

Prior research has shown significant declines in gateway drug use among participants in a school/community substance abuse prevention intervention in a Midwestern, suburban school district (Lohrmann, Alter, Greene, & Younoszai, 2005). Evidence suggests that increased alcohol education, policy, and access enforcement efforts in this community contributed to observed decreases in alcohol use. Though still at or below national levels, student marijuana use was not impacted as positively. The purpose of this study was to investigate the possibility that efforts to prevent alcohol use resulted in an unintentional substitution effect thereby increasing use of marijuana. Factors including perceived access to alcohol and marijuana, along with perceived harm associated with alcohol and marijuana use, were examined to determine their role in marijuana use among students in this community.

#### *Statement of the Problem*

This study focused on the role of perceived access to alcohol and marijuana and perceived harm associated with alcohol and marijuana use relative to marijuana use among youth in a Midwestern suburban school district. Specifically, the study attempted to answer the following research questions:

1. Is perceived access to alcohol and perceived access to marijuana related to lifetime marijuana use?
2. Is perceived access to alcohol and perceived access to marijuana related to past month marijuana use?

3. Is perceived harm associated with alcohol use and perceived harm associated with marijuana use related to lifetime marijuana use?

4. Is perceived harm associated with alcohol use and perceived harm associated with marijuana use related to past month marijuana use?

#### *Purpose of the Study*

This study was intended to determine whether adolescent substance abuse prevention efforts led by this Midwestern, suburban school district unintentionally affected marijuana use among students. And, if so, the study attempted to identify aspects of the intervention that may have contributed to this increased use. Study results will be used to shape future substance abuse prevention interventions.

#### *Justification for the Study*

Prevalence of substance use among adolescents and the resultant problems has prompted schools and communities to implement local prevention interventions. One such intervention was launched in 1988 by a school/family/community substance abuse prevention partnership lead by a Midwestern, suburban school district. The intervention was designed using the PRECEDE Model of Health Program Planning (Green & Kreuter, 1991). Based on social cognitive theory (Bandura, 1986), this model recognizes that behavior is multiply-determined and encourages the application of theories of behavior change such as problem behavior theory (Jessor, 1987) that incorporate modifiable determinants of health behavior residing within the individual as well as the social and physical environments. PRECEDE refers to these determinants as predisposing, reinforcing, and enabling factors, respectively. Using problem behavior theory, changeable determinants of drug use behaviors were identified and served as the primary

foci of the intervention. Specifically, perceptions of harm associated with use were identified as predisposing factors for drug use. In addition, access to drugs (alcohol, in particular) and community norms pertaining to drug use were identified as enabling and reinforcing factors, respectively. An intervention was designed to increase perceptions of harm associated with substance use as well as reduce youth access to drugs thereby changing community norms pertaining to drug use. The intervention consisted of health education, student assistance program and policy adoption, and family and community involvement.

*Health education curriculum.* The health education component utilized Growing Healthy at the elementary level. Growing Healthy is a comprehensive health education curriculum consisting of sequential lessons covering ten content areas including nutrition, substance abuse, and mental health that are designed to enhance students' health-related decision-making and problem-solving. At the secondary level, a combination of instructional units selected from Teenage Health Teaching Modules and the Michigan Model for Comprehensive School Health Education was utilized. Teenage Health Teaching Modules is a comprehensive health education curriculum designed for adolescents and intended to enhance decision-making, communication, and risk assessment via 41-91 lessons per year covering a variety of health topics including substance abuse and violence prevention. The Michigan Model combines social and emotional learning (SEL) with a variety of health topics such as substance use and abuse, conflict resolution, and communication skills.

In grades K-5, health education was provided by regular classroom teachers in coordination with the Science curriculum. In 6<sup>th</sup> grade, health was integrated into the

required Science course. Initially, 7<sup>th</sup> grade students received 20 weeks of required health instruction, but in 1995 this was reduced to 10 weeks. Though the overall 7<sup>th</sup> grade health curriculum was downsized, the alcohol, tobacco, and other drug (ATOD) prevention component was retained in its entirety. An 8<sup>th</sup> grade elective health course was offered and one semester of health was required in high school during 9<sup>th</sup> grade. After 9<sup>th</sup> grade, substance abuse prevention programming consisted of sporadic awareness assemblies and student-designed special displays associated with events such as proms and graduation parties.

Previous findings suggested that the intervention contributed to decreased tobacco and marijuana, but not alcohol, use prior to and after implementation between 1987 and 1991 (Younoszai, Lohrmann, Seefeldt, & Greene, 1999). Based on these findings increased emphasis was placed on alcohol use prevention by supplementing the health education curriculum and adding parent workshops on alcohol. Since 1991, the health education component was expanded to include Talking with Your Students About Alcohol (TWYSAA). Now known as Prime for Life Under 21, TWYSAA was designed for youth at high risk for involvement with ATOD use. Focusing primarily on alcohol, the curriculum involves interactive presentations and group discussion. In addition, the parent organization has conducted workshops on the parent companion to TWYSAA called Talking with Your Kids About Alcohol (TYWKAA), now known as Prime for Life for Adults. TWYKAA was used to educate parents about the causes of alcohol problems and strategies for alcohol use prevention.

*Student assistance program and policy adoption.* The school district implemented a student assistance program to provide intervention services to students

recognized as high risk for academic difficulties, adjustment problems (e.g., after a divorce or death), or problems related to ATOD use. This program involved a cluster of educational and support services, including chemical awareness classes and monitoring of academic progress, offered by school guidance offices in collaboration with parents, teachers, and social workers (Lohrmann & Allensworth, 1995). Students thought to have more pronounced substance use and/or mental health problems were referred to community agencies for assessment and treatment. The student assistance program was supported in three important ways. First, the existing strong Student Code of Conduct was amended to allow students to participate in intervention programs in lieu of suspension for some alcohol, drug and tobacco-related offenses. Second, the district adopted a “no use” policy for alcohol and drugs, eventually extended to include tobacco products, for students and adults alike on school grounds, at school events, and in school vehicles. Third, on a voluntary basis, the majority of secondary school faculty members attended a three-day substance abuse prevention workshop that included information on the student assistance program and how to refer students.

*Family and community involvement.* To assure the involvement of those outside of the schools, the school district collaborated with a core group of parents to form a parent organization in 1989. This parent organization, still in existence, provides information to parents on alcohol and drug issues and parent/child communication and facilitates parent networking. In 1990, the parent organization partnered with the school district and other community organizations and agencies to form a community coalition. In 1991, the coalition was awarded a \$1.3 million five-year federal Center for Substance Abuse Prevention (CSAP) Community Partnership Grant with the school district as lead

agency. Within two years, over 90 organizations representing every sector of the community had joined the coalition.

Currently, the coalition is self sustaining and continues to provide numerous community-based services including member training, social marketing campaigns, and alcohol retailer trainings. The coalition also sponsors youth activities, youth leadership development programs (Teens Taking Action), and a Youth Dialogue Day where community leaders listen to groups of youth discuss their perception of life in their community and respond to prompts regarding ATOD risk/protective factors. The coalition also collaborates with a regional coalition of coalitions to coordinate services offered in nearby communities.

Examination of the longer-term impact of the expanded prevention intervention revealed that lifetime and monthly alcohol use decreased below 1991 levels for most grades, a result not previously detected (Lohrmann, Alter, Greene, & Younoszai, 2005). While still below national rates, reported lifetime use of marijuana increased for all grades over time (see Table 1)<sup>1</sup>. Results suggest that the intervention did not impact marijuana use to the same extent as alcohol use. This may be due to a confluence of factors involving relative perceived access to marijuana and alcohol and perceptions of harm associated with their use.

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<sup>1</sup> Table used with permission from the authors D. K. Lohrmann, R. J. Alter, R. Greene, and T. M. Younoszai, 2005, of "Long-term impact of a district-wide school/community-based substance abuse prevention initiative on gateway drug use," *Journal of Drug Education*, 35(3), p. 249.

Table 1

*Comparison of Local and National Prevalence of Gateway Drug Use*

Grade		Local	National	Local	National	Local	National	Local	National	Local	National
		1991		1994		1998		2000		2003	
8 <sup>th</sup>	Lifetime Cigarettes	29.2	44.0	32.3	46.1	33.3	45.7	20.0	40.5	14.1	28.4
	Monthly Cigarettes	7.7	14.3	13.5	18.6	11.3	19.1	8.3	14.6	4.9	10.2
	Lifetime Smokeless Tobacco	8.7	22.2	10.1	19.9	5.5	15.0	3.8	12.8	4.3	11.3
	Monthly Smokeless Tobacco	3.0	6.9	5.1	7.7	1.8	4.8	2.6	4.2	3.2	4.1
	Lifetime Alcohol	NA	70.1	NA	55.8	49.5	52.5	43.9	51.7	38.0	45.6
	Monthly Alcohol	NA	25.1	NA	25.5	17.4	23.0	14.8	22.4	13.6	19.7
	Lifetime Marijuana	3.9	10.2	12.8	16.7	11.0	22.2	7.1	20.3	8.4	17.5
	Monthly Marijuana	1.2	3.2	7.5	7.8	5.5	9.7	3.3	9.1	3.8	7.5
10 <sup>th</sup>	Lifetime Cigarettes	44.2	55.1	47.6	56.9	55.6	57.7	43.9	55.1	31.7	43
	Monthly Cigarettes	20.0	20.8	25.4	25.4	29.9	27.6	20.3	23.9	14.2	16.7
	Lifetime Smokeless Tobacco	17.1	28.2	16.2	29.2	12.3	22.7	12.4	19.1	7.1	14.6
	Monthly Smokeless Tobacco	8.8	10	6.0	10.5	6.1	7.5	8.2	6.1	4.6	5.3
	Lifetime Alcohol	NA	83.8	NA	71.1	71.5	69.8	66.0	71.4	60.7	66
	Monthly Alcohol	NA	42.8	NA	39.2	41.3	38.8	36.3	41	32.7	35.4
	Lifetime Marijuana	11.5	23.4	28.7	30.4	31.8	39.6	25.7	40.3	24.8	36.4
	Monthly Marijuana	4.6	8.7	18.6	15.8	18.0	18.7	15.0	19.7	13.5	17
12 <sup>th</sup>	Lifetime Cigarettes	65.1	63.1	57.5	62	62.4	65.3	57.6	62.5	52.3	53.7
	Monthly Cigarettes	34.3	28.3	29.0	31.2	39.8	35.1	31.0	31.4	30.8	24.4
	Lifetime Smokeless Tobacco	29.9	NA	24.2	30.7	22.0	26.2	21.5	23.1	25.5	17
	Monthly Smokeless Tobacco	11.1	NA	4.8	11.1	7.4	8.8	10.0	7.6	11.1	6.7
	Lifetime Alcohol	NA	88	NA	80.4	80.2	81.4	81.0	80.3	76.4	76.6
	Monthly Alcohol	NA	54	NA	50.1	53.1	52	54.7	50	50.4	47.5
	Lifetime Marijuana	34.3	36.7	34.6	38.2	45.4	49.1	38.4	48.8	44.3	46.1
	Monthly Marijuana	8.6	13.8	19.4	19	24.4	22.8	19.4	21.6	24.8	21.2

The current study examined the possibility that successful efforts in the community to decrease access to alcohol may have unintentionally increased the relative perceived access to marijuana. Additionally, increases in perceived harm associated with alcohol use may have inversely affected relative perceived harm associated with marijuana use. Combined, relative decreased access to alcohol and relative increased access to marijuana, along with increased perceived harm associated with alcohol use and decreased perceived harm associated with marijuana use, may have contributed to increased marijuana use among students in this community. If so, then this unintended consequence would have implications for substance use prevention interventions of this type.

#### *Delimitations*

The study was delimited to the following:

1. The study population consisted of 8<sup>th</sup> through 12<sup>th</sup> graders in a Midwestern suburban school district in 1998, 2000, and 2003 totaling 11,542 students. All students in grades 8-12 were eligible for the study; however, only those students that were in attendance on the day the survey was administered and provided complete and consistent responses to the survey were included in the sample.
2. Data pertaining to demographics, substance use, and exposure to risk and protective factors were collected. Data collected each survey year varied. Only information that was reported every year was eligible for analysis, which included (a) grade; (b) past month use of alcohol and marijuana; (c) perceived harm associated with alcohol and marijuana use; and (d) access to alcohol and marijuana.

3. Variables were measured via a student survey. To limit the length of the survey, two forms of the survey were administered randomly to half of the participants, respectively. Each form contained the same questions pertaining to demographics and substance use, but questions pertaining to risk and protective factors differed between forms. That is, form A assessed perception of risk and form B assessed availability of substances.

4. Data collection occurred in the spring of 1998, 2000, and 2003. Data were merged in spring 2004 and analyzed in spring 2006.

#### *Limitations*

The results from this investigation were interpreted considering the following limitations:

1. Reliability and validity of self-reported substance use is a concern. Gibson and Young (1994) pointed out that reporting of risky or illegal behaviors under circumstances that could result in embarrassment or punishment could be more vulnerable to underreporting. This concern is poignant in the school environment and the possible consequences of reporting illegal substance use. However, Johnston, O'Malley, and Bachman (2003) noted that self-reported substance use among adolescents has a high degree of reliability and convergence with related attitudes and behaviors. To guarantee reliable and valid responses, great care was taken to ensure the confidentiality and anonymity of the respondents. In addition, the procedure and majority of the survey items were standardized from year to year. Finally, inconsistent or medically improbable responses were removed from the sample.

2. Longitudinal monitoring of students' perceived risk and availability across time would be ideal insomuch as this would yield information about the effect of dose and sustained impact. However, the data did not include identifiers that would allow tracking of students from survey year to survey year, which precludes examination of questions pertaining to dose and prolonged impact. In addition, the inability to conduct repeated measures analyses diminishes power to detect effects if effects are present.

3. Due to the cross-sectional nature of the survey and the inevitable exit and entry of students into and out of the district, some of the students in the sample may not have received sufficient dose of the intervention whereas those that received adequate dose may have left the district prior to the survey period. Both exits and entries serve to dilute the observed effect of the intervention.

4. Only students in attendance on the survey day were included in the sample. Participation rates indicated that a larger proportion of younger students were present and completed the student survey than older students. For example, in 2003 89.1% of 8<sup>th</sup> graders provided data while only 69.6% of 12<sup>th</sup> graders provided data. It has been shown that substance abuse among students is related to increases in absences (Roebuck, French, & Dennis, 2004). Therefore, it is probable that those students that are involved in substance abuse were more likely to have been excluded from the study. However, nonparticipation may have been related to other extraneous factors such as absences due to illness, field trips, or college visits. Nevertheless, characteristics and substance use behaviors of non-participants cannot be determined.

5. Uncontrolled extraneous variables unrelated to the intervention may have systematically influenced the variables of interest. The use of a control group, either

within or outside the district, would have provided stronger evidence for the relationship between perceptions of risk and availability and marijuana use. However, the study design and secondary analysis of data did not allow for such control.

6. Prior to analysis, data were stratified by grade to control for the influence of maturation on substance use. Ideally, data also would have been stratified by year to control for extraneous variables related to the passage of time. However, data were not stratified by year to assure adequate cell sizes. As a result, individuals may have participated in multiple survey years. For example, an individual may have participated in 1998 as an 8<sup>th</sup> grader and participated again in 2000 as a 10<sup>th</sup> grader. In such a case, reported lifetime use for this individual would be dually represented in the data set, which potentially violates the independence of observations assumption in the models using lifetime marijuana use as the outcome.

### *Assumptions*

The study was based upon the following assumptions:

1. Health education, school and community policies, and family and community involvement affect risk and protective factors related to deviant behavior including substance use.
2. Modifying risk and protective factors influences deviant behavior including substance use.
3. Substantial portions of the health education components were delivered with fidelity and in their entirety by teachers in the district, especially at the middle and high school levels.
4. The surveys were administered accurately by school personnel.

5. Students answered questions on the survey honestly and to the best of their abilities.

6. Students accurately conveyed their ATOD use prevalence and their perceptions regarding various aspects of ATOD risk and protective factors on the survey.

### *Hypotheses*

1. There is no relationship between perceived access to alcohol, perceived access to marijuana, and lifetime marijuana use.

2. There is no relationship between perceived access to alcohol, perceived access to marijuana, and past month marijuana use.

3. There is no relationship between perceived harm associated with alcohol use, perceived harm associated with marijuana use, and lifetime marijuana use.

4. There is no relationship between perceived harm associated with alcohol use, perceived harm associated with marijuana use, and past month marijuana use.

### *Definition of Terms*

The following terms are defined to clarify their use in the study:

*Access.* Merriam-Webster defines access as “freedom or ability to obtain or make use of.” In the context of adolescent substance use, access refers to availability of and ability to obtain substances such as alcohol and marijuana.

*Acute Effects.* Merriam-Webster defines acute as “having a sudden onset, sharp rise, and short course.” Therefore, acute effects resulting from substance use refer to immediate and/or short-term effects.

