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Substance Use Among 7th - 9th Grade Adolescents: The Role Of Risk- Related Variables In The Probability Of Use Involving Tobacco, Alcohol And Marijuana

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SUBSTANCE USE AMONG 7TH – 9TH GRADE ADOLESCENTS: THE ROLE OF RISK-RELATED VARIABLES IN THE PROBABILITY OF USE INVOLVING TOBACCO, ALCOHOL AND MARIJUANA

Doctoral Program in Educational Leadership and Foundations

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Dedication

This dissertation is dedicated to my son, Jonathan Gregory, who gave me strength, courage and love to carry-on and persevere to the end.

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by

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Abstract

The role of schools in preventing *substance use* among adolescents is a priority for public health advocates across the United States. In recent years the United States has seen an increase in prescription medication overdoses in adults and adolescents. A lack of research exists of adolescents in middle school substance use (Welsh, & Rappaport, 2018). Trends of adolescent substance use of tobacco, alcohol and marijuana continue to rise. Early onset use of legal and illegal substances has proven to increase the odds of long-term use of adolescence into adulthood. Parents, educators, community advocates and law enforcement have long tackled the issue of substance misuse on school campuses, with little to no success, with national campaigns such as the Drug Abuse Resistance Education Program (D.A.R.E.), and the "Just Say No" campaign, failing in their overall efforts (Ennett, Tobler, Ringwalt & Flewelling, 1994; Lynam, Milich, Zimmerman, Novak, Logan, Martin, Leukefeld, Clayton, 1999; Werb, 2018). Moreover, researchers (Hawkins, Jenson, Catalano, Fraser, Botvin, Shapiro & Rotheram-Borus, 2016) have found that in regulating substance use behavior, schools favor incorporating punishment and consequence over access to prevention services that include promoting positive behaviors.

This study examined reports of substance use among 7^{th} - 9^{th} grade adolescents, and the influence of "close-friend" substance use, access to legal and illegal substances, and school environment as risk-related factors of use. This research utilized the Texas State School Survey collected by the Texas Department of State Health Services (DSHS) and by the Institute at Texas A&M University. Participants were 7^{th} - 9^{th} graders (n = 27,035) from middle schools across the state of Texas, including El Paso, Texas, and are drawn from a larger study (N = 49,070). It was hypothesized that the relationship of "close-friend" influence of substance use, access of tobacco,

alcohol or marijuana, and school environment would be associated with higher frequencies in the use of legal and illegal substances among 7^{th} – 9^{th} grade adolescents.

A predictive research design using logistic regression analysis, along with descriptive statistics were used as the primary analysis of substance use among 7^{th} – 9^{th} grade adolescents (11-16 years of age). Results from the analysis showed responses to "close-friend" influence is a likely motivator for use, and while a large percentage of middle school adolescents are not using tobacco, alcohol and marijuana, there appears to be an interactional relationship that occurs at this transitional period for adolescents. Students whose "close-friends" were using tobacco, alcohol or marijuana had odds that were significantly greater than those students who did not have substance using friends. The likelihood of marijuana substance use was also found to be significantly higher than tobacco and alcohol use. This may mean that while students who have not been exposed to either tobacco, alcohol or marijuana within their home environment, will most likely be exposed at some level in their school environment. Findings also suggest that an adolescent's impression on a safe school environment, may have implications for prevention efforts on middle school campuses.

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Chapter 1

Introduction

Background and Significance

Drug use epidemics have become a fixture of life in the United States. Adolescent substance use is found to occur primarily during middle school years (Otten, Mun, Shaw, Wilson, & Dishion, 2019), largely due to accessibility. The prevalence of tobacco, alcohol and marijuana use differs across a student's lifetime. A student embedded in a school context affects their exposure to substances. Studies have suggested that school contexts may moderate relationships between risk or protective factors and health behavior outcomes (Yeager, Dahl &Dweck, 2018; Wilson, 2004). Much of the research on drug use is focused on older adolescents and young adults (16 - 25 years of age), and the likelihood of substance use may be occurring much sooner in 7th through 9th grades (Arrazola, Singh, Corey, Husten, Neff, Apelber, & McAfee, 2015). School officials and educators are in a unique position to detect, identify, and prevent adolescent substance use. While prevention and intervention efforts do exist on varying levels on school campuses, the incidences of adolescent substance use persist, and remains problematic for school officials.