*Adolescent Substance Use.* Any non-medical use of legal substances including over-the-counter medications, inhalants, and nicotine (for individuals over age 18) in a

manner or amount not indicated by an authorized authority (e.g., doctor, pharmacist, parent, or product labeling) as well as any use of illicit substances including though not limited to alcohol by individuals up to 20 years of age.

*Chronic Effects.* Merriam-Webster defines chronic as “marked by long duration or frequent recurrence.” Therefore, chronic effects resulting from substance use refer to delayed and/or long-term effects.

*Complements.* In the context of substance use, a substance is a complement to another when the restriction of one substance (e.g., by increasing taxes) reduces the use of the other substance (Farely, Bray, Zarkin, & Wendling, 2001).

*Consumer Behavior Model.* A model describing processes individuals use to select, obtain, and use products (Hawkins, Best, & Coney, 2003).

*Current Use.* Current substance use refers to use in the past 30 days (Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998).

*Enabling Factors.* According to the PRECEDE program planning model, enabling factors refer to “those conditions of the environment that facilitate actions by individuals, groups, or organizations,” (Kreuter, Lezin, Kreuter, & Green, 1998, p. 79).

*Expectations.* According to social cognitive theory (Bandura, 1986), expectations refer to anticipated outcomes of a behavior.

*Gateway Drugs.* Gateway drugs are those that precede the use of other drugs in progressive stages of drug involvement (Kandel & Faust, 1975). That is, drugs such as alcohol, tobacco, and marijuana often precede or serve as a gateway to the use of other illicit drugs or prescription medications.

*Illicit Drugs.* Merriam-Webster defines illicit as “unlawful.” Illicit drugs are those that are illegal to possess and use such as marijuana and cocaine.

*Licit Drugs.* Merriam-Webster defines licit as “not forbidden by law.” Licit drugs are drugs that are legal to possess and use, which includes drugs that are restricted such as alcohol, tobacco, and prescription drugs.

*Lifetime Use.* Episode or instance of use at any point in one’s lifetime (Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998).

*Predisposing Factors.* According to the PRECEDE program planning model, predisposing factors refer to cognitive capacities and affective characteristics that influence behavior (Kreuter, Lezin, Kreuter, & Green, 1998).

*Prevalence.* “Prevalence is the number of cases of a condition per population at risk at one time or in a relatively short period of time,” (Kelsey, Petitti, & King, 1998, p. 46).

*Primary Prevention.* “Actions and interventions designed to identify risks and reduce susceptibility or exposure to health threats prior to disease onset,” (Joint Committee on Health Education Terminology, 2002).

*Problem Behavior.* “Problem behavior is defined as behavior that departs from the norms – both social and legal – of the larger society; it is behavior that is socially disapproved by the institutions of authority and that tends to elicit some form of social control response whether mild reproof, social rejection, or even incarceration,” (Jessor, 1987, p. 332).

*Protective Factors.* Environmental, interpersonal and individual factors that steer youth toward positive outcomes (Hawkins, Catalano, & Miller, 1992). These factors include affect-laden relationships and clear standards for behavior.

*Reciprocal Determinism.* In social cognitive theory, reciprocal determinism refers to mutual causal action of behavior, cognitive, and environmental factors that “all operate interactively as determinants of each other,” (Bandura, 1986, p. 23).

*Reinforcing Factors.* According to the PRECEDE program planning model, reinforcing factors refer to attitudes and the “climate of support” one gets that influence behavior (Kreuter, Lezin, Kreuter, & Green, 1998, p. 78).

*Risk Factors.* Environmental, interpersonal and individual factors that steer youth away from positive outcomes (Hawkins, Catalano, & Miller, 1992). These factors include availability of drugs and favorable attitudes toward drug use.

*Secondary Prevention.* “Actions and interventions designed to detect and treat disease in early stages to prevent progress or recurrence,” (Joint Committee on Health Education Terminology, 2002).

*Situation.* According to social cognitive theory (Bandura, 1986), situation refers to anticipated outcomes of a behavior.

*Social and Emotional Learning.* “Social and emotional learning (SEL) programs provide systematic classroom instruction that enhances children’s capacities to recognize and manage their emotions, appreciate the perspectives of others, establish prosocial goals and solve problems, and use a variety of interpersonal skills to effectively and ethically handle developmentally relevant tasks,” (Payton, Wardlaw, Graczyk, Bloodworth, Tompsett, & Weissberg, 2000).

*Social Norms.* In the context of ATOD use, social norms refer to "...the extent to which members of a group find consumption socially acceptable," (Hawkins, Catalano, & Miller, 1992, p. 81).

*Student Assistance Program.* A program that provides educational and support services for students identified as at-risk for academic or personal difficulties due to major life changes or personal circumstance. School personnel are trained to identify students who are exhibiting signs of problems (Swisher & Baker, 1993). Identified students are provided intervention services through the program or referred for more extensive treatment for problems such as substance addiction or mental illness. Coordinated with the school's discipline policy, students in need of assistance are allowed to participate in the program in lieu of suspension for some alcohol and tobacco related offenses.

*Substitutes.* "When two goods (or substances) are substitutes, policies which successfully ration demand for one good will generate an increased demand for the other good," (DiNardo & Lemieux, 2001, p. 992).

*Substitution Effect.* When the use of one substance is restricted in some manner, then use of the substitute will increase (DiNardo & Lemieux, 2001).

*Tertiary Prevention.* "Actions and interventions designed to alleviate the effects of disease and injury," (Joint Committee on Health Education Terminology, 2002).

## Chapter 2

### REVIEW OF THE RELATED LITERATURE

The literature related to the relationship between alcohol and marijuana use is reported in this chapter. For organizational purposes, the literature is presented under the following topics: (a) Alcohol and Marijuana Use among Adolescents; (b) Determinants and Prevention of Adolescent Substance Use (c) Prevention in a Midwestern, Suburban Community; (d) Substitution Effect; and (e) Summary.

#### *Alcohol and Marijuana Use among Adolescents*

Alcohol is the most used drug among Americans. As reported by the National Survey on Drug Use and Health (NSDUH, 2004), over half of Americans over the age of 12 are current users of alcohol, which totals more than 120 million people. Among adolescents aged 12-17, nearly 18% are current users of alcohol (NSDUH, 2004) as measured by reported use in the past month and over 75% of high school seniors have used alcohol in their lifetime (Johnston, O'Malley, Bachman, & Schulenberg, 2005).

Alcohol use is related to myriad negative health outcomes including coronary heart disease (National Institute on Alcohol Abuse and Alcoholism - NIAAA, 1999), liver disease (NIAAA, 1998), and fetal alcohol syndrome (NIAAA, 2000). A central nervous system depressant, alcohol also disrupts coordination, decreases arousal, and lowers inhibition. These effects adversely affect decision-making and increase risky behaviors contributing to increased likelihood of injury or death from motor vehicle accidents (National Institute on Alcohol Abuse and Alcoholism, 2001; Spain, Boaz, Davidson, Miller, Carrillo, & Richardson, 1997), transmission of sexually transmitted infections including human immunodeficiency virus (HIV) (Hingson, Strunin, Berlin, &

Heeren, 1990), involvement in violent crime (Howard & Wang, 2005; Swahn & Donovan, 2005), and self-inflicted injury and suicide attempts (Doshi, Boudreaux, Wang, Pelletier, & Camargo, 2005).

Alcohol use not only jeopardizes the health of the adolescent user, but also undermines academic achievement. Users of alcohol are more likely to be truant and have lower grades. To illustrate, high school seniors that had high truancy rates were 2.5 times more likely to be alcohol users than their peers with low truancy rates (O'Malley, Johnston, & Bachman, 1998). In addition, of high school seniors with grade point averages (GPAs) of "B-minus" or lower, 58% were current users of alcohol whereas only 45% of their peers with GPAs of "A" were current users of alcohol (O'Malley, Johnston, & Bachman, 1998).

Negative consequences of alcohol use are particularly distressing considering that its use is often followed by use of other drugs such as marijuana and other illicit and prescription drugs (Lai, Lai, Page, & McCoy, 2000; Wagner & Anthony, 2002). Often labeled "gateway drugs" (Kandel, & Faust, 1975), prospective studies of drug use have shown that the use of illicit drugs is often preceded by use of licit drugs such as alcohol (Kandel, 2002; Kandel, Yamaguchi, & Chen, 1992). That is, individuals exhibit progressive stages of drug use beginning with alcohol and tobacco and progressing to illicit drugs (though licit drugs such as alcohol and tobacco are illegal for minors to purchase, possess, and use). Therefore, the negative effects of alcohol use are compounded by the negative effects of drugs used following or in combination with alcohol, such as marijuana.

Marijuana is the most used illicit drug among adolescents in the United States. According to the Monitoring the Future Project (MTF), nearly half of adolescents use marijuana before graduating from high school while less than a third have used any other illicit drugs (Johnston, O'Malley, Bachman, & Schulenberg, 2005). Regular marijuana use, as measured by reported use in the past 30 days, by 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> graders has reached nearly 6.5%, 16%, and 20%, respectively (Johnston, O'Malley, Bachman, & Schulenberg, 2005).

Effects of the psychoactive component of marijuana, delta-9-tetrahydrocannabinol (THC) include loss of coordination, distorted perception, and impaired memory and learning (National Institute on Drug Abuse-NIDA, 2002). These effects impact the physical, psychological, and behavioral well-being of adolescents jeopardizing their health and academic success. To illustrate, acute effects of marijuana use include impaired coordination, vision, and cognition (National Institute on Drug Abuse-NIDA, 2002) contributing to injury and death from accidents such as car crashes (Blows, Ivers, Connor, Ameratunga, Woodward, & Norton, 2005). In addition, impaired decision-making and problem-solving resulting from marijuana use increases the likelihood of engaging in risky behaviors such as unprotected sex (Hingson, Strunin, Berlin, & Heeren, 1990). Chronic effects of marijuana use such as memory impairment (Iverson, 2003), decreased motivation (Lane, Cherek, Don, Pietras, & Steinberg, 2005), classroom misbehavior (Bryant, Schulenberg, O'Malley, Bachman & Johnston, 2003), and truancy (Roebuck, French, & Dennis, 2004) serve to undermine students' academic achievement. In fact, marijuana users are 2.3 times more likely than their non-using peers to drop out of school (Bray, Zarkin, Ringwalt, & Qi, 2000).

*Determinants and Prevention of Adolescent Substance Use*

Substance use-related problems can be avoided through successful substance use prevention efforts. Effective efforts are based on a thorough understanding of the etiology of substance use including identification and attention to important correlates of substance use. Research has identified a group of factors associated with substance use called risk and protective factors. Hawkins, Catalano, and Miller (1992) defined risk factors as “precursors of drug and alcohol problems,” (p. 65). Several risk factors for adolescent substance use that originate from environment or context, the individual and interpersonal interactions, psycho-behavioral characteristics, and biogenetic constitution have been identified (Hawkins, Catalano & Miller, 1992). Risk factors include availability of ATOD as well as attitudes and norms favorable to drug use (Hawkins, Catalano & Miller, 1992). Youth exposed to an abundance of risk factors are more likely to engage in substance use (Lohrmann & Fors, 1986).

A second category of factors is called “protective” because factors of this type “mediate or moderate the effects of exposure to risk.” (Hawkins, Catalano & Miller, 1992, p. 86). Rather than the antithesis of risk, protective factors represent a separate concept that serves to undermine risks and steer youth toward more positive outcomes (Hawkins, Catalano & Miller, 1992; Newcomb, 1995; Newcomb & Felix-Ortiz, 1992).

Given the abundance of risk and protective factors that may play a role in substance use, identification of the most influential and changeable factors assures maximal use of resources and intervention effectiveness (Gielen & McDonald, 2002). Determination of intervention priorities is facilitated by the use of a planning model such as PRECEDE. Based on social cognitive theory (SCT - Bandura, 1986), PRECEDE

guides the identification of risk factors within the individual, his/her behavior and environment that influence change in the target health behavior such as ATOD use. Within the PRECEDE model, these factors are referred to as predisposing, reinforcing, and enabling factors, respectively. Predisposing factors refer to cognitive capacities and affective characteristics that influence behavior (Kreuter, Lezin, Kreuter, & Green, 1998), such as perceptions of harm associated with ATOD use. Reinforcing factors refer to attitudes and the “climate of support” one gets that influence behavior (Kreuter, Lezin, Kreuter, & Green, 1998, p. 78), such as community norms. Enabling factors refer to “those conditions of the environment that facilitate actions by individuals, groups, or organizations,” (Kreuter, Lezin, Kreuter, & Green, 1998, p. 79), such as access to drugs.

PRECEDE “does not attempt to predict or explain the relationship among factors...Rather it provides a structure for applying theories so that the most appropriate intervention strategies can be identified and implemented (Gielen & McDonald, 2002, p. 410). A useful blending of theories for incorporation into PRECEDE is the social development model. This model incorporates theories addressing risk and protective factors and their role as predictors of deviant behavior, including substance use (Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996; Hawkins & Weis, 1985). The model distinguishes between those that engage in antisocial behavior (such as substance use) and those that maintain a prosocial trajectory (Catalano, et al., 1996; Hawkins & Weis, 1985).

The social development model highlights the critical role of the process and agents of socialization. That is, human behavior is influenced by the bonds or attachments made with socializing agents such as parents, friends, school, and

community. Bonds are created via perceived opportunities for involvement in interpersonal interaction and activities (prosocial and antisocial) as well as the degree of participation, possession of interpersonal skills, and perceived reward stemming from participation (Catalano et al., 1996).

These socialization processes are duly represented along two paths, one leading to prosocial behavior and the other to antisocial behavior. The constructs along the prosocial path represent processes by which protective factors discourage antisocial behavior while constructs along the antisocial path represent processes by which risk factors encourage antisocial behavior. The overarching concept of the social development model specifies that behavior is driven by formation of social bonds that result in the internalization of values and standards of behavior held by the socializing agent(s).

The social development model provides a roadmap for describing the etiology of deviance and the prevention of deviant behavior, including substance use. The model incorporates social and emotional learning (SEL) to enhance involvement in prosocial activities and promote bonding to prosocial others. SEL is a process of developing social and emotional skills of children and adolescents. Specifically targeted by SEL are the development of self-awareness, social awareness, self-management, relationship skills, and responsible decision-making (Collaborative for Academic, Social, and Emotional Learning-CASEL, 2002). Also incorporated into this model is involvement of the family and community – components recognized as critical to effective prevention programming (Dusenbury & Falco, 1995).

Based on the social development model, the Seattle Social Development Project (Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999) was designed to reduce substance use and other risky behaviors among adolescents. This program was implemented in 1985 and provided training to students, teachers, and parents beginning when youth were in the first grade. It was Hawkins and colleagues' (1999) expectation that,

training teachers to teach and manage their classrooms in ways that promote bonding to school, training parents to manage their families in ways that promote bonding to family and to school, and provide children with training in skills for social interaction would positively affect children's attitudes toward school, their behavior at school, and their academic achievement. We thought that these changes would, in turn, set children on a different developmental trajectory observable in more positive academic outcomes and fewer health-risk behaviors later in adolescence (pp. 227).

Outcomes of the SSDP were measured longitudinally through late adolescence and results revealed that program participants were less likely than their non-participating peers to have engaged in risky health behaviors such as heavy alcohol use, driving while drunk, and sexual intercourse. In addition, youth in the intervention group reported improvement in school achievement and a reduction in school misbehavior as well as less violent behavior, arrests, and delinquency at age 17 years (Hawkins et al., 1999).

Other effective substance abuse prevention interventions have focused on the reduction of risk factors and increase of protective factors, development of social and emotional skills, and involvement of the family and community. The effectiveness of these curricula has been assessed in two ways. First, curricula have been the subject of evaluation research studies examining cognitive and behavioral outcomes. Second, Drug Strategies (1999) convened a panel of experts in substance abuse prevention to review

drug prevention curricula and evaluation reports. Using a detailed assessment system, each curriculum was assigned grades based on content and quality. Examples of effective curricula include the Michigan Model for Comprehensive School Health Education, Growing Healthy, Teenage Health Teaching Modules, TWYSAA, and TWYKAA.

The Michigan Model for Comprehensive School Health Education encourages positive health behaviors through development of social and emotional skills and parental involvement. The Michigan Model curriculum addresses health topics such as substance use, relationships, safety, emotions, physical senses, pollution, exercise, and nutrition. Evaluations of the Michigan Model have revealed that middle school participants were significantly less likely to use alcohol, tobacco, and marijuana than their non-participating peers (Shope, Copeland, Marcoux, & Kamp, 1996). This curriculum was one of just twenty-two SEL curricula rated as “select” in a meta-analysis conducted by Collaborative for Academic, Social, and Emotional Learning (CASEL, 2002) and received an overall grade of “A” from Drug Strategies (1999).

A similar curriculum, Growing Healthy, is a comprehensive school health education curriculum that addresses mental and emotional health, family life, nutrition, substance use, and safety. Growing Healthy is based on social and emotional learning strategies that encourage family involvement. An evaluation of Growing Healthy revealed improvements in health knowledge, attitudes, and behavior (Connell, Turner, & Mason, 1985). This curriculum received an overall grade of “B” from an expert panel review conducted by Drug Strategies (1999).

Teenage Health Teaching Modules (THTM) is a curriculum designed to curb substance use and violence as well as foster healthy sexual development and citizenship. An evaluation of THTM revealed significant positive health behaviors among students, including reductions in the reported use of alcohol, tobacco, and illegal drugs (Errecart, Walberg, Ross, Gold, Fiedler, & Kolbe, 1991). This curriculum also received an overall grade of “B” from Drug Strategies (1999).

A curriculum specifically addressing alcohol use, TWYSAA and the parent companion piece, TWYKAA (now known as Prime for Life), targets risk factors that include “factors directly related to alcohol and drug use such as whether or not one has positive attitudes towards alcohol and drugs and especially, perception of risk,” (Prime for Life, n.d.). An evaluation of TWYSAA revealed that alcohol using students were five times more likely to abstain after delivery of the curriculum than alcohol using controls (Daugherty & O’Bryan, 1988). In addition, 83% of non-using students remained non-users after delivery of the curriculum while only 60% of controls remained non-users (Daugherty & O’Bryan, 1988). An evaluation of TWYKAA revealed that parents and their children consumed less alcohol (even though their children had not participated in TWYSAA) than controls (Van Tubergen, 1983).

One focus of TWYSAA and TWYKAA is to determine level of risk for alcohol-related problems. Those at greater risk (e.g., parental use or addiction) are taught skills to lower this risk. Another strategy for assisting those with higher risk for substance use problems involves student assistance programs. These programs identify those at higher risk and provide intervention and referral services. Student assistance programs of this type have been shown to increase self-esteem and enhance academic achievement of

participants and have been associated with a lower likelihood of smoking and drinking alcohol (Scott & Surface, 1999; Swisher, Baker, Barnes, Doebler, Hadleman, & Kophazi, 1993).

*Prevention in a Midwestern, Suburban Community*

Suburban youth are sometimes assumed to be at lower risk for substance abuse than their urban or rural peers because of exposure to fewer risks and more protective factors as well as greater opportunities for involvement with prosocial others. However, involvement in substance use and other problem behaviors is higher among suburban youth than their urban peers (Dinardo & Lemieux, 2001; Greene & Forster, 2004). Greene and Forster (2004) found that among high school seniors suburban youth have tried cigarettes (60% suburban versus 54% urban), driven while high (20% suburban versus 13% urban) or drunk (22% suburban versus 16% urban), and engaged in unsupervised drinking (63% suburban versus 57% urban) at higher rates than urban youth. Suburban youth also are at an increased risk for substance-related problems such as alcohol abuse, alcohol dependence (Chen, Sheth, Elliott, & Yeager, 2004).

Adolescent substance use patterns indicative of increased risk for substance-related problems were identified in a Midwestern suburban community. In a 1987 survey, 8<sup>th</sup> grade students reported prevalence rates of binge drinking, daily cigarette use, and marijuana, cocaine, and stimulant use that was higher than prevalence among 8<sup>th</sup> graders nationally (Younoszai, Lohrmann, Seefeldt, & Greene, 1999). In response to this pattern, the school district in 1987 designed a comprehensive school-based substance abuse prevention intervention in an effort to decrease risk factors, increase protective factors, and decrease prevalence of substance use among youth. Risk factors identified

using problem behavior theory were sorted into predisposing, reinforcing, and enabling factors delineated by PRECEDE in the education and ecological assessment phase, which informed the administration, policy assessment, and intervention alignment. School district leaders recognized that schools alone could not influence the preponderance of risk factors (Lohrmann and Fors, 1986) and, therefore, proposed a three-pronged approach involving effective substance use prevention strategies including (1) evidence-based comprehensive health education, (2) a student assistance program with policy adoption and staff training, and (3) parent and community involvement.

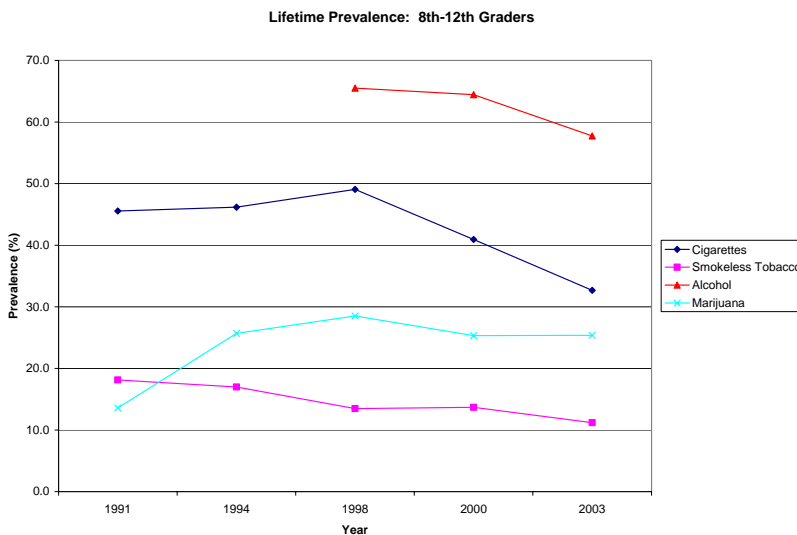
Effectiveness of the intervention has been evaluated by examining annual and monthly prevalence of reported substance use of 8<sup>th</sup> and 11<sup>th</sup> graders prior to and after implementation of the intervention (Younoszai et al., 1999). Results of the two-stage cross-sectional study revealed decreases in the use of most drugs with the exception of alcohol. In addition, prevalence rates of marijuana, cocaine, and stimulant use that were above the national rates in 1987 fell below the national rates in 1991. These findings suggest that the intervention was effective in decreasing prevalence of annual and monthly use of most substances. Steep declines of prevalence in the study population without similar declines in national trends provide strong support for the assumption that the intervention contributed, at least partly, to the observed changes.

Based on the findings related to the effects of the intervention on alcohol use rates, the intervention was revised to enhance the focus on predisposing, reinforcing, and enabling factors related to alcohol use by adding alcohol use prevention components for youth and parents. Specifically, the health education component was expanded in 1991 to include Talking with Your Students About Alcohol (TWYSAA). In addition, a parent

group conducted workshops on the parent companion to TWYSAA called Talking with Your Kids About Alcohol (TYWKAA). A study designed to examine the long-term effects (1991-2003) of the expanded substance abuse prevention partnership intervention led by the Midwestern school district (Lohrmann, Alter, Greene, & Younoszai, 2005) revealed decreases in lifetime and monthly cigarette and alcohol use among students (see figure 1)<sup>2</sup>. Alcohol use was of particular interest given that the intervention had little effect on alcohol use in its earliest years (Younoszai et al., 1999). Decreases in alcohol use following the addition of TWYKAA and TWYSAA suggest that this increased focus on alcohol use prevention contributed to the decreased prevalence of alcohol use. However, results also revealed an increase in marijuana use among adolescents in the community. Specifically, reported lifetime use of marijuana increased for all grades over time, though prevalence remained below national prevalence rates.

Figure 1

Lifetime Prevalence: 8<sup>th</sup>-12<sup>th</sup> Graders



<sup>2</sup> Graph used with permission from the authors D. K. Lohrmann, R. J. Alter, R. Greene, and T. M. Younoszai, 2005, of “Long-term impact of a district-wide school/community-based substance abuse prevention initiative on gateway drug use,” *Journal of Drug Education*, 35(3), p. 244.

### *Substitution Effect*

Prior research on alcohol use prevention efforts has revealed interdependence between alcohol and marijuana use. Specifically, it has been shown that marijuana is a substitute for alcohol, such that restricting access to alcohol can result in unintended increases in marijuana use (DiNardo & Lemieux, 2001). For example, DiNardo and Lemieux (2001) examined the effect of raising the minimum drinking age from 18 to 21 years in the United States. Results revealed that stricter alcohol regulation resulted in decreased alcohol consumption among high school seniors by 4.5% and increased marijuana use by 2.4%.

Regulation of tobacco has also been shown to influence marijuana use, but in a different manner. Specifically, when access to tobacco is restricted (e.g., via increased taxes or enforcement efforts), marijuana use decreases (see Chaloupka, Pacula, Farrelly, Johnston, O'Malley, & Bray, 1999; Pacula, 1998). For example, "higher cigarette taxes decrease the intensity of marijuana use" whereby a "10% increase in cigarettes prices would lead to a 5.4% decrease in total marijuana use" (Farrelly, Bray, Zarkin, & Wendling, 2001, p. 65). This suggests that tobacco and marijuana are complements rather than substitutes, such that decreased access to tobacco by way of increased prices reduces the use of marijuana.

DiNardo and Lemieux (2001) speculated that the observed substitution of marijuana for alcohol was related to similarities in the physiological effects of these substances. Self-reported and empirical observations of performance impairments associated with alcohol and marijuana use are similar (Heishman, Stitzer, & Bigelow, 1988). Therefore, substitution effects have been proposed as an effective strategy for

harm reduction of alcohol use. For example, Charlton (2005) argued that government policy should promote the substitution of marijuana for alcohol because it is a safer and equally effective alternative to alcohol.

DiNardo and Lemieux (2001) also suggested that increased societal disapproval of alcohol use played a role in the substitution of marijuana for alcohol. Social disapproval, particularly parental and peer disapproval, is related to decreased likelihood of substance use (Kumar, O'Malley, Johnston, Schulenberg, & Bachman, 2002; Nash, McQueen, & Bray, 2005). However, the DiNardo and Lemieux (2001) study did not specifically address the role of societal factors in substitution. Rather, substitution was examined from the perspective of a consumer behavior model that focused on demand for goods, in this case, alcohol and marijuana. This did not allow for examination of other societal factors that may play a role in substitution. Social cognitive theory (Bandura, 1986) and problem behavior theory (Jessor, 1987) address the role of environmental factors, which include societal influences, in ATOD use while also incorporating the influence of personal and behavioral factors.

Social cognitive theory (SCT - Bandura, 1986) highlights the importance of societal factors involved in drug use, but further acknowledges the influence of other environmental factors as well as individual and behavioral factors. SCT is based on a behaviorist approach, which holds that behavior is regulated by the environment and outcomes of the behavior. However, SCT extends this premise by incorporating the role of cognitions in regulating behavior. Specifically, individuals are believed to possess capabilities to symbolize behavior, anticipate outcomes, learn vicariously, possess confidence in their ability to perform a behavior, self-regulate behavior, and reflect upon

their behavior (Baranowski, Perry, & Parcel, 2002). These cognitive capabilities allow one to regulate behavior antecedently. That is, one can predict outcomes of a behavior prior to engaging in the behavior. These cognitive processes interact with the environment and behavioral outcomes to guide behavior.

Central to SCT is the principle of reciprocal determinism, which describes the dynamic influences of the individual, his/her behavior, and environment on behavior (Baranowski, Perry, & Parcel, 2002). As Bandura (1986) explained, these interactions are not unidirectional, such that behavior is the outcome of environmental or cognitive influences. Further, interactions are not bidirectional, such that the environment and individual influence each other and produce behavior. Rather, the individual, environment, and behavior influence one another in a reciprocal fashion. This triadic influence can vary in strength and timing. One factor may have greater or lesser influence than others depending upon the circumstances. To illustrate, in a given situation environmental constraints on behavior may restrict influence of other factors or interpersonal factors may be weak allowing individual factors (e.g., beliefs, personality) to exert greater influence. Temporal dynamics of the influence of factors varies as well, such that “the mutual influences and their reciprocal effects do not spring forth all at the same instant,” (Bandura, 1986, p. 25).

Akin to SCT, problem behavior theory conceptualizes the likelihood of engaging in a problem behavior (one that is rejected by society and often results in punishment such as adolescent ATOD use) by considering the individual, behavioral, and environmental factors operating within a social structure that may make one more prone such problem behaviors. Each factor is comprised of specific structures that are closely

related to risk and protective factors proposed by Hawkins, Catalano and Miller (1992). For example, the individual factor, termed the personality system by Jessor (1987), is comprised of the motivational-instigation structure which encompasses values and expectations related to academic achievement, independence, and affection.

Using PRECEDE, this influence of individual, behavioral, and environmental factors put forth by SCT and problem behavior theory were the basis of the substance abuse prevention intervention undertaken by the aforementioned Midwestern, suburban school district. In fact, the risk factors for substance abuse were sorted into predisposing, reinforcing, and enabling factors and incorporated into the educational and ecological assessment phase of PRECEDE. The intervention was designed to affect all three sets of factors, which are thought to have played a role in substitution. One focus of the intervention was to modify the environment by reducing access to alcohol. The community coalition conducted alcohol retailer trainings and created city ordinances against open shelving of alcohol and social hosting in an effort to limit the availability of alcohol to minors. Research has shown that access to drugs is directly related to use (Gillmore, Catalano, Morrison, Wells, Iritani, & Hawkins, 1990; Hofler, Lieb, Perkonig, Schuster, Sonntag, Wittchen, 1999). For example, community-based enforcement efforts to reduce the illegal sale of alcohol to minors have been shown to reduce drinking as well as drinking and driving among minors (Dent, Grube, & Biglan, 2005). According to SCT, this change in the environment not only affects substance use behaviors, but also the situation - an individual's perception of the environment. Perceived access to alcohol is related to greater likelihood of alcohol use (Foley, Altman, Durant & Wolfson, 2004; MacKillop & Lisman, 2005). Based on the principle of reciprocity put forth by SCT, it

stands to reason that perceptions of access to one substance may influence the perceptions of access to another substance. Specifically, perceptions of decreased access to alcohol may have influenced relative perceptions of access to marijuana, such that access to alcohol is restricted to such a degree that marijuana is perceived as more easily accessible than alcohol – a hypothesized relationship requiring further study.

In concert with other intervention components, health education components were intended to affect expectations – anticipated outcomes of a behavior. Specifically, health education was intended to increase awareness of risks associated with alcohol use. Increasing awareness of risks associated with use is a prevention strategy based on the negative relationship between perceived harm associated with alcohol, tobacco, and other drug use and actual use (Bachman, Johnston, & O’Malley, 1998; Hemmelstein, 1995; Henry, Slater, & Oetting, 2005). In line with the SCT construct of reciprocal determinism and the hypothesized relationship between perceived access to alcohol and marijuana, increases in perceived harm associated with alcohol use may inversely affect relative perceived harm associated with marijuana use justifying further investigation into the role of these factors in substitution.

### *Summary*

Alcohol and marijuana are the most used licit and illicit drugs among American adolescents, respectively. The myriad problems related to use of these and other substances have sparked communities to implement prevention interventions. Successful prevention interventions decrease risk factors, increase protective factors, develop social and emotional skills, and involve parents and the community. Based upon these components of effective prevention programs, a three-pronged intervention including

health education, a student assistance program with policy adoption and staff training, and parent/community involvement was undertaken by a Midwestern, suburban community. Initially, the intervention successfully decreased use of most drugs among students in the school district with the exception of alcohol. After revision of the intervention to focus more heavily on limiting access to alcohol and changing community norms and perceptions of harm associated with alcohol use, alcohol use decreased. Student marijuana use was not impacted as positively. This interdependence between the use of alcohol and marijuana has been reported in the literature and examined from a demand perspective. However, the role of environmental, cognitive, and behavioral factors that may play a role in this substitution effect have not been adequately studied. Further research is needed to examine the effect of cognitive factors thought to be related to substitution effects – perceived access and harm of alcohol and marijuana, specifically.

## Chapter 3

### METHODOLOGY

The focus of the study was the role of perceived access to alcohol and marijuana and perceived harm associated with alcohol and marijuana use on reported marijuana use among youth in a Midwestern, suburban school district. The conduct of the study included the following organizational steps: (a) Selection of participants; (b) Selection of the measurement tools; (c) Collection of the data; and (d) Treatment of the data.

#### *Selection of Participants*

Data were obtained from the school district for secondary data analysis. Study participants consisted of 11,542 8<sup>th</sup> through 12<sup>th</sup> grade students in the Midwestern suburban school district in 1998, 2000, and 2003. All students in grades 8-12 in the seven middle, high, and alternative schools in the district were eligible for the study, but only those students in attendance on the day the survey was administered were included in the sample. In addition, those students that provided inconsistent or incomplete responses were not included in the analyses. Though all students in the district participated in the intervention, school administrators chose to survey older students only because of the sensitive nature of the questions (e.g., ATOD use behavior).

Students were surveyed in 1991, 1994, 1998, 2000, and 2003 and data were available for these survey years. However, for unknown reasons, a large portion of respondents in 1991 and 1994 (approximately 27%) did not respond to the questions pertaining to monthly and lifetime alcohol use. As a result, data from these survey years are unreliable and were not included in the analysis.

### *Selection of the Measurement Tools*

The survey instrument mirrors the survey used in the Monitoring the Future Project (Johnston et al., 2003). Specifically, the survey was comprised of questions pertaining to demographics, as well as youths' exposure to risk and protective factors and substance use. To limit the length of the survey, two forms of the survey were administered randomly. Each form contained the same questions pertaining to demographics and substance use, but questions pertaining to risk and protective factors differed between forms. Questions assessing perceptions of access were on Form A while questions assessing perceptions of harm were on Form B. Fifty-one percent of respondents completed form A of the survey and 49% completed form B.