According to Cambron, Kosterman, Catalano, Guttmannova & Hawkins (2018), most initial experiences with tobacco, alcohol and other drugs occur during the middle school grades. Mitchell, Gryczynski, O'Grady, & Schwartz, (2013) highlight the relevance in screening younger adolescents in middle school grades, due to research that correlates to a higher risk of abuse during late adolescence and young adulthood. Additionally, Guyll, Madon, Spoth and Lannin (2014) have found initiation of substance use at ages younger than 16 years old have personal and social difficulties, and in some respect differ from those that initiate substance use later in

life. Researchers have also found that for a great majority who commence substance use during adolescence, the possibility of increased use is doubled in adulthood (National Institute of Health, 2019).

Substance use among adolescents can take many forms, such as with tobacco, alcohol and marijuana, with an increased likelihood of regular substance use in late adolescence (National Institute of Health, 2019). For this study, the term *substance use* will refer to tobacco, alcohol, and marijuana, as they are the most common at this age group (11 – 16 years of age). The problems associated with increasing use of legal and illegal substances have grown at an exponential rate, and some experts have described adolescents' use of particular substances at an epidemic status (Levy, Campbell, Shea & DuPont, 2018). The National Institute on Drug Abuse (2018) survey found one in seventeen 12th graders smoked marijuana on a daily basis, 30% of 12th graders reported drinking an alcoholic beverage in a 30-day period, and 23% of 8th graders reported low perception of risk of regular electronic cigarette use, suggesting that many adolescents consider electronic cigarettes as not containing nicotine. Problematic for school officials, as electronic cigarettes use has become an epidemic among some groups of adolescents (Sumner, & Farsalinos, 2018).

Substance use in the lives of adolescents is usually portrayed as students huddled in a corner on a playground, the view of odorless vapors coming from bathroom stalls (electronic cigarettes), or house parties off campus (alcohol consumption). Participating in social activities is expected during school hours. Associated factors of use for adolescents in this age group may lie in their ability to easily access legal and illegal substances originating on school grounds, or from their "close-friend" substance use and the willingness to engage in risky behaviors. Negative association of substance use have led to greater concern for the health and well-being of

adolescents. Within the last five years, tobacco use has decreased among some adolescent age groups, but the new marketed electronic cigarettes have led to an increased use of certain tobacco products. Vaping products have taken over the tobacco market, such as the JUUL, marketed and tailored specifically for use by adolescences (Huang, Duan, Kwok, Binns, Vera, Kim, Szczypka & Emory, 2019; Wigmore, 2018).

The JUUL is one of many new electronic cigarettes (e-cigarettes) on the market. The Surgeon General of the United States Public Health Service issued an advisory on e-cigarette use among adolescents early in 2016. In the advisory, he mentions the aerosol dangers, the use of regular cigarettes into adulthood, and the increased of use by middle and high school students by 900% during the years 2011-2015 (Youth & U.S. Department of Health and Human Services, 2016). The facts and figures of increasing use among 7 - 12th graders have become problematic for school officials, with little to no prevention efforts among school districts (Texas Health and Human Services Commission, 2018).

Early research on adolescent substance use, highlighted by the work of Kandel (1975), focused on the phenomenon known as the *Gateway Theory*. The theory posited the assumption of initial substance use, leading to the use of a higher classes of drugs, such as tobacco to marijuana (Stone, Becker, Huber, Catalano, 2012). Unger, Soto & Leventhal (2016) in their study of electronic cigarette use among adolescents, found those who had smoked an electronic cigarette in the past 30 days, were twice as likely to have used marijuana in the same time frame, and more likely to transition to the use of cigarettes. Moreover, the age of onset for first use of any substance including tobacco, alcohol, or marijuana, if 16 years of age or younger, were found to move from substance use to abuse (Brownlie, Beitchman, Chaim, Wolfe, Rush, & Henderson, 2019). Additional research found the use of electronic cigarettes has increased

among youth between the ages of 10 - 24, and increased susceptibility for marijuana use over a 5-year period (Chadi, Schroeder, Jensen, & Levy, 2019). The meta-analysis on the "Association between Electronic Cigarette Use and Marijuana Use among Adolescents and Young Adults" by (Chadi, Schroeder, Jense, & Levy, 2019) also found the odds of marijuana use among youth were higher in adolescents 12 -17 years of age.

The use of substances such as tobacco, alcohol, marijuana and prescription medication may be viewed less harmful or not as dangerous when used responsibly by adults (Schuler, Tucker, Pedersen & D'Amico, 2019), but the increasing trends among adolescents is aggravated by their perceived risk of harm and biological developmental period during adolescence (Levy, 2018). The presence of these substances in general and within school settings, allows for increased harm to the student and those around them. An adolescent's future is at risk with consequences on schoolwork, lack of motivation, and the possibility of substance abuse occurring in later adolescence and or adulthood.

Much of the quantitative data on school substance abuse continues to be inaccessible or confusing to practitioners. A larger percentage of educational research is qualitative, so this study is unique in its quantitative nature. It is important to highlight the evidence found in the data collected from school surveys, as it will add to the abundance of qualitative educational research. The information derived from quantitative data analysis is a vital component to combatting substance use among adolescents, with the development of appropriate prevention strategies. This may be due in part to the copiousness of researchers having to rely on national and state survey data, with little to no accessible interpretation of that data for school and district level officials. Therefore, it is important to interpret the data on substance use to make it accessible to school and district officials.

The research that is quantitative is primarily focused on later adolescent use or young adulthood (high school – college). The importance of this study is to highlight the gap of research in middle school adolescents (7^{th} – 9^{th} grade) and their associated risk factors for substance use. Adolescent substance use prevalence is frequently analyzed and published by national governmental agencies, but less is known on how adolescents acquire drugs for use (Warren, Smalley & Barefoot, 2015). An adolescents' school environment and access to legal, and illegal substances are found to influence pre-mature onset substance use (Haas, Zamboanga, Bersamin & Hyke, 2018).

The analysis of the population (7^{th} - 9^{th} grade adolescents) comes from the Texas School Survey first administered in 1988, by The Texas Commission on Alcohol and Drug Abuse from a lottery of voluntary schools. The schools were public secondary schools in the State of Texas. In conjunction with Texas A & M University and the Public Policy Research Institute, the surveys are administered every 2 years with an average cluster sample of 130,000 students among 7^{th}-12^{th} graders. This study is using data from surveys, which were administered for the school year 2015 - 2016 with a sample population of 49,070 students. A subset of the larger population that includes only 7^{th} - 9^{th} grade students will be utilized for analysis (n = 27,035). The Public Policy Research Institute publishes the data collected 1 year after the surveys have been collected. As of the print of this study, the data for the 2016-2017 school year should be made available on their web page.

The seven-page survey questionnaire has remained consistent over time, asking about the use of substances that include tobacco (e-cigarettes, smokeless or chewing tobacco), alcohol, inhalants (11 types), marijuana, and other drugs such as cocaine, crack, hallucinogens, uppers, downers, steroids, ecstasy, Rohypnol, and heroin (Texas Health and Human Services

Commission, 2018). Questions in the survey also pertained to behavioral and demographic information, where they received their sources of information on drugs, who did they reach out to for help of substance-related problems, parental perceptions of peer values and attitudes, and how did they feel about their surroundings including neighbor and school environments. The anonymous survey was specifically designed to be administered confidentially with no identifiable information. A copy of the questionnaire survey instrument is included in the addendum of the study, and can also be accessed at https://www.texasschoolsurvey.org/Survey.

Purpose of the Study

This study will examine the probability of substance use (tobacco, alcohol, marijuana) with the proposed predictor variables factors of "close-friend" substance use, access and environment by 7^{th} - 9^{th} grade adolescents. The study will add to the body of knowledge and development of a model aimed at identifying adolescent risk-related factors of substance use. Through the analysis of the data from the Texas School Survey, this study will provide descriptors of the school environment, frequency of substance use by grade, "close-friend" use, and access of substances. By exploring the relationship, this study will identify gaps not currently reported in the literature. Because of the quantitative nature of the data, and the gap between such data and its practical application, this study also sets out to interpret, analyze and present the complex data in a more accessible way to assist districts and administrators.

By building this bridge from data to practice, educators will be able to access and understand the seriousness of drug prevalence on campus, the baseline characteristics of student substance use, and identify preventive tactics useful in the classroom environment for the formation of effective school policies.