The demographic information collected each survey year varied. In general, students were asked to provide information pertaining to gender, grade, ethnicity, family structure, parental education, academic performance, and extracurricular activities. Only demographic information that was reported every year was eligible for inclusion in the analysis. These variables included gender, grade, ethnicity, custodial parent, parents' education level, available spending money (allowance or earned), and time spent participating in extracurricular activities including those outside of school.

Exposure to risk and protective factors was measured via a battery of questions pertaining to availability of alcohol, perceptions of risk associated with ATOD use, and perceptions of peer approval of ATOD use, as well as awareness of policies and norms pertaining to substance use. Of particular interest were questions assessing perceived access and harm of alcohol and marijuana. Perceived access was assessed via 12 questions. The format of these questions was a single stem ("How difficult do you think

it would be for you to get each of the following types of drugs, if you wanted some?") followed by a list of 12 substances including marijuana, LSD, amphetamines, barbiturates, tranquilizers, crack cocaine, powdered cocaine, heroin, other narcotics (e.g., methadone, opium), steroids, alcohol, and cigarettes. The response format was a 5-point Likert-type scale ranging from 1 (probably impossible) to 5 (very easy). Perceived harm was assessed via 20 questions. The format of these questions was a single stem ("How much do you think people risk harming themselves (physically or in other ways)") followed by a list of 20 drug use behaviors. Marijuana use behaviors included trying marijuana once or twice, smoking marijuana occasionally, and smoking marijuana regularly. Responses to these items were summed to create an index representing risk associated with these levels of marijuana use. Alcohol use behaviors included taking one or two drinks of alcohol nearly every day, taking four or five drinks nearly every day, and having five or more drinks once or twice each weekend. Responses to these items were summed to create an index representing risk associated with these levels of alcohol use.

Substance use was measured via a battery of questions probing youths' use of substances in their lifetime, the past year, and the past month. However, past year items were excluded from the current study due to variation in response format across survey years, which made comparisons difficult. The response format was a 7-point Likert-type scale ranging from 1 (0 occasions) to 7 (40 or more occasions). Responses were dichotomized into 0 (no use) and 1 (use).

Validation of an instrument used to assess sensitive behaviors such as substance use proves difficult. However, several sources of evidence suggest that the instrument used by the school district was a valid measure of substance use and risk and protective

factors. First, internal consistency among items on a scale provides the necessary, though insufficient, condition for validity. All scales included in the instrument have a high degree of internal consistency as indicated by acceptable inter-item correlations among items (see Table 2). Second, content validity was established through a review of survey items by school district staff. Guided by the literature on risk and protective factors (e.g., Hawkins, Catalano & Miller, 1992), only those items deemed critical to the constructs were included in the instrument. Third, reported substance use was related to other behaviors and attitudes as would be expected based on previous studies. For example, findings from the current study revealed that the likelihood of marijuana use increased as perceived access to marijuana increased and as perceptions of harm associated with marijuana decreased, which is consistent with the literature (Bachman, Johnston, & O'Malley, 1998; Hemmelstein, 1995; Henry, Slater, & Oetting, 2005; Foley, Altman, Durant & Wolfson, 2004; MacKillop & Lisman, 2005). Fourth, the majority of the

Table 2

*Internal Consistency of Scales: Chronbach's Alpha*

Scale	Number of items	Year		
		1998	2000	2003
Risk associated with ATOD use	20	.93	.94	.94
ATOD use	39	.92	.92	.92
Age of first ATOD use	18	.85	.84	.85
Peer approval of ATOD use	9	.94	.95	.96
Sources of help for ATOD problems	7	.79	.81	.81
Access to ATOD	12	.94	.95	.95
Intention to use ATOD	4	.76	.74	.77
Pressure to use ATOD	4	.80	.78	.82
Setting: Alcohol use	8	.87	.87	.88
Setting: Drug use	8	.95	.93	.93
School ATOD policies	4	.91	.93	.95
School punishment for ATOD offenses	4	.90	.91	.95

survey items were modeled after validated surveys (e.g., Monitoring the Future), which were standardized from year to year. Fifth, a variety of procedural safeguards were put in place to ensure that responses were collected anonymously and confidentially. Finally, inconsistent or medically improbable responses were removed from the sample.

#### *Collection of the Data*

School district personnel obtained passive informed consent from parents prior to data collection. Data were collected in late March of each year, five to six weeks following winter break and prior to spring break (periods when drug use tends to increase). To avoid contamination due to informal student discussion of the survey, data were collected on the same day during the same hour for all 8<sup>th</sup> through 12<sup>th</sup> grade students district-wide. Data were obtained without any identifiers and could not be linked to individual students over successive years.

#### *Treatment of the Data*

Data were analyzed using SPSS® 13.0 statistical software on a desktop personal computer. Data were stratified by grade level and two sets of analyses were conducted to investigate the role of alcohol use and perceptions on past month marijuana use and lifetime marijuana use, respectively. Relationships between variables in the data set and monthly and lifetime marijuana use were analyzed via first-order correlations. Of particular interest was the relationship between perceived access to alcohol and marijuana use, access to alcohol and perceived access to marijuana, perceived harm associated with alcohol use and marijuana use, and perceived harm associated with alcohol use and perceived harm associated with marijuana use.

Additionally, more complex relationships between marijuana use and alcohol use, perceived access to alcohol and marijuana, and perceived harm associated with alcohol and marijuana use were examined via two sets of logistic regression analyses; one set of analyses examining the relationship between perceived access variables, alcohol use, and the likelihood of marijuana use and the other set of analyses examining the relationship between perceived harm variables, alcohol use, and the likelihood of marijuana use. Two separate analyses were needed because access and harm questions were on separate forms of the survey administered to students. That is, questions pertaining to perceived harm were on Form A of the survey and questions pertaining to perceived access were on Form B. Therefore, no individual student provided responses on both access and harm question sets, preventing a logistic regression analysis with alcohol use, perceived harm, and perceived access variables in a single model.

In the first set of logistic regression analyses, the role of perceived access and alcohol use on marijuana use was examined by regressing the dichotomized alcohol use variable, perceived access of alcohol variable, perceived access of marijuana variable, and perceived access of alcohol x perceived access of marijuana interaction term on the dichotomized lifetime marijuana use variable (research question 1). Data were split by grade, such that a separate logistic regression analysis was conducted on 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> graders for a total of five analyses. The same five analyses were conducted using dichotomized past month marijuana use as the outcome (research question 2). Follow-up analyses were conducted to interpret significant interactions. Evidence for the unintentional effect of increasing relative access to marijuana would be supported by a significant alcohol x perceived access of marijuana interaction, such that when access to

marijuana is low, the likelihood of marijuana use is low and not affected by perceptions of access to alcohol to the same extent as when perceptions of access to alcohol are high. In the latter case, low perceptions of access to alcohol and high perceptions of access to marijuana would be related to greater use of marijuana.

In the second set of logistic regression analyses, the role of perceived harm and alcohol use on marijuana use was examined by regressing the dichotomized alcohol use variable, perceived harm of alcohol use composite, perceived harm of marijuana use composite, and perceived harm of alcohol use x perceived harm of marijuana use interaction term on the dichotomized lifetime marijuana use variable (research question 3). Data were split by grade, such that a separate logistic regression analysis was conducted on 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> graders for a total of five analyses. The same five analyses were conducted using dichotomized past month marijuana use as the outcome (research question 4). Follow-up analyses were conducted to interpret significant interactions. Evidence for the unintentional effect of increasing relative access to marijuana would be supported by a significant perceived harm of alcohol use x perceived harm of marijuana use interaction, such that when perceptions of harm associated with marijuana use are high, the likelihood of marijuana use is low and not affected by perceptions of harm associated with alcohol use to the same extent as when perceptions of harm associated with alcohol use are high. In the latter case, high perceptions of harm associated with alcohol use and low perceptions of harm associated with marijuana use would be related to greater use of marijuana.

*Summary*

The current study examined the role of perceived access to alcohol and marijuana and perceived harm associated with alcohol and marijuana use on marijuana use among 11,542 8<sup>th</sup> through 12<sup>th</sup> grade students in a Midwestern, suburban school district. Data pertaining to demographics, substance use, perceived access, and perceived harm was assessed via a reliable and valid student survey in 1998, 2000, and 2003. Research questions addressed complex relationships between lifetime and past month marijuana use and alcohol use, perceived access to alcohol and marijuana, and perceived harm associated with alcohol and marijuana use. Questions were examined via two sets of logistic regression analyses.

## Chapter 4

### ANALYSIS AND DISCUSSION OF DATA

This study focused on the role of perceived access to alcohol and marijuana and perceived harm associated with alcohol and marijuana use in marijuana use among youth in a Midwestern suburban school district. This study included an attempt to identify aspects of the intervention led by this school district that may have unintentionally contributed to increased use of marijuana. The analysis of the data is presented in this chapter according to the following topics: (a) Participant demographics; (b) Characteristics of variables in the model; (c) Access logistic regression analyses; (d) Harm logistic regression analyses; and (e) Discussion of findings.

#### *Participant Demographics*

Participants consisted of 11,542 8<sup>th</sup> through 12<sup>th</sup> grade students (5,620 males and 5,881 females) from seven middle and high schools within a Midwestern, suburban school district. Table 3 indicates the number of youth per grade included in the sample. The breakdown of participants by year and grade reveals a disparity in response rate, such that older students were less likely to participate in the earlier survey years than younger students. However, this disparity is lesser than in earlier survey years (e.g., 1991 and 1994). A slight adjustment in survey date succeeded in capturing more older students in the sample as previous survey dates fell on days that many upperclassmen were away on college visits.

Table 3

*Participants by Grade and Survey Year*

Grade	Year of survey					
	1998		2000		2003	
	n	%	n	%	n	%
8	901	87.1	822	85.1	885	89.1
9	790	80.7	808	82.4	794	81.8
10	783	81.1	768	72.8	805	79.9
11	703	75.7	734	71.8	782	77.8
12	636	70.1	620	64.3	711	69.6

Information pertaining to sociodemographics and family characteristics collected each survey year included ethnicity, living situation, parents' education level, available spending money, and participation in extracurricular activities. The majority of participants were Caucasian (68.5%). The remaining participants reported the following ethnic identities: Asian, 10.4%; Asian Indian, 5.8%; Arab, 5.7%; Other, 4.4%; Black, 2.6%; Hispanic, 1.5%; and Native American, 0.9%. Most participants (81.4%) lived in two parent homes while 11.5% lived with a single parent and 6.2% lived with a remarried parent. Education levels of participants' parents were quite high with 31.8% and 33.5% of fathers and mothers holding a college degree, respectively. Participants reported having little spending money available for their use. Over half of participants reported having less than \$25 of available spending money per week. Only 16.3% of participants reported having over \$60 of available spending money per week.

Table 4 indicates participants' reported involvement in a variety of extracurricular activities. Of those participants indicating involvement in extracurricular activities, most spent only one to two hours per week engaged in band, sports, in-school and out-of-school clubs, and religious groups (37%, 47%, 43%, 50%, and 57%, respectively). The

slight majority of participants reported no participation in band, sports, and in-school clubs (62.6%, 52.8%, and 57%, respectively) each week. The distribution of involvement in band and sports teams was bimodal with most indicating no participation (62.6% and 52.8%, respectively) and many indicating 6 or more hours of participation per week (12.8% and 31.9%, respectively). This pattern was expected given the competitive nature of selection for band and sports team participation (e.g., tryouts for a limited number of available slots) and the amount of practice required for these activities.

Table 4

*Percentage of Participants Reporting Involvement in Extracurricular Activities per Week*

Hours	Extracurricular activities				
	Band	Sports	In-school clubs	Out-of-school clubs	Religious activities
0	62.6	52.8	57.0	49.2	42.7
1-2	12.8	7.0	25.5	24.5	34.8
3-5	11.7	8.3	11.9	16.2	16.4
6-10	9.0	14.4	3.6	6.3	4.5
11 or more	3.8	17.5	2.1	3.7	1.6

*Characteristics of Variables in the Models*

Variables in the access model and harm model were measured on an ordinal scale. Therefore, the most appropriate measures of central tendency and dispersion are the median and minimum, maximum, first quartile ( $Q_1$ ) and third quartile ( $Q_3$ ), respectively. Table 5 provides these indicators for each variable in the model. Examination of these indicators revealed that while a minority of participants had used marijuana in their lifetime ( $Q_3 = 1$  or “once or twice”), most participants were not regular users of marijuana (past month  $Q_3 = 0$  or “never”). Similarly, some participants had used alcohol in their lifetime (median = 1 or “once or twice”). However, most were not regular users

Table 5

*Characteristics of the Variables in the Models*

	Variables in the model							
	Lifetime Marijuana use	Past Month Marijuana use	Lifetime alcohol use	Past month alcohol use	Alcohol harm index	Marijuana harm index	Access to alcohol	Access to marijuana
Median	0.0	0.0	1.0	0.0	6.0	6.0	4.0	3.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	6.0	6.0	9.0	6.0	9.0	9.0	4.0	4.0
1 <sup>st</sup> quartile	0.0	0.0	0.0	0.0	4.0	4.0	3.0	2.0
3 <sup>rd</sup> quartile	1.0	0.0	4.0	1.0	8.0	8.0	4.0	4.0

of alcohol (past month  $Q_3 = 1$  or “once or twice”). Perceptions of harm and access were more evenly distributed with one exception. Most participants reported perceptions of high access to alcohol ( $Q_1 = 3$  or “fairly easy to obtain”).

Table 6 indicates the bivariate correlations between outcome and predictor variables of interest included in the access and harm models. The correlation matrix revealed positive correlations between alcohol and marijuana use, such that those participants that reported use of alcohol were also likely to report use of marijuana. In addition, perceived harm associated with alcohol use and perceived harm associated with marijuana use was negatively correlated with marijuana use. Specifically, those participants that reported higher perceptions of harm associated with alcohol were less likely to report use of marijuana. Similarly, those participants that reported higher perceptions of harm associated with marijuana were less likely to report use of marijuana. Finally, access to alcohol and access to marijuana were positively correlated with marijuana use. Specifically, those participants that reported greater perceived access to alcohol were more likely to report use of marijuana. Similarly, those participants that reported greater perceived access to marijuana were more likely to report use of marijuana.

Table 6

*Bivariate Correlations between Predictor and Outcome Variables in the Models*

Predictors	Outcomes			
	Lifetime marijuana use		Past month marijuana use	
	r	p	r	p
Past month alcohol use	.55	.001	.39	.001
Alcohol harm index	-.34	.001	-.27	.001
Marijuana harm index	-.47	.001	-.39	.001
Access to alcohol	.19	.001	.10	.001
Access to marijuana	.39	.001	.27	.001

Table 7 indicates intercorrelations between predictors included in the access and harm models. The correlation matrix revealed significant correlations between all predictors included in the models. However, relatively weak correlations would be expected to reach significance due to the large sample size. As is the case with all types of regression analyses, multicollinearity is a concern and is signaled by high standard errors and/or a failure of the tolerance test (Tabachnick & Fidell, 2001). All logistic regression analyses passed the tolerance test and standard errors for betas were small.

Table 7

*Intercorrelations between Predictors in the Models*

Predictors	Past month alcohol use		Alcohol harm index		Marijuana harm index		Access to alcohol		Access to marijuana	
	r	p	r	p	r	p	r	p	r	p
Past month alcohol use	-	-	-.30	.001	-.36	.001	.23	.001	.39	.001
Alcohol harm index			-	-	.60	.001	*	*	*	*
Marijuana harm index					-	-	*	*	*	*
Access to alcohol							-	-	.63	.001
Access to marijuana									-	-

\*Correlations cannot be computed between these items because they were included on different forms of the survey (Form A vs. B).

*Access Logistic Regression Analyses*

Two sets of logistic regression analyses were used to investigate the role of perceived access to alcohol and perceived access to marijuana in past month marijuana use. In addition, these analyses were used to investigate the role of perceived access to alcohol and perceived access to marijuana in lifetime marijuana use. The results of the analyses are presented in Tables 8-13.

*Past month marijuana use.* Table 8 provides results of the Hosmer and Lemeshow Goodness-of-Fit Test. This test compares observed and expected frequencies of users and non-users in this model and serves as an indicator of the extent to which the set of variables accounts for variance in the outcome variable. None of these tests reached significance at the .05 level thereby failing to reject the null hypothesis and indicating a good fit of the model to the data. Table 9 indicates the model summary including Cox and Snell  $R^2$  - an estimate of the strength of association between the set of predictors and the outcome variable. The estimated amount of variance explained by the set of predictors for this set of logistic regression analyses ranged from 13.0% among ninth graders to 22.4% among eleventh graders.