The primary goal of this study is to obtain a greater understanding of the harms created from the use of tobacco, alcohol, or marijuana, by curious adolescents, particularly at earlier ages. Efforts must be made to understand what is the primary driver for middle school adolescents to use substances, and the accessibility of substances? As the school environment serves as an educational tool, the importance of pinpointing risk-related factors will help in determining positive policies, regulations, and prevention strategies to decrease and prevent substance use by adolescents. The social element of adolescent substance use is critical in shaping an adolescents behavior. This study will examine "close-friend" influence as a risk related behavior of substance use. The type of relationship an adolescent perceives as a "close-friend" differs from that of a peer (an authoritive figure) and will be examined in the analysis of the reported survey responses.

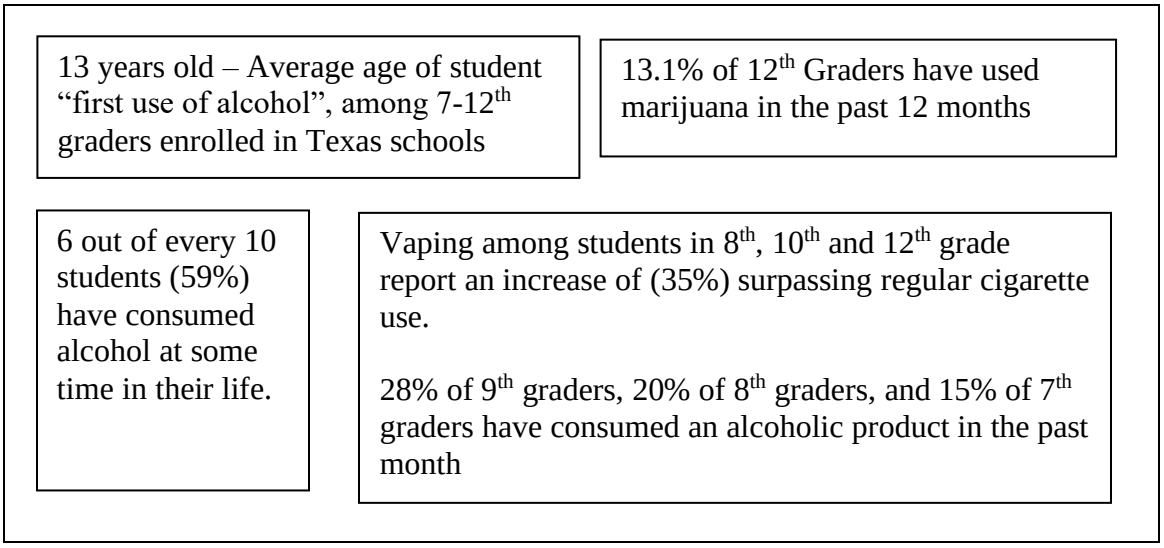
Substance use among Adolescents

Premature substance use among adolescents has been a public health concern for many decades (National Center on Addiction and Substance Abuse, 2011). The federal initiative Healthy People 2020 is focused on improving the health of all Americans over a ten-year period and includes content addressing adolescents:

- decreasing school absenteeism among adolescents due to illness or injury;
- reducing the proportion of adolescents who have been offered, sold, or given an illegal drug on school property;
- increase the proportion of persons who need alcohol and/or illicit drug treatment and received specialty treatment for abuse or dependence in the past year; and
- reduce the proportion of person engaging in binge drinking during the past month – adolescents aged 12-17 years (Healthy People 2020, 2018)

In the United States the economic toll of underage drinking is estimated at $249 billion per year (National Center for Chronic Disease, 2018) including medical costs, work loss, traffic accidents, legal and treatment costs; 72% of all adolescent deaths are caused by drinking while under the influence, suicide and violence (Baiden, Mengo, Boateng & Small, 2019). Adolescents are reported to have substantially increased their use of marijuana in the last five years, mainly due to lack of perception of harm, access and its legalization (Green, Musci, Johnson, Matson, Reboussin & Ialongo, 2016; Keyes, Wall, Cerda, Schulenberg, O'Malley, Galea, & Hasin, 2016; Maslowksy, Capell, Moberg & Brown, 2017; Montes, Witkiewitz, Pearson & Leventhal, 2019).

The Texas School Survey (2018), identifies areas of concern regarding substance use among adolescents. The data below in Figure 1 shows a significant increase in the use of tobacco vaping products and continued use of alcohol.



Public Policy Research Institute. (2018). Texas School Survey, Substance use of alcohol and tobacco, 2015-2016 Academic School Year.

Figure 1 Adolescent Substance Use, Texas School Survey, 2018

Factors of Substance use

Adolescence is a pathway of discovery and experimentation, and much of their developmental time is spent on school grounds (Wilson, 2004; Cohen, Pickeral, & McCloskey, 2009). This environment cultivates many of the learned behaviors such as social, moral and health-promoting conduct. The efforts in the area of substance use prevention are documented in the literature, but not much is known regarding prevention targeting adolescents much younger than high school age adolescents (Centers for Disease Control and Prevention, 2017).

There is varied and wide-ranging literature on adolescent substance use (Li, Zhang, Liu, Arbeit, Schwartz, Bowers, & Lerner, 2011; National Center on Addiction and Substance Abuse, 2011; Johnston, et al., 2018; Swendsen, Burstein, Case, Conway, Dierker, Merikangas, 2012). The risk and protective factors regarding adolescent substance use are also well documented (Hawkins, Graham, Maguin, Abbott, Hill & Catalano, 1997; Mayes & Schuman, 2015; Stone, Becker, Huber & Catalano, 2012). These studies focused on delineating factors of initiation, though their findings have been more targeted to identify factors of adolescents of high school age, rather than 7^{th} - 9^{th} grade adolescents. And while some of the research has tended to isolate trauma, mental health, familial use and peer influence as determinants of use, in general, they have confirmed that an interactional force occurs when an adolescent commences substance use. The findings also suggest that adolescents that experiment with drugs and alcohol will have a higher likelihood of adverse consequences.

The past two decades have shown steady declines in smoking (CDC/NCHS, 2018), due in-part to targeted health awareness campaigns. But more recently, within the past ten years, educators have been met with the challenges of new products such as alcopops (flavored alcoholic beverages), powdered alcohol, vaping (a form of e-cigarette including the JUUL), and

the legalization of marijuana by states in varying degrees (medicinal or decriminalization). An approach to investigate a relationship of close-friend substance use, access and environment, particularly related to risk-related factor of substance use among 7^{th} – 9^{th} adolescents, may have the potential to inform school officials in addressing substance use in their schools.

Age of Initiation

Exposure to substance use at a young age, increases risk factors for long-term consequences (Flay, Petraitis & Hu, 1999). Studies have shown that problem behaviors, including tobacco and alcohol use, tend to occur concurrently in the same individuals during adolescence (Cambron, Kosterman, Catalano, Guttmannova & Hawkins, 2018). According to the Texas School Survey (2018), Texas students reported the average age of first use of legal or illicit substances from 12-14 years old. Nationally the average age for tobacco and alcohol initiation is 12 years of age according to the Substance Abuse and Mental Health Services Administration (2017). Research suggests that substance use by adolescents before the age of 13 is a predictive factor for substance misuse into later adolescence and adulthood (Brownlie et al., 2019). Some youth may be at greater risk due to a combination of factors such as peer use, close-friend substance use, self-esteem, trauma and mental health issues (Flay, Petraitis, & Hu, 1999; Otten, Mun, Shaw, Wilson & Dishion, 2019). The investigation of risk factors for younger adolescents is necessary as the literature on this age group is lacking. Current research suggests that factors associated with middle school use may vary from risk factors among older adolescents in high school (Warren, Smalley, & Barefoot, 2015).

Tobacco (electronic cigarettes and vaping)

The alarming increased rates of electronic cigarette (e-cigarette) use among adolescents is one of the main findings across, national, state and local data. The e-cigarette was first created

for the U.S. market in 2007, as a disposable tool for smokers to gradually reduce their intake of nicotine over a period of time. The market grew as the invention of flavored nicotine was introduced to entice the use of the larger marketed vape products with added rechargeable versions. Many of the new e-cigarettes come with batteries and cartridges, also known in the market as tanks, to fill with flavored or regular liquid nicotine. Other names of marketed e-cigarettes include Mods, which are larger in size and can be modified to allow more of the aerosol, nicotine and other chemicals to be inhaled. The pod-based model of the e-cigarette known as the JUUL, is attractive for adolescent use and is sleek in its design, easier to conceal, shaped like a USB and affordable. The term vaping is misconstrued as a form of harmless water vapor, but in reality, the vapor inhaled through the e-cigarette contains a wide range of harmful chemicals and ultra-fine particles.