Table 8

*Past Month Marijuana Use: Hosmer and Lemeshow Goodness-of-Fit Test*

Grade	Chi-square	df	Sig.
8	5.702	8	.681
9	9.111	6	.167
10	5.857	7	.557
11	8.338	5	.139
12	4.486	5	.482

Table 9

*Past Month Marijuana Use: Access Logistic Regression Model Summary*

Grade	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
8	249.934	.189	.270
9	282.732	.130	.426
10	556.491	.176	.362
11	678.291	.224	.386
12	873.490	.215	.328

The use of alcohol in the past month was related to the use of marijuana in the past month across each grade level (see Table 10). Specifically, those participants that

indicated no alcohol use were more likely to report marijuana use. This finding was consistent across each grade level. Variables that reached significance in analyses conducted on each grade will be discussed in turn.

Among eighth graders, the only other variable aside from past month use of alcohol to reach significance was access to marijuana whereby those indicating greater access to marijuana were more likely to report use of marijuana. Among ninth graders, the only other variable aside from past month use of alcohol to reach significance was access to alcohol whereby likelihood of past month marijuana use increased as perceived access to alcohol decreased. Among tenth graders, no other variables aside from past month alcohol use reached significance. Among eleventh graders, the only other variables aside from past month use of alcohol to reach significance was access to alcohol and the access to marijuana x access to alcohol interaction. Interpretation of the odds ratio for the access to alcohol variable indicated that as access to alcohol decreased, the likelihood of marijuana use increased. However, given the presence of a significant interaction, interpretation of the interaction is most appropriate. To do so, follow-up tests were required to calculate odds ratios at each level of access to marijuana with the values of the reported access to alcohol held constant. Data for those participants indicating that it was impossible, very difficult, or fairly difficult to obtain alcohol were separated from those that indicated that it was fairly easy or very easy to obtain alcohol. Logistic regression analyses were conducted for each group (low versus high access). The analysis for the high access to alcohol group failed to reach significance while the analysis for the low access to alcohol group was marginally significant. Failure to reach significance was most likely due to a reduction of overall sample size ( $n_{low} = 93$ ,

Table 10

*Past Month Marijuana Use: Access Logistic Regression*

Grade	Variables	B	S.E.	Wald	df	Sig.	Exp(B)
8	Past month alcohol use	-2.558	.399	41.110	1	.001	.077
	Access to marijuana	.803	.363	4.882	1	.027	2.232
	Access to alcohol	-.758	.409	3.434	1	.064	.469
	Interaction: Access to marijuana x alcohol	.139	.120	1.360	1	.243	1.150
	Constant	-2.995	1.150	6.785	1	.009	.050
9	Past month alcohol use	-2.764	.270	104.509	1	.001	.063
	Access to marijuana	.533	.319	2.795	1	.095	1.705
	Access to alcohol	-.822	.246	11.176	1	.001	.439
	Interaction: Access to marijuana x alcohol	.093	.093	1.008	1	.315	1.097
	Constant	-.750	.611	1.508	1	.220	.472
10	Past month alcohol use	-2.862	.273	109.582	1	.001	.057
	Access to marijuana	.502	.327	2.349	1	.125	1.651
	Access to alcohol	-.342	.307	1.244	1	.265	.710
	Interaction: Access to marijuana x alcohol	.045	.096	.217	1	.641	1.046
	Constant	-1.615	.944	2.927	1	.087	.199
11	Past month alcohol use	-2.377	.221	115.415	1	.001	.093
	Access to marijuana	-.143	.281	.258	1	.612	.867
	Access to alcohol	-.854	.209	16.724	1	.001	.426
	Interaction: Access to marijuana x alcohol	.230	.080	8.314	1	.004	1.258
	Interaction: Access to marijuana x low access to alcohol	.759	.435	3.049	1	.081	2.137
	Interaction: Access to marijuana x high access to alcohol	.201	.311	.415	1	.520	1.222
	Constant	.218	.548	.158	1	.691	1.244
12	Past month alcohol use	-2.571	.285	81.175	1	.001	.076
	Access to marijuana	-.107	.279	.148	1	.701	.898
	Access to alcohol	-1.060	.242	19.127	1	.001	.347
	Interaction: Access to marijuana x alcohol	.219	.083	6.927	1	.008	1.245
	Interaction: Access to marijuana x low access to alcohol	.716	.505	2.016	1	.156	2.047
	Interaction: Access to marijuana x high access to alcohol	.365	.373	.960	1	.327	1.441
	Constant	.663	.598	1.229	1	.268	1.940

$n_{\text{high}} = 968$  and the number of marijuana users per cell (14 and 5 users, respectively) thereby reducing power to detect an effect in either group; however, the odds ratios for each analysis were in the predicted direction. A comparison of odds ratios obtained for each group revealed that when access to alcohol is high, access to marijuana does not predict likelihood of marijuana use (OR = 1.222,  $p = \text{ns}$ ). However, when access to alcohol is low, increased access to marijuana increases the likelihood of marijuana use (OR = 2.137,  $p = .08$ ).

Among twelfth graders, the only other variables aside from past month use of alcohol to reach significance were access to alcohol and the access to marijuana x access to alcohol interaction. Interpretation of the odds ratio for the access to alcohol variable indicated that as access to alcohol decreased, the likelihood of marijuana use increased. However, given the presence of a significant interaction, interpretation of the interaction is most appropriate. Again, follow-up tests failed to reach significance most likely due to a reduction in overall sample size ( $n_{\text{low}} = 71$ ) and the number of marijuana users (13 users) in the low group; however, the odds ratios for each analysis were in the predicted direction and showed a similar pattern as 11<sup>th</sup> graders.

*Lifetime marijuana use.* Table 11 provides results of the Hosmer and Lemeshow Goodness-of-Fit Test. All but one of these tests failed to reach significance at the .05 level thereby failing to reject the null hypothesis and indicating a good fit of the model to the data. The eleventh grade model reached significance and the tenth and twelfth grade models were marginally significant indicating that the models may not be well calibrated to the data requiring caution in interpreting these models. Table 12 indicates the model summary including Cox and Snell  $R^2$ . The estimated amount of variance explained by

the set of predictors for this set of logistic regression analyses ranged from 23.1% among tenth graders to 31.7% among eleventh graders.

Table 11

*Lifetime Marijuana Use: Hosmer and Lemeshow Goodness-of-Fit Test*

Grade	Chi-square	df	Sig.
8	7.568	6	.271
9	5.530	7	.596
10	11.815	6	.066
11	14.528	7	.043
12	11.719	6	.069

Table 12

*Lifetime Marijuana Use: Access Logistic Regression Model Summary*

Grade	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
8	269.662	.237	.320
9	478.239	.232	.488
10	819.690	.231	.376
11	886.348	.317	.456
12	1018.296	.310	.421

The use of alcohol in the past month was related to the use of marijuana in the past month across each grade level (see Table 13). Specifically, those participants that indicated no alcohol use were more likely to report marijuana use. This finding was consistent for every grade level. Variables that reached significance in analyses conducted on each grade will be discussed in turn.

Among eighth and ninth graders, the only other variable aside from past month alcohol use that reached significance was access to marijuana. That is, the likelihood of lifetime marijuana use increased as access to marijuana increased. Among tenth graders, access to marijuana and alcohol reached significance. That is, the likelihood of

Table 13

*Lifetime Marijuana Use: Access Logistic Regression*

Grade	Variables	B	S.E.	Wald	df	Sig.	Exp(B)
8	Past month alcohol use	-2.238	.243	84.688	1	.001	.107
	Access to marijuana	.955	.325	8.634	1	.003	2.599
	Access to alcohol	-.360	.310	1.347	1	.246	.698
	Interaction: Access to marijuana x alcohol	.085	.097	.764	1	.382	1.089
	Constant	-3.121	.986	10.024	1	.002	.044
9	Past month alcohol use	-2.261	.182	154.862	1	.001	.104
	Access to marijuana	.610	.302	4.091	1	.043	1.841
	Access to alcohol	-.384	.206	3.464	1	.063	.681
	Interaction: Access to marijuana x alcohol	.052	.084	.393	1	.531	1.054
	Constant	-1.322	.600	4.846	1	.028	.267
10	Past month alcohol use	-2.413	.176	187.096	1	.001	.090
	Access to marijuana	.692	.274	6.387	1	.011	1.999
	Access to alcohol	-.570	.217	6.913	1	.009	.566
	Interaction: Access to marijuana x alcohol	.069	.078	.789	1	.374	1.072
	Constant	-.812	.628	1.671	1	.196	.444
11	Past month alcohol use	-2.258	.161	196.546	1	.001	.105
	Access to marijuana	.442	.275	2.578	1	.108	1.556
	Access to alcohol	-.480	.193	6.160	1	.013	.619
	Interaction: Access to marijuana x alcohol	.097	.076	1.632	1	.201	1.102
	Constant	-.380	.574	.437	1	.509	.684
12	Past month alcohol use	-2.326	.171	184.132	1	.001	.098
	Access to marijuana	.285	.268	1.129	1	.288	1.330
	Access to alcohol	-.656	.209	9.850	1	.002	.519
	Interaction: Access to marijuana x alcohol	.151	.076	3.929	1	.047	1.163
	Interaction: Access to marijuana x low access to alcohol	.780	.499	2.440	1	.118	2.181
	Interaction: Access to marijuana x high access to alcohol	.151	.302	.250	1	.617	1.163
	Constant	.066	.602	.012	1	.913	1.068

marijuana use increased as access to marijuana increased and access to alcohol decreased.

Among eleventh graders, the only other variable aside from past month use of alcohol to reach significance was access to alcohol whereby likelihood of lifetime marijuana use

increased as access to alcohol decreased. Among twelfth graders, the only other variables aside from past month use of alcohol to reach significance was access to alcohol and the access to marijuana x access to alcohol interaction. Interpretation of the odds ratio for the access to alcohol variable indicated that as access to alcohol decreased, the likelihood of marijuana use increased. However, given the presence of a significant interaction, interpretation of the interaction is most appropriate. Follow-up tests failed to reach significance most likely due to a reduction in overall sample size ( $n_{\text{low}} = 49$ ) and the number of marijuana users (22 users) in the low group; however, the odds ratios for each analysis were in the predicted direction and showed a similar pattern as 11<sup>th</sup> and 12<sup>th</sup> graders in the access model using past month marijuana use as the outcome.

#### *Harm Logistic Regression Analyses*

Two sets of logistic regression analyses were used to investigate the role of perceived harm associated with alcohol use and perceived harm associated with marijuana use in past month marijuana use. In addition, these analyses were used to investigate the role of perceived harm associated with alcohol use and perceived harm associated with marijuana use in lifetime marijuana use. The results of the analyses are presented in Tables 14-19.

*Past month marijuana use.* Table 14 provides results of the Hosmer and Lemeshow Goodness-of-Fit Test. All but one of these tests failed to reach significance at the .05 level thereby failing to reject the null hypothesis and indicating a good fit of the model to the data. The eleventh grade model reached significance and the ninth grade model was marginally significant indicating that the models may not be well calibrated to the data, which requires caution in interpreting these models. Table 15 indicates the

model summary including Cox and Snell  $R^2$ . The estimated amount of variance explained by the set of predictors for this set of logistic regression analyses ranged from 10.9% among eighth graders to 29.3% among twelfth graders.

Table 14

*Monthly Marijuana Use: Hosmer and Lemeshow Goodness-of-Fit Test*

Grade	Chi-square	df	Sig.
8	6.782	8	.560
9	14.326	8	.074
10	10.499	8	.232
11	19.165	8	.014
12	12.842	8	.117

Table 15

*Monthly Marijuana Use: Harm Logistic Regression Model Summary*

Grade	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
8	244.665	.109	.402
9	470.144	.190	.396
10	680.666	.208	.371
11	738.614	.259	.416
12	723.675	.293	.433

The use of alcohol in the past month was related to the use of marijuana in the past month across each grade level (see Table 16). Specifically, those participants that indicated no alcohol use were more likely to report marijuana use. This finding was consistent across every grade level. Variables that reached significance in analyses conducted on each grade will be discussed in turn.

Among eighth graders, no other variables aside from past month alcohol use accounted for a significant amount of variance in past month marijuana use. Among ninth graders, the only other variables aside from past month use of alcohol to reach significance was harm associated with alcohol and the harm of marijuana x harm of

Table 16

*Monthly Marijuana Use: Harm Logistic Regression*

Grade	Variables	B	S.E.	Wald	df	Sig.	Exp(B)
8	Past month alcohol use	-3.233	.431	56.202	1	.001	.039
	Harm of marijuana	-.198	.120	2.731	1	.098	.820
	Harm of alcohol	-.101	.125	.649	1	.421	.904
	Interaction: Harm of marijuana x alcohol	-.007	.025	.082	1	.775	.993
	Constant	.336	.484	.480	1	.488	1.399
9	Past month alcohol use	-2.406	.280	73.753	1	.001	.090
	Harm of marijuana	-.146	.103	1.986	1	.159	.864
	Harm of alcohol	.182	.093	3.862	1	.049	1.200
	Interaction: Harm of marijuana x alcohol	-.049	.020	5.740	1	.017	.953
	Interaction: Harm of marijuana x low alcohol	-.023	.041	.307	1	.579	.977
	Interaction: Harm of marijuana x high alcohol	.023	.094	.058	1	.810	1.023
10	Constant	.206	.387	.283	1	.595	1.229
	Past month alcohol use	-2.053	.226	82.427	1	.001	.128
	Harm of marijuana	-.252	.089	8.053	1	.005	.777
	Harm of alcohol	.109	.075	2.111	1	.146	1.115
	Interaction: Harm of marijuana x alcohol	-.027	.016	2.683	1	.101	.974
11	Constant	.499	.325	2.359	1	.125	1.647
	Past month alcohol use	-2.244	.230	95.434	1	.001	.106
	Harm of marijuana	-.318	.087	13.277	1	.001	.728
	Harm of alcohol	.035	.072	.238	1	.626	1.036
	Interaction: Harm of marijuana x alcohol	-.015	.016	.904	1	.342	.985
12	Constant	1.056	.328	10.375	1	.001	2.875
	Past month alcohol use	-2.669	.276	93.607	1	.001	.069
	Harm of marijuana	-.332	.088	14.145	1	.001	.717
	Harm of alcohol	.008	.075	.010	1	.920	1.008
	Interaction: Harm of marijuana x alcohol	-.008	.017	.208	1	.649	.992
12	Constant	1.263	.329	14.696	1	.001	3.534

alcohol interaction. Interpretation of the odds ratio for the harm of alcohol variable indicated that as perceptions of harm associated with alcohol increased, the likelihood of marijuana use increased. However, given the presence of a significant interaction,

interpretation of the interaction is most appropriate. To interpret the interaction, follow-up tests were required to calculate odds ratios at each level of perception of harm associated with marijuana holding constant the values of the reported perception of harm associated with alcohol. A median split was performed on the composite variable and logistic regression analyses were conducted for each group (low versus high perceptions of harm). Follow-up tests failed to reach significance. Among tenth, eleventh and twelfth graders, the only other variable aside from past month use of alcohol to reach significance was harm associated with marijuana whereby likelihood of past month marijuana use decreased as perceived harm increased.

*Lifetime marijuana use.* Table 17 provides results of the Hosmer and Lemeshow Goodness-of-Fit Test. None of these tests reached significance at the .05 level thereby failing to reject the null hypothesis and indicating a good fit of the model to the data. The twelfth grade model was marginally significant indicating that the model may not be well calibrated to the data requiring caution in interpreting this model. Table 18 indicates the model summary including Cox and Snell  $R^2$ . The estimated amount of variance explained by the set of predictors for this set of logistic regression analyses ranged from 14.8% among eighth graders to 37.6% among eleventh graders.

Table 17

*Lifetime Marijuana Use: Hosmer and Lemeshow Goodness-of-Fit Test*

Grade	Chi-square	df	Sig.
8	13.956	8	.083
9	9.726	8	.285
10	12.756	8	.121
11	2.007	8	.981
12	15.082	8	.058

Table 18

*Lifetime Marijuana Use: Harm Logistic Regression Model Summary*

Grade	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
8	476.479	.148	.351
9	612.994	.290	.482
10	922.015	.299	.436
11	918.550	.376	.515
12	862.229	.358	.479

The use of alcohol in the past month was related to lifetime use of marijuana across each grade level (see Table 19). Specifically, those participants that indicated no alcohol use were more likely to report marijuana use. This finding was consistent each grade level. Variables that reached significance in analyses conducted on each grade will be discussed in turn.

Table 19

*Lifetime Marijuana Use: Harm Logistic Regression*

Grade	Variables	B	S.E.	Wald	df	Sig.	Exp(B)
8	Past month alcohol use	-2.354	.255	85.372	1	.001	.095
	Harm of marijuana	-.052	.083	.385	1	.535	.950
	Harm of alcohol	.079	.098	.643	1	.423	1.082
	Interaction: Harm of marijuana x alcohol	-.042	.018	5.656	1	.017	.959
	Interaction: Harm of marijuana x low alcohol	.094	.037	6.633	1	.010	.910
	Interaction: Harm of marijuana x high alcohol	.014	.088	.026	1	.872	1.014
	Constant	.479	.388	1.526	1	.217	1.614
9	Past month alcohol use	-2.406	.215	125.336	1	.001	.090
	Harm of marijuana	-.099	.088	1.265	1	.261	.906
	Harm of alcohol	.265	.084	9.928	1	.002	1.303
	Interaction: Harm of marijuana x alcohol	-.068	.017	15.708	1	.001	.934
	Interaction: Harm of marijuana x low alcohol	.104	.039	7.144	1	.008	.901
	Interaction: Harm of marijuana x high alcohol	.015	.078	.037	1	.848	1.015

	high alcohol						
	Constant	1.013	.362	7.856	1	.005	2.755
10	Past month alcohol use	-1.876	.168	124.848	1	.001	.153
	Harm of marijuana	-.169	.073	5.386	1	.020	.844
	Harm of alcohol	.163	.070	5.469	1	.019	1.177
	Interaction: Harm of marijuana x alcohol	-.046	.014	11.511	1	.001	.955
	Interaction: Harm of marijuana x low alcohol	-.111	.030	13.535	1	.001	.895
	Interaction: Harm of marijuana x high alcohol	.023	.060	.148	1	.701	1.023
	Constant	1.378	.313	19.342	1	.001	3.967
11	Past month alcohol use	-2.170	.168	166.047	1	.001	.114
	Harm of marijuana	-.135	.076	3.173	1	.075	.874
	Harm of alcohol	.217	.071	9.255	1	.002	1.243
	Interaction: Harm of marijuana x alcohol	-.057	.014	17.014	1	.001	.945
	Interaction: Harm of marijuana x low alcohol	-.092	.031	8.671	1	.003	.913
	Interaction: Harm of marijuana x high alcohol	.070	.059	1.387	1	.239	.932
	Constant	1.760	.340	26.873	1	.001	5.815
12	Past month alcohol use	-2.046	.176	135.471	1	.001	.129
	Harm of marijuana	-.277	.079	12.260	1	.001	.758
	Harm of alcohol	-.026	.076	.116	1	.733	.974
	Interaction: Harm of marijuana x alcohol	-.016	.014	1.286	1	.257	.984
	Constant	2.599	.363	51.339	1	.001	13.444

Among eighth, ninth, tenth and eleventh graders, the only other variable aside from past month use of alcohol to reach significance was the perception of harm associated with marijuana x perception of harm associated with alcohol interaction. Follow-up tests revealed a significant effect in the low perceptions of harm associated with alcohol group while the analysis for the high perceptions of harm associated with alcohol group failed to reach significance. A comparison of odds ratios obtained for each group revealed that when that when perceptions of harm associated with alcohol are low, increased perceptions of harm associated with marijuana decreases the likelihood of

marijuana use. However, when perceptions of harm associated with alcohol are high, perceptions of harm associated with marijuana did not predict the likelihood of marijuana use. In some cases, the coefficients (B) of the overall interaction term differ in direction from the follow-up tests. This is most likely due to a violation of assumptions, which may include specification errors (inability to include harm and access variables in a single model), multicollinearity (significant intercorrelations between predictor variables), and/or independence of observations (inability to track individuals, which allows one to participate each year).

Among ninth, tenth, and eleventh graders, perceptions of harm associated with alcohol also reached significance indicating that as perceptions of harm of alcohol increased, the likelihood of marijuana use also increased. However, given the presence of a significant interaction, interpretation of the interaction is most appropriate. Among twelfth graders, the only other variable aside from past month use of alcohol to reach significance was harm associated with marijuana whereby likelihood of past month marijuana use decreased as perceived harm increased.

### *Discussion of Findings*

The primary purpose of the study was to examine the relationship between marijuana use among adolescents and (1) perceived access to alcohol and marijuana and (2) perceived harm associated with alcohol and marijuana use. Specifically, the study investigated whether perceptions of access to alcohol may have influenced relative perceptions of access to marijuana, thereby increasing marijuana use. Also, the study investigated whether perceived harm associated with alcohol use may have inversely affected relative perceived harm associated with marijuana, thereby increasing marijuana

use. Results supported prior research by revealing evidence of a substitution effect as well as relationships between the use of marijuana and perceptions of access and harm associated with marijuana use. In addition, findings provided support for a relationship between perceived access to marijuana and its use that depended on the level of perceived access to alcohol. Similarly, findings also revealed a relationship between perceptions of harm associated with marijuana use and its use that depended on the perceptions of harm associated with alcohol.

Previous research has shown that marijuana is a substitute for alcohol, such that when access to alcohol is limited marijuana use increases (DiNardo & Lemieux, 2001). One focus of the intervention undertaken by the Midwestern, suburban school district was to increase perceptions of harm associated with alcohol through school-based health education and reduced access to alcohol via community policy change and stricter law enforcement. The relationship between past month use of alcohol and marijuana use across grade levels provided evidence for a substitution effect, such that those who reported no use of alcohol were more likely to report use of marijuana. The current study sought to further investigate factors that may influence this relationship between alcohol and marijuana use.

SCT and problem behavior theory in conjunction with the PRECEDE model provided a framework for understanding the relationship between intervention components, including limiting access to alcohol, and the observed decrease in alcohol use and increase in marijuana use. In particular, these theories highlight the importance and reciprocal influence of environmental, personal, and behavioral factors in adolescent ATOD use. It has been suggested that changes within the environment (e.g., limited

access) affect cognitive factors within the individual, which may play a role in substitution (DiNardo & Lemieux, 2001). Two such factors examined in the current study included perceptions of access and harm.

Prior research has established a relationship between perceived access to and use of a substance (Foley, Altman, Durant & Wolfson, 2004; MacKillop & Lisman, 2005). Findings from the current study indicating that the likelihood of marijuana use increased as perceived access to marijuana also increased further supports this body of evidence. Based on the principle of reciprocity put forth by SCT, the current study sought to examine the possibility that perceived access to one substance could influence relative perceived access to another substance and influence its use. Specifically, one focus of the current study was to determine whether perceptions of decreased access to alcohol may have influenced relative perceptions of access to marijuana, thereby increasing marijuana use.

The role of perceived access in substitution of marijuana for alcohol was supported by the significant relationship found between perceived access to alcohol and marijuana use, such that decreased perceptions of access to alcohol were related to an increased likelihood of marijuana use. Interaction effects further supported the role of perceived access in marijuana use. Specifically, perceived access to marijuana played a role in marijuana use only when perceived access to alcohol was limited, such that greater perceived access to marijuana increased the likelihood of marijuana use. These effects were not found across all grade levels. Rather, more complicated relationships between perceived access to alcohol and marijuana and marijuana use were mostly found among older participants. This may be due to a variety of factors including more

advanced cognitive development and greater independence (e.g., driver's license, more unsupervised time), which may influence perceptions of access.

Another focus of the current study was to investigate the role of perceptions of harm in substitution. Previous studies have shown that increased perceptions of harm associated with ATOD use are related to lower use rates (Bachman, Johnston, & O'Malley, 1998; Hemmelstein, 1995; Henry, Slater, & Oetting, 2005). Findings from the current study further support this relationship by indicating that as perceptions of harm associated with marijuana increased, the likelihood of marijuana use decreased. Based on the principle of reciprocity put forth by SCT, the current study also sought to examine the possibility that perceptions of harm associated with the use of one substance could influence perceptions of harm associated with the use of another substance and influence its use. Specifically, one focus of the current study was to determine whether increases in perceived harm associated with alcohol use may have inversely affected relative perceived harm associated with marijuana use, thereby increasing marijuana use.

Results provided mixed evidence for the role of perceptions of harm in substitution of marijuana for alcohol. Perceptions of harm associated with alcohol were not related to likelihood of past month or lifetime marijuana use in any grade level. However, interaction effects reached significance for past month marijuana use among 9<sup>th</sup> graders and lifetime marijuana use among most grade levels. These interaction effects supported the role of perceived harm in marijuana use, but not in the expected manner. Specifically, perceived harm associated with marijuana played a role in marijuana use only when perceptions of harm associated with alcohol were low, such that increased perceptions of harm associated with marijuana was related to a decreased likelihood of

marijuana use. This suggests that when perceptions of harm associated with alcohol are high, the protective effect of high perceptions of harm associated with marijuana use against marijuana use is lost.

Limitations of the study including the evaluation design, structure of the data set, and small sample and cell sizes limit the conclusions that may be drawn from the findings. Future studies should address these limitations in an effort to enhance internal and external validity and strengthen conclusions. For example, secondary data analyses should be conducted using existing national data sets (e.g., Youth Risk Behavior Surveillance System, Monitoring the Future Project) to further investigate substitution effects that may reveal other influential cognitive variables such as perceived norms associated with alcohol and marijuana. This type of replication would yield larger sample and cell sizes, thus increasing power to detect effects, and increase generalization of findings beyond this Midwestern suburban school district. In addition, a replication of the study using an experimental design and a validated survey assessing perceptions of access and harm from each participant should be conducted. An experimental design would be better able to determine cause and effect between perceptions of access and harm and substitution of marijuana for alcohol. The use of a more comprehensive survey would allow access and harm variables to be included in a single model. This expanded model may reveal more complicated relationships between perceptions of access and harm. For example, it stands to reason that substitution of marijuana for alcohol may be influenced by decreasing perceptions of access to alcohol decreases, increased perceptions of harm associated with alcohol, and relative increases in perceptions of harm associated with marijuana.

Findings from the previous studies (Lohrmann, Alter, Greene, & Younoszai, 2005; Younoszai, Lohrmann, Seefeldt, & Greene, 1999) as well as the current study highlight the success of the district-wide school/community-based substance abuse prevention initiative in lowering substance use among adolescents. In particular, findings suggest that the three-pronged intervention contributed to decreases in the use of alcohol and tobacco as well as the reduction of marijuana rates to levels substantially below national use rates. Aside from successfully reducing substance use, the school district and community have succeeded in sustaining the intervention for well over a decade – a feat not accomplished by many communities.

Despite their many successes, evidence of a substitution effect was revealed by the current study warranting recommendations for improving upon the intervention. In this school district, the health education component offered to students in grades ten and above consisted only of sporadic awareness assemblies and displays. It is recommended that the Midwestern suburban school district combine efforts to limit access to and increase perceptions of harm associated with alcohol among older adolescents by implementing an accompanying evidence-based ATOD use prevention program addressing the underlying risk and protective factors for adolescent ATOD use (e.g., curricula based on social and emotional learning skills development) designed for older adolescents. In particular, the school district should identify a prevention program from the Center for Substance Abuse Prevention's (CSAP) National Registry of Effective Programs and Practices (NREPP) that has been shown to effectively reduce drug use among older adolescents. This program should be required for high school students beyond the ninth grade. For example, Project Toward No Drug Abuse (TND) is a

program designed for high school youth aged 14-19. Project TND focuses on decreasing risk factors within the individual as well as increasing protective factors within the individual, school, and family through development of decision-making, interpersonal, and self-control skills. The prevention strategy should be supplemented with a program aimed at older adolescents at higher risk for substance use and related problems. Also listed on NREPP, Project SUCCESS (Schools Using Coordinated Community Efforts to Strengthen Students) is designed for higher-risk high school youth aged 14-18. Project SUCCESS focuses on decreasing risk factors and increasing protective factors within the individual, school, and family through the development of stress/anger management, problem-solving, and refusal skills development. Providing these types of required health education components designed for older adolescents would assure the delivery of evidence-based health education curricula throughout the high school years that are tailored to the cognitive development of the students.

### *Summary*

Analysis of the data included an examination of participant demographics, characteristics of variables in the model, access logistic regression analyses, and harm logistic regression analyses followed by a discussion of the findings. An overview of the participant demographics revealed that the majority of the 11,542 participants were white students that lived in a two parent household and participated in some sort of extracurricular activity. Examination of the variables in the model revealed that all predictors were intercorrelated and correlated with the outcome variables. Overall, results of the access logistic regression analyses revealed that (1) across all grades, those participants who indicated no alcohol use were more likely to report past month and

lifetime marijuana use and (2) among older students, perceived access to marijuana played a role in past month and lifetime marijuana use only when perceived access to alcohol was limited. Overall, results of the harm logistic regression analyses revealed that (1) across all grades, those participants who indicated no alcohol use were more likely to report past month and lifetime marijuana use and (2) perceived harm associated with marijuana played a role in lifetime marijuana use only when perceptions of harm associated with alcohol were low. Recommendations for improving this successful intervention include delivery of evidence-based health education curricula tailored to the cognitive development of the students.

## Chapter 5

### SUMMARY, FINDINGS, CONCLUSIONS, IMPLEMENTATIONS, AND RECOMMENDATIONS

The purpose of the study was to investigate the role of perceived access to alcohol and marijuana and perceived harm associated with alcohol and marijuana use in marijuana use among youth. Included in this study was an attempt to identify aspects of an overall effective district-wide prevention intervention that may have unintentionally contributed to increased use of marijuana.

Participants consisted of 11,542 eighth through twelfth grade students in a Midwestern suburban school district. Participants completed a survey in the spring of 1998, 2000, and 2003 assessing demographics, drug use behaviors, and risk and protective factors. Using SPSS, data were separated by grade level and analyzed using two sets of 10 logistic regression analyses. The first set of analyses investigated the role of alcohol use and access to alcohol and marijuana in past month and lifetime marijuana use. The second set of analyses investigated the role of alcohol use and perceptions of harm associated with alcohol and marijuana use in past month and lifetime marijuana use.

#### *Findings*

The analysis of the data revealed the following significant findings:

1. Past month alcohol use, perceived access to alcohol, perceived access to marijuana, and perceived access to alcohol x perceived access to marijuana accounted for variance in group membership in each outcome variable (past month and lifetime marijuana use or non-use).

2. The use of alcohol in the past month was the only variable that reached significance across each model (perceived access and harm) and grade level.
3. Perceived access to marijuana and alcohol reached significance among individuals in most lower grade levels.
4. The interaction of perceived access to alcohol by perceived access to marijuana accounted for variance in group membership in each outcome variable among individuals in most higher grade levels.
5. Past month alcohol use, perceived harm associated with marijuana use, and perceived harm of alcohol x perceived harm of marijuana accounted for variance in group membership in each outcome variable (past month and lifetime marijuana use or non-use).
6. Perceptions of harm associated with marijuana use accounted for variance in group membership in each past month marijuana use among individuals in most grade levels.
7. The interaction of perceived harm of alcohol by perceived harm of marijuana accounted for variance in group membership in lifetime marijuana use among individuals in most grade levels.

### *Conclusions*

Within the limitations of the study the following conclusions are warranted:

1. The use of alcohol in the past month decreased the likelihood of using marijuana in the past month as well as in one's lifetime.

2. Access to alcohol or marijuana played a greater role in marijuana use among younger adolescents, whereas the interaction between access to alcohol and marijuana was more important among older adolescents.

3. Perceptions of harm associated with alcohol use did not play a role in past month marijuana use.

4. Perceptions of harm associated with marijuana use played a greater role in past month marijuana use.

5. The interaction between perceived harm of alcohol and marijuana was more important in lifetime marijuana use, such that perceptions of harm associated with marijuana use was related to decreased likelihood of lifetime marijuana use when perceptions of harm associated with alcohol were low.

### *Implementations*

The findings of the study may be implemented into either a professional practice situation or a research setting in the following ways:

1. Different prevention strategies must be delivered to younger and older adolescents that are tailored to the cognitive development of each group.

2. Efforts to limit access to and increase perceptions of harm associated with alcohol should also include an accompanying evidence-based ATOD use prevention component that addresses the underlying risk and protective factors for adolescent ATOD use (e.g., curricula based on social and emotional learning skills development) particularly among older adolescents.

3. The prevention strategy should be supplemented with a program aimed at older adolescents at higher risk for substance use and related problems.

*Recommendations for Further Study*

The following recommendations are made for further research in the area of adolescent substance use prevention:

1. Validation of the survey instrument should be completed.
2. The current study should be replicated using a survey assessing perceptions of access and harm from each participant so that access and harm may be included in a single model.
3. A study should be conducted using an experimental design to determine cause and effect between perceptions of access and harm and substitution of marijuana for alcohol.
4. Additional studies should be conducted to determine other cognitive variables that may play a role in substitution.
5. This study should be replicated in other communities identified as exhibiting a substitution effect to increase generalization of findings beyond this Midwestern suburban school district.
6. Secondary analyses of existing data sets (e.g., Youth Risk Behavior Surveillance System, Monitoring the Future Project) should be conducted to further investigate substitution effects.

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APPENDIX A

STUDENT SURVEY FORM A

**A****Student Survey****Demographics**

Sex: Male = M, Female = F

Grade: 8, 9, 10, 11, or 12

A. Form:

0 = Form A

1 = Form B

B. School:

0 = Athens

1 = Troy High

2 = Niles Community High School

3 = Baker

4 = Boulan

5 = Larson

6 = Smith

C. With whom do you live?

0 = Both parents

1 = Mother only

2 = Father only

3 = Mother and stepfather

4 = Father and stepmother

5 = Other relative or guardian

D. How would you describe yourself?

0 = American Indian

1 = Black or African-American

2 = Hispanic or Chicano

3 = Oriental or Asian American

4 = Arabic or Chaldean

5 = White or Caucasian

6 = Asian Indian or Pakistani

7 = Other

- E. What is the highest level of schooling completed by your father?
- 0 = Some high school or less
  - 1 = High school graduate
  - 2 = Some college or vocational training
  - 3 = College graduate
  - 4 = More than 4 years of college
  - 5 = Don't know or does not apply
- F. What is the highest level of schooling completed by your mother?
- 0 = Some high school or less
  - 1 = High school graduate
  - 2 = Some college or vocational training
  - 3 = College graduate
  - 4 = More than 4 years of college
  - 5 = Don't know or does not apply
- G. What are your grades in school?
- 0 = Mostly A's
  - 1 = Mostly B's
  - 2 = Mostly C's
  - 3 = Mostly D's
  - 4 = Mostly E's
- H. During the last 4 weeks, how many days of school have you missed because you skipped or cut?
- 0 = None
  - 1 = 1 day
  - 2 = 2 days
  - 3 = 3 to 5 days
  - 4 = 6 or more days
- I. In an average week, how many hours do you spend doing homework?
- 0 = 0 hours
  - 1 = 1-2 hours
  - 2 = 3-5 hours
  - 3 = 6-10 hours
  - 4 = 11 hours or more
- J. About how much spending money do you have per week - either as allowance or earned?
- 0 = Less than \$10 per week
  - 1 = Between \$10 and \$25 per week
  - 2 = Between \$26 and \$40 per week
  - 3 = Between \$41 and \$60 per week
  - 4 = More than \$60

**For K through O: During the average week how many hours do you spend on:**

K. Band, choir, orchestra or practicing voice or an instrument.

- 0 = 0 hours
- 1 = 1-2 hours
- 2 = 3-5 hours
- 3 = 6-10 hours
- 4 = 11 hours or more

L. Playing sports on a school team.

- 0 = 0 hours
- 1 = 1-2 hours
- 2 = 3-5 hours
- 3 = 6-10 hours
- 4 = 11 hours or more

M. Participating in school clubs and organizations other than sports.

- 0 = 0 hours
- 1 = 1-2 hours
- 2 = 3-5 hours
- 3 = 6-10 hours
- 4 = 11 hours or more

N. Participating in clubs, etc. outside of school.

- 0 = 0 hours
- 1 = 1-2 hours
- 2 = 3-5 hours
- 3 = 6-10 hours
- 4 = 11 hours or more

O. Attending services, groups or programs at a church, mosque or synagogue.

- 0 = 0 hours
- 1 = 1-2 hours
- 2 = 3-5 hours
- 3 = 6-10 hours
- 4 = 11 hours or more

**How much do you think people who do these things risk harming themselves (physically or in other ways):**

(Mark one circle for each.)

	No Risk	Slight Risk	Moderate Risk	Great Risk	Can't Say Drug Unfamiliar
1. Smoke one or more packs of cigarettes per day.	A	B	C	D	E
2. Use smokeless tobacco					

	regularly (chewing tobacco, snuff, plug, dipping tobacco).	A	B	C	D	E
3.	Try marijuana once or twice.	A	B	C	D	E
4.	Smoke marijuana occasionally.	A	B	C	D	E
5.	Smoke marijuana regularly.	A	B	C	D	E
6.	Try LSD (“acid”) once or twice.	A	B	C	D	E
7.	Take LSD regularly.	A	B	C	D	E
8.	Try heroin once or twice.	A	B	C	D	E
9.	Try amphetamines (uppers, pep pills, bennies, speed) once or twice.	A	B	C	D	E
10.	Take amphetamines regularly.	A	B	C	D	E
11.	Try cocaine in powder form once or twice.	A	B	C	D	E
		No Risk	Slight Risk	Moderate Risk	Great Risk	Can’t Say Drug Unfamiliar
12.	Take cocaine powder occasionally.	A	B	C	D	E
13.	Take cocaine powder regularly.	A	B	C	D	E
14.	Try “crack” cocaine once or twice.	A	B	C	D	E
15.	Take “crack” cocaine occasionally.	A	B	C	D	E
16.	Take “crack” cocaine regularly.	A	B	C	D	E
17.	Take one or two drinks of an alcoholic beverage (beer, wine, liquor) nearly every day.	A	B	C	D	E

18. Take four or five drinks nearly every day.                    A            B            C            D            E
19. Have five or more drinks once or twice each weekend.                    A            B            C            D            E
20. Take steroids to increase athletic performance or muscle development.                    A            B            C            D            E
21. **Have you ever smoked cigarettes?**  
A) Never  
B) Once or twice  
C) Occasionally but not regularly  
D) Regularly in the past  
E) Regularly now
22. **How often have you smoked cigarettes during the past 30 days?**  
A) Not at all  
B) Less than one cigarette per day  
C) One to five cigarettes per day  
D) About one-half pack per day  
E) About one pack per day  
F) About one and one-half packs per day  
G) Two packs or more per day
23. **Have you ever taken or used smokeless tobacco (chewing tobacco, snuff, plug, dipping tobacco)?**  
A) Never  
B) Once or twice  
C) Occasionally but not regularly  
D) Regularly in the past  
E) Regularly now
24. **How often have you taken smokeless tobacco during the past 30 days?**  
A) Not at all  
B) Once or twice  
C) Once or twice per week  
D) Three to five times per week  
E) About once a day  
F) More than once a day

**On how many occasions have you had alcoholic beverages to drink...(more than just a few sips)?**

(Mark one circle for each line.)

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
25. ...in your lifetime?	A	B	C	D	E	F	G
26. ...during the last 12 months?	A	B	C	D	E	F	G
27. ...during the past 30 days?	A	B	C	D	E	F	G

**28. On occasions that you drink alcoholic beverages, how often do you drink enough to feel pretty high?**

- A) On none of the occasions
- B) On few of the occasions
- C) On about half of the occasions
- D) On most of the occasions
- E) On nearly all of the occasions

**29. Think back over the LAST TWO WEEKS. How many times have you had five or more drinks in a row? (A "drink" is a glass of wine, a bottle of beer, a wine cooler, a shot glass of liquor, or a mixed drink.)**

- A) None
- B) Once
- C) Twice
- D) Three to five times
- E) Six to nine times
- F) Ten or more times

**On how many occasions (if any) have you used marijuana (grass, pot) or hashish (hash, hash oil)...**

(Mark one circle for each line.)

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
30. ...in your lifetime?	A	B	C	D	E	F	G
31. ...during the last 12 months?	A	B	C	D	E	F	G
32. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you used LSD (“acid”)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
33. ...in your lifetime?	A	B	C	D	E	F	G
34. ...during the last 12 months?	A	B	C	D	E	F	G
35. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you used psychedelics other than LSD (like PCP, mescaline, peyote, psilocybin)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
36. ...in your lifetime?	A	B	C	D	E	F	G
37. ...during the last 12 months?	A	B	C	D	E	F	G
38. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken “crack” cocaine (cocaine in chunk or rock form)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
39. ...in your lifetime?	A	B	C	D	E	F	G
40. ...during the last 12 months?	A	B	C	D	E	F	G
41. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken cocaine in any other form...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
42. ...in your lifetime?	A	B	C	D	E	F	G
43. ...during the last 12 months?	A	B	C	D	E	F	G
44. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken amphetamines on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
45. ...in your lifetime?	A	B	C	D	E	F	G
46. ...during the last 12 months?	A	B	C	D	E	F	G
47. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken barbiturates (downers, reds, yellows, etc.) on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
48. ...in your lifetime?	A	B	C	D	E	F	G
49. ...during the last 12 months?	A	B	C	D	E	F	G
50. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken tranquilizers on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
51. ...in your lifetime?	A	B	C	D	E	F	G
52. ...during the last 12 months?	A	B	C	D	E	F	G
53. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you used heroine (smack, horse, skag)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
54. ...in your lifetime?	A	B	C	D	E	F	G
55. ...during the last 12 months?	A	B	C	D	E	F	G
56. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken narcotics other than heroin on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
57. ...in your lifetime?	A	B	C	D	E	F	G
58. ...during the last 12 months?	A	B	C	D	E	F	G
59. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you sniffed glue, or breathed the contents of aerosol spray cans, or inhaled other gases or sprays in order to get high...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
60. ...in your lifetime?	A	B	C	D	E	F	G
61. ...during the last 12 months?	A	B	C	D	E	F	G
62. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken steroids, on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
63. ...in your lifetime?	A	B	C	D	E	F	G
64. ...during the last 12 months?	A	B	C	D	E	F	G
65. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken any of these drugs (like heroin, cocaine, amphetamines or steroids) by injection with a needle...(Do not include anything you took under a doctor's orders.)**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
66. ...in your lifetime?	A	B	C	D	E	F	G

67. ...during the last 12 months? A B C D E F G

68. ...during the past 30 days? A B C D E F G

**In what grade did you FIRST do each (if any) of the following things? Don't count anything you took because a doctor told you to: and mark "never" if you have never done it.**

(Mark one circle for each line.)

	Never	Gr 5 or Below	Gr 6	Gr 7	Gr 8	Gr 9	Gr 10	Gr 11	Gr 12
69. Smoke your first cigarette.	A	B	C	D	E	F	G	H	I
70. Smoke cigarettes on a daily basis.	A	B	C	D	E	F	G	H	I
71. Try smokeless tobacco (snuff, plug or chewing tobacco).	A	B	C	D	E	F	G	H	I
72. Try an alcoholic beverage more than just a few sips.	A	B	C	D	E	F	G	H	I
73. Drink enough to feel drunk or very high.	A	B	C	D	E	F	G	H	I
74. Try marijuana or hashish.	A	B	C	D	E	F	G	H	I
75. Try LSD.	A	B	C	D	E	F	G	H	I

	Never	Gr 5 or Below	Gr 6	Gr 7	Gr 8	Gr 9	Gr 10	Gr 11	Gr 12
76. Try any psychedelic other than LSD.	A	B	C	D	E	F	G	H	I
77. Try amphetamines.	A	B	C	D	E	F	G	H	I
78. Try barbiturates.	A	B	C	D	E	F	G	H	I
79. Try tranquilizers.	A	B	C	D	E	F	G	H	I
80. Try "crack" cocaine.	A	B	C	D	E	F	G	H	I
81. Try any other form of cocaine.	A	B	C	D	E	F	G	H	I

82. Try heroin.	A	B	C	D	E	F	G	H	I
83. Try any narcotic other than heroin.	A	B	C	D	E	F	G	H	I
84. Try inhalants (sniff glue, aerosols, etc.)	A	B	C	D	E	F	G	H	I
85. Try steroids.	A	B	C	D	E	F	G	H	I
86. Try injecting some drug with a needle (without a doctor's orders).	A	B	C	D	E	F	G	H	I

**How do you think your CLOSE FRIENDS feel (or would feel) about YOU doing each of the following things?**

	Approve	Disapprove	Strongly Disapprove
87. Smoking one or more packs of cigarettes per day.	A	B	C
88. Trying marijuana once or twice.	A	B	C
89. Smoking marijuana occasionally.	A	B	C
90. Smoking marijuana regularly.	A	B	C
91. Trying LSD once or twice.	A	B	C
92. Trying an amphetamine (upper, pep pill, bennie, speed) without a doctor's orders once or twice.	A	B	C
93. Trying "crack" cocaine once or twice.	A	B	C
	Approve	Disapprove	Strongly Disapprove
94. Trying "crack" cocaine occasionally.	A	B	C
95. Trying cocaine powder			

- |      |                                                        |   |   |   |
|------|--------------------------------------------------------|---|---|---|
|      | once or twice.                                         | A | B | C |
| 96.  | Taking cocaine powder occasionally.                    | A | B | C |
| 97.  | Taking one or two drinks nearly every day.             | A | B | C |
| 98.  | Taking four or five drinks nearly every day.           | A | B | C |
| 99.  | Having five or more drinks once or twice each weekend. | A | B | C |
| 100. | Using smokeless tobacco regularly.                     | A | B | C |
| 101. | Taking steroids.                                       | A | B | C |

**If you ever found yourself “hooked” on drugs, or otherwise needed help related to your drug or alcohol use, would you be likely to turn to any of the following sources for help?**

(Mark one circle for each line.)

- |                                                                                             | No                 | Maybe | Yes |
|---------------------------------------------------------------------------------------------|--------------------|-------|-----|
| 102. Members of your family.                                                                | A                  | B     | C   |
| 103. Friends.                                                                               | A                  | B     | C   |
| 104. A teacher.                                                                             | A                  | B     | C   |
| 105. A school counselor.                                                                    | A                  | B     | C   |
| 106. A doctor.                                                                              | A                  | B     | C   |
| 107. A drug clinic.                                                                         | A                  | B     | C   |
| 108. A minister, priest, or rabbi.                                                          | A                  | B     | C   |
| 109. <b>How frequently have your parents spoken with you about alcohol and other drugs?</b> |                    |       |     |
|                                                                                             | A) Very frequently |       |     |
|                                                                                             | B) Frequently      |       |     |
|                                                                                             | C) Occasionally    |       |     |
|                                                                                             | D) Seldom          |       |     |
|                                                                                             | E) Never           |       |     |

110. **How well do you understand what your parents expect of you?**  
A) Very well  
B) Fairly well  
C) Fairly poorly  
D) Very poorly
111. **How important are your parents' expectations when you are deciding what activities you will spend your time with?**  
A) Very important  
B) Somewhat important  
C) Slightly important  
D) Not at all important
112. **If a parent caught you using alcohol without their permission, how likely would it be that you were punished?**  
A) Very likely  
B) Likely  
C) Not sure  
D) Unlikely  
E) Very unlikely
113. **If a parent caught you using an illegal drug, how likely would it be that you were punished?**  
A) Very likely  
B) Likely  
C) Not sure  
D) Unlikely  
E) Very unlikely
114. **Would you say that the information about drugs that you received in school classes or programs has...**  
A) Made you less interested in trying drugs.  
B) Not changed your interest in trying drugs.  
C) Made you more interested in trying drugs.
115. **How many of the following drug education experiences have you had in school?**  
(Mark all that apply.)  
A) A special course just about drugs.  
B) A part of a health course.  
C) Films, lectures, or discussions in one of my other regular courses.  
D) Films or lectures, outside of my regular courses.  
E) Special discussions ("rap" groups) about drugs.

116. **Overall, how valuable were these experiences to you?**
- A) Little or no value
  - B) Some value
  - C) Considerable value
  - D) Great value
117. **In the past 6 months, have you ever been a passenger in a car when you thought the driver was intoxicated or impaired by alcohol?**
- (A) Yes
  - (B) No
  - (C) Don't Know
118. **If yes, which of the following was most often the driver.** (Mark only one.)
- A) Parent
  - B) Other adult family member
  - C) Other adult - not a family member
  - D) Brother or sister
  - E) Friend

**Thank you for completing this survey.**

APPENDIX B

STUDENT SURVEY FORM B

**B****Student Survey****Demographics**

Sex: Male = M, Female = F

Grade: 8, 9, 10, 11, or 12

A. Form:

0 = Form A

1 = Form B

B. School:

0 = Athens

1 = Troy High

2 = Niles Community High School

3 = Baker

4 = Boulan

5 = Larson

6 = Smith

C. With whom do you live?

0 = Both parents

1 = Mother only

2 = Father only

3 = Mother and stepfather

4 = Father and stepmother

5 = Other relative or guardian

D. How would you describe yourself?

0 = American Indian

1 = Black or African-American

2 = Hispanic or Chicano

3 = Oriental or Asian American

4 = Arabic or Chaldean

5 = White or Caucasian

6 = Asian Indian or Pakistani

7 = Other

- E. What is the highest level of schooling completed by your father?  
0 = Some high school or less  
1 = High school graduate  
2 = Some college or vocational training  
3 = College graduate  
4 = More than 4 years of college  
5 = Don't know or does not apply
- F. What is the highest level of schooling completed by your mother?  
0 = Some high school or less  
1 = High school graduate  
2 = Some college or vocational training  
3 = College graduate  
4 = More than 4 years of college  
5 = Don't know or does not apply
- G. What are your grades in school?  
0 = Mostly A's  
1 = Mostly B's  
2 = Mostly C's  
3 = Mostly D's  
4 = Mostly E's
- H. During the last 4 weeks, how many days of school have you missed because you skipped or cut?  
0 = None  
1 = 1 day  
2 = 2 days  
3 = 3 to 5 days  
4 = 6 or more days
- I. In an average week, how many hours do you spend doing homework?  
0 = 0 hours  
1 = 1-2 hours  
2 = 3-5 hours  
3 = 6-10 hours  
4 = 11 hours or more
- J. About how much spending money do you have per week - either as allowance or earned?  
0 = Less than \$10 per week  
1 = Between \$10 and \$25 per week  
2 = Between \$26 and \$40 per week  
3 = Between \$41 and \$60 per week  
4 = More than \$60

**For K through O: During the average week how many hours do you spend on:**

K. Band, choir, orchestra or practicing voice or an instrument.

0 = 0 hours

1 = 1-2 hours

2 = 3-5 hours

3 = 6-10 hours

4 = 11 hours or more

L. Playing sports on a school team.

0 = 0 hours

1 = 1-2 hours

2 = 3-5 hours

3 = 6-10 hours

4 = 11 hours or more

M. Participating in school clubs and organizations other than sports.

0 = 0 hours

1 = 1-2 hours

2 = 3-5 hours

3 = 6-10 hours

4 = 11 hours or more

N. Participating in clubs, etc. outside of school.

0 = 0 hours

1 = 1-2 hours

2 = 3-5 hours

3 = 6-10 hours

4 = 11 hours or more

O. Attending services, groups or programs at a church, mosque or synagogue.

0 = 0 hours

1 = 1-2 hours

2 = 3-5 hours

3 = 6-10 hours

4 = 11 hours or more

**How difficult do you think it would be for you to get each of the following types of drugs, if you wanted some?**

(Mark one circle for each line.)

	Probably Impossible	Very Difficult	Fairly Difficult	Fairly Easy	Very Easy
1. Marijuana (pot, grass).	A	B	C	D	E
2. LSD ("acid").	A	B	C	D	E

- |                                                                          |                     |                |                  |             |           |
|--------------------------------------------------------------------------|---------------------|----------------|------------------|-------------|-----------|
| 3. Amphetamines (uppers, pep pills, bennies, speed).                     | A                   | B              | C                | D           | E         |
| 4. Barbiturates (downers, reds, yellows, etc.)                           | A                   | B              | C                | D           | E         |
| 5. Tranquilizers (like Valium).                                          | A                   | B              | C                | D           | E         |
| 6. "Crack" cocaine.                                                      | A                   | B              | C                | D           | E         |
| 7. Cocaine in powder form.                                               | A                   | B              | C                | D           | E         |
| 8. Heroin.                                                               | A                   | B              | C                | D           | E         |
| 9. Some other narcotic (methadone, opium, codeine, paregoric, etc.).     | A                   | B              | C                | D           | E         |
| 10. Steroids (anabolic steroids).                                        | A                   | B              | C                | D           | E         |
| 11. Alcoholic beverages (beer, wine or liquor).                          | A                   | B              | C                | D           | E         |
|                                                                          | Probably Impossible | Very Difficult | Fairly Difficult | Fairly Easy | Very Easy |
| 12. Cigarettes.                                                          | A                   | B              | C                | D           | E         |
| 13. <b>Have you ever smoked cigarettes?</b>                              |                     |                |                  |             |           |
| A) Never                                                                 |                     |                |                  |             |           |
| B) Once or twice                                                         |                     |                |                  |             |           |
| C) Occasionally but not regularly                                        |                     |                |                  |             |           |
| D) Regularly in the past                                                 |                     |                |                  |             |           |
| E) Regularly now                                                         |                     |                |                  |             |           |
| 14. <b>How often have you smoked cigarettes during the past 30 days?</b> |                     |                |                  |             |           |
| A) Not at all                                                            |                     |                |                  |             |           |
| B) Less than one cigarette per day                                       |                     |                |                  |             |           |
| C) One to five cigarettes per day                                        |                     |                |                  |             |           |
| D) About one-half pack per day                                           |                     |                |                  |             |           |
| E) About one pack per day                                                |                     |                |                  |             |           |
| F) About one and one-half packs per day                                  |                     |                |                  |             |           |
| G) Two packs or more per day                                             |                     |                |                  |             |           |

15. **Have you ever taken or used smokeless tobacco (chewing tobacco, snuff, plug, dipping tobacco)?**

- A) Never
- B) Once or twice
- C) Occasionally but not regularly
- D) Regularly in the past
- E) Regularly now

16. **How often have you taken smokeless tobacco during the past 30 days?**

- A) Not at all
- B) Once or twice
- C) Once or twice per week
- D) Three to five times per week
- E) About once a day
- F) More than once a day

**On how many occasions have you had alcoholic beverages to drink...(more than just a few sips)?**

(Mark one circle for each line.)

	0	1-2	3-5	6-9	10-19	20-39	40 or
	Occa.	Occa.	Occa.	Occa.	Occa.	Occa.	More
17. ...in your lifetime?	A	B	C	D	E	F	G
18. ...during the last 12 months?	A	B	C	D	E	F	G
19. ...during the past 30 days?	A	B	C	D	E	F	G

20. **On occasions that you drink alcoholic beverages, how often do you drink enough to feel pretty high?**

- A) On none of the occasions
- B) On few of the occasions
- C) On about half of the occasions
- D) On most of the occasions
- E) On nearly all of the occasions

21. **Think back over the LAST TWO WEEKS. How many times have you had five or more drinks in a row? (A "drink" is a glass of wine, a bottle of beer, a wine cooler, a shot glass of liquor, or a mixed drink.)**

- A) None
- B) Once
- C) Twice
- D) Three to five times
- E) Six to nine times
- F) Ten or more times

**On how many occasions (if any) have you used marijuana (grass, pot) or hashish (hash, hash oil)...**

(Mark one circle for each line.)

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
22. ...in your lifetime?	A	B	C	D	E	F	G
23. ...during the last 12 months?	A	B	C	D	E	F	G
24. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you used LSD (“acid”)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
25. ...in your lifetime?	A	B	C	D	E	F	G
26. ...during the last 12 months?	A	B	C	D	E	F	G
27. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you used psychedelics other than LSD (like PCP, mescaline, peyote, psilocybin)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
28. ...in your lifetime?	A	B	C	D	E	F	G
29. ...during the last 12 months?	A	B	C	D	E	F	G
30. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken “crack” cocaine (cocaine in chunk or rock form)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
31. ...in your lifetime?	A	B	C	D	E	F	G
32. ...during the last 12 months?	A	B	C	D	E	F	G
33. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken cocaine in any other form...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
34. ...in your lifetime?	A	B	C	D	E	F	G
35. ...during the last 12 months?	A	B	C	D	E	F	G
36. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken amphetamines on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
37. ...in your lifetime?	A	B	C	D	E	F	G
38. ...during the last 12 months?	A	B	C	D	E	F	G
39. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken barbiturates on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
40. ...in your lifetime?	A	B	C	D	E	F	G
41. ...during the last 12 months?	A	B	C	D	E	F	G
42. ...during the past 30 days?	A	B	C	D	E	F	G

**On how many occasions (if any) have you taken tranquilizers on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
43. ...in your lifetime?	A	B	C	D	E	F	G
44. ...during the last 12 months?	A	B	C	D	E	F	G

45. ...during the past 30 days? A B C D E F G

**On how many occasions (if any) have you used heroine (smack, horse, skag)...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
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46. ...in your lifetime? A B C D E F G

47. ...during the last 12 months? A B C D E F G

48. ...during the past 30 days? A B C D E F G

**On how many occasions (if any) have you taken narcotics other than heroin on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
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49. ...in your lifetime? A B C D E F G

50. ...during the last 12 months? A B C D E F G

51. ...during the past 30 days? A B C D E F G

**On how many occasions (if any) have you sniffed glue, or breathed the contents of aerosol spray cans, or inhaled other gases or sprays in order to get high...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
--	------------	--------------	--------------	--------------	----------------	----------------	---------------

52. ...in your lifetime? A B C D E F G

53. ...during the last 12 months? A B C D E F G

54. ...during the past 30 days? A B C D E F G

**On how many occasions (if any) have you taken steroids, on your own--that is, without a doctor telling you to take them...**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
--	------------	--------------	--------------	--------------	----------------	----------------	---------------

55. ...in your lifetime? A B C D E F G

56. ...during the last 12 months? A B C D E F G

57. ...during the past 30 days?    A      B      C      D      E      F      G

**On how many occasions (if any) have you taken any of these drugs (like heroin, cocaine, amphetamines or steroids) by injection with a needle...(Do not include anything you took under a doctor's orders.)**

	0 Occa.	1-2 Occa.	3-5 Occa.	6-9 Occa.	10-19 Occa.	20-39 Occa.	40 or More
58. ...in your lifetime?	A	B	C	D	E	F	G
59. ...during the last 12 months?	A	B	C	D	E	F	G
60. ...during the past 30 days?	A	B	C	D	E	F	G

**In what grade did you FIRST do each (if any) of the following things? Don't count anything you took because a doctor told you to: and mark "never" if you have never done it.**

(Mark one circle for each line.)

	Never	Gr 5 or Below	Gr 6	Gr 7	Gr 8	Gr 9	Gr 10	Gr 11	Gr 12
61. Smoke your first cigarette.	A	B	C	D	E	F	G	H	I
62. Smoke cigarettes on a daily basis.	A	B	C	D	E	F	G	H	I
63. Try smokeless tobacco (snuff, plug or chewing tobacco).	A	B	C	D	E	F	G	H	I
64. Try an alcoholic beverage more than just a few sips.	A	B	C	D	E	F	G	H	I
65. Drink enough to feel drunk or very high.	A	B	C	D	E	F	G	H	I
66. Try marijuana or hashish.	A	B	C	D	E	F	G	H	I
67. Try LSD.	A	B	C	D	E	F	G	H	I
68. Try any psychedelic other than LSD.	A	B	C	D	E	F	G	H	I
69. Try amphetamines.	A	B	C	D	E	F	G	H	I
70. Try barbiturates.	A	B	C	D	E	F	G	H	I

71. Try tranquilizers.	A	B	C	D	E	F	G	H	I
72. Try "crack" cocaine.	A	B	C	D	E	F	G	H	I
73. Try any other form of cocaine.	A	B	C	D	E	F	G	H	I
74. Try heroin.	A	B	C	D	E	F	G	H	I
	Never	Gr 5 or Below	Gr 6	Gr 7	Gr 8	Gr 9	Gr 10	Gr 11	Gr 12
75. Try any narcotic other than heroin.	A	B	C	D	E	F	G	H	I
76. Try inhalants (sniff glue, aerosols, etc.)	A	B	C	D	E	F	G	H	I
77. Try steroids.	A	B	C	D	E	F	G	H	I
78. Try injecting some drug with a needle (without a doctor's orders).	A	B	C	D	E	F	G	H	I

**Do you think that in the future you will ever...**

	Definitely Won't	Probably Won't	Probably Will	Definitely Will
79. ...smoke cigarettes?	A	B	C	D
80. ...drink alcoholic beverages?	A	B	C	D
81. ...try or use marijuana?	A	B	C	D
82. ...try or use cocaine?	A	B	C	D
83. ...try or use any other illegal drug?	A	B	C	D

**How much pressure do you feel from your friends and schoolmates to...**

	None	A Little	Some	A Lot
84. ...smoke cigarettes?	A	B	C	D
85. ...drink alcoholic beverages?	A	B	C	D
86. ...use marijuana?	A	B	C	D

87. ...use other illegal drugs?                    A                    B                    C                    D

**During the past 30 days, how often (if ever) have you used alcohol in each of the following places?**

	Not at All	1-2 Times	3-5 Times	6 or more Times
88. At your home.	A	B	C	D
89. At friends' houses.	A	B	C	D
90. At a school dance, a game, or other event.	A	B	C	D
91. At school during the day.	A	B	C	D
	Not at All	1-2 Times	3-5 Times	6 or more Times
92. Near school.	A	B	C	D
93. In a car.	A	B	C	D
94. At a party.	A	B	C	D
95. At work.	A	B	C	D

**During the past 30 days, how often (if ever) have you used marijuana or any other drugs (like cocaine, amphetamines, etc.) in each of the following places?**

	Not at All	1-2 Times	3-5 Times	6 or more Times
96. At your home.	A	B	C	D
97. At friends' houses.	A	B	C	D
98. At a school dance, a game, or other event.	A	B	C	D
99. At school during the day.	A	B	C	D
100. Near school.	A	B	C	D
101. In a car.	A	B	C	D
102. At a party.	A	B	C	D





## **Randi Jean Alter, PhD, MA, CHES**

### EDUCATION

Doctor of Philosophy, Health Behavior, Indiana University, Bloomington, IN, June 2006.

Master of Arts, Experimental Psychology, Wake Forest University, Winston-Salem, NC, May 2000.

Bachelor of Arts, Major in Psychology and Spanish, Butler University, Indianapolis, IN, May 1998.

### PROFESSIONAL EXPERIENCE

September 2000 – Present

Research Associate and Evaluation Specialist, Indiana Prevention Resource Center, Bloomington, IN

- Provided complete evaluation services and technical assistance for after-school drug prevention programs funded through the Division of Mental Health & Addiction.
- Served as the Evaluation Specialist via a 50%FTE graduate assistantship from September 2003 to July 2005.

August 2001 – December 2002

Adjunct Instructor, Indiana University Purdue University, Columbus, IN

- Instructed an introductory psychology course focusing on biological influences on behavior.

August 1998 – May 2000

Teaching Assistant, Wake Forest University, Winston-Salem, NC

- Instructed a laboratory section of the undergraduate research methods and statistics course sequence. Course content included survey design, correlational and experimental research methods, design, and analyses.

### PEER-REVIEWED PUBLICATIONS

Alter, R.J., & Seta, C.E. (2005). Compensation for inconsistencies: The effects of stereotype strength on expectations of applicants' job success and satisfaction. *Sex Roles, 53*(1-2), 79-87.

Alter, R.J., & Lohrmann, D.K. (2005). Building support for coordinated school health programs. *The Health Educator, 37*(1), 3-7.

Lohrmann, D.K., Alter, R.J., Greene, R., & Younoszai, T.M. (2005). Long-term impact of a district-wide school/community-based substance abuse prevention initiative on gateway drug use. *Journal of Drug Education, 35*(3), 233-253.

Alter, R.J., & Lohrmann, D.K. (Submitted). Social and emotional learning: The key to healthy and successful students. *American Journal of Health Education*.

Alter, R.J., Jun, M.K., & Jones-McKyer, E.L. (Submitted). Impact of ATOD prevention programming in the non-school-hours on adolescent substance use. *Journal of Primary Prevention*.

Alter, R.J., & Umscheid, D. (Submitted). Pathological gambling: The utility of substance addiction theories to activity addiction. *Journal of Gambling Studies*.

#### RESEARCH CONFERENCE PRESENTATIONS

Alter, R.J., Jun, M.K., & Torabi, M.R. (2005). *Involvement in prosocial activities and gateway drug use among youth*. Poster Presentation at the annual meeting of the American Public Health Association, Philadelphia, PA.

Alter, R.J., Lohrmann, D.K., & Greene, R. (2005). *Effect of changing perceptions of risk associated with alcohol use on marijuana use among youth and adolescents*. Oral Presentation at the annual meeting of the American School Health Association, Burbank, CA.

Alter, R.J., Goetze, D.D., & Kelley, J.E. (2005). *Smoking bans and the increased use of smokeless tobacco products: An unintentional effect*. Poster Presentation at the annual meeting of the Indiana Public Health Association, Bloomington, IN.

Arvin, C., Stednitz, B., Geary, C., & Alter, R.J. (2005). *Physical activity adherence in college students*. National Intramural-Recreational Sports Association, Orlando, FL.

Jun, M.K., & Alter, R.J. (2005). *Effects of drug abuse prevention programming on gateway drug use among adolescents*. Poster presentation at the annual Women in Science Research Day, Indiana University-Bloomington.

Alter, R.J., Jun, M.K., & Jones-McKyer, E.L. (2004). *Impact of youth participation in ATOD prevention programming: An evaluation of ATOD prevention in Indiana*. Poster Presentation at the annual meeting of the American Public Health Association, Washington, DC.

Alter, R.J., Jun, M.K., & Jones-McKyer, E.L. (2004). *The effect of a state-wide after-school prevention program on ATOD use in Indiana*. Poster Presentation at the annual meeting of the Indiana Public Health Association, West Lafayette, IN.

Alter, R.J., & Flannagan, J.M. (1998). *The effects of arousal on memory for first kiss*. Poster Presentation at the annual meeting of the American Psychological Society, Washington, D.C.

## HONORS AND DISTINCTIONS

Delbert Oberteuffer Scholar, American Association for Health Education, 2005.

Educational Opportunity Fellow, Indiana University Graduate School, 2005.

Updyke/President's Challenge Fellow, Indiana University, School of Health, Physical Education and Recreation, 2003-2005.

School of Health, Physical Education, and Recreation Fellowship, Indiana University, 2005.

HPER Alumni Board Scholar, Indiana University, School of Health, Physical Education and Recreation, 2003-2004.

School of HPER Travel Grant-in-Aid Recipient, 2005.

Women in Science Program Travel Grant Recipient, 2005.

Graduate Student and Professional Student Organization Travel Grant Recipient, 2004.

Excellence in Psychology Award Recipient, Butler University, Psychology Department, 1998.

Who's Who Among American Universities and Colleges, 1997.

Holcomb Research Institute Student Thesis Grant, Butler University, 1997.

Butler University Academic Scholarship Recipient, Butler University, 1994-1998.

Butler University School of Liberal Arts and Sciences Scholarship Recipient, Butler University, 1994 -1998.

## MEMBERSHIPS AND CERTIFICATIONS

American Public Health Association Student Member, 2004 – present.

American School Health Association Student Member, 2004 – present.

American Alliance for Health, Physical Education, Recreation and Dance, 2004 – present.

Certified Health Education Specialist, National Commission for Health Education Credentialing, Inc.

Certified Prevention Professional, Indiana Association of Prevention Professionals.