The JUUL makers intended to create another easier, and sleek method of cutting down on the use of combustible cigarettes. The marketed JUUL, denying intentions of marketing directly to adolescents, has contributed to a health crisis concerning public health advocates across the nation. Gaining awareness and strategies to combat the issue of e-cigarette use has become a priority for the Food and Drug Administration as more and more adolescents continue to use vape products (Office of the Surgeon General, 2016). The federal government has received backlash for largely ignoring the explosion of the vaping products on the market for the last decade. The little-to-no regulatory oversight on the issue has left public health officials scrambling to understand the cause of vaping deaths across the country. Rising rates of teen vaping and lung illness has led to the federal government announcing a ban on the sale of flavored electronic cigarettes. A recent article by the New York Times reported 2,506 identified vaping illnesses, and 54 deaths attributed to vaping across the United States (Corum, 2019).

Peers vs. Close-friends Influence

The influence of peer influence substance use, particularly in risky behaviors tends to peak during early adolescence (Catalano, Haggerty, Hawkins & Elgin, 2011; Centers for Disease Control and Prevention, 2017; Guyll, Madon, Spoth & Lannin, 2014). Adolescents whose "close-friends" are involved in substance use, are a dominant factor in whether an adolescent is likely to initiate substance use. Risky behavior by friends and/or peers use is a central component of most adolescent use theories (Flay, Petraitis & Hu, 1999) and is the most consistent correlate for adolescent substance use (Hawkins, Catalano & Miller, 1992; Hawkins & Weis, 2017; Hawkins, Graham, Maguin, Abbott, Hill & Catalano, 1997). The strongest predictor of adolescent substance use is reported to be those that are affiliated with a peer or friend who is substance-using, the odds are far more likely they will use, compared to their friends that are not involved in substance-using (Mayes & Schman, 2015). The dilemma lies in distinguishing the difference between a peer and a "close-friend", as close-friends would have a greater impact in the persuasion of substance use (Bauman & Ennett, 1996).

The relationship of a "close-friend" differs from a peer. A large body of literature acknowledges peer influence as critical for appropriate behaviors in groups (Bauman & Ennett, 1996; Bahr, Marcos & Maughan, 1995; Kirkcaldy, Siefenb, Surallb, Bischoffe & Karlamangla, 2004). Differentiating among peers and "close-friends" is found less in the literature. Close-friends are sources of social and emotional support, wherein peer circles tend to provide opportunities of conformity (Windle, 2000). A peer can also represent a teacher, coach, parent, or older sibling, and represents a different relationship as compared to a "close-friend", who as some researchers suggest (Steinberg, Fletcher & Darling, 1994)), are also vital and important to an adolescent in determining their identity.

Access to tobacco, alcohol and marijuana

There is limited research on the relationship of access to legal (tobacco/alcohol) and illegal substances (marijuana) on school grounds (Welsh, Tretyak, & Rappaport, 2018). An adolescent attends a greater number of hours at school as they proceed through the grade levels. Transitions from younger grades to middle school can cause a stressful situation for developing youth (London, & Ingram, 2018). Changes in adolescences, biologically and cognitively can create challenges that provide opportunity for stress relieving outlets. As school becomes more difficult, the need for maturity and responsibility becomes increasingly demanding.

The transition from elementary to middle school can involve changes that include emotional and physical life changes, such as "close-friend" influence or persuasion to use substances to cope with their pressures. This age (11 - 17 years of age) is the most susceptible to increasing demands of their mind and body, with intrigue and curiosity to relieve the pressures with legal and illegal substances (Flay, Petraitis & Hu, 1999), a pivotal moment for educators to understand.

School Environment

Environments specific to adolescents in middle school should contain a targeted goal of the prevention of substance use, and in particular a normalcy of disapproval of use among close-friend substance use (Gottfredson, 2017; Guyll, Madon, Spoth & Lannin, 2014; Hawkins, Graham Maguin, Abbott, Hill & Catalon, 1997; Janssen, Treloar-Padovano, Merrill, & Jackson, 2018). At a higher level, schools should consider the need for regulations (policies) and goals that are appropriate for the middle school population in creating an environment for them to refuse the curiosity of substance use overall (Li, Ahang, Liu, Arbeit, Schwartz, Bowers, &

Lerner, 2011; Noland, Rayens, Riggs, Staten, Hahn & Riker, 2011) and creating a sense of safety in doing so.

Summary

Schools have been recognized as influential socializing environments (Agabio et al., 2015; Baiden et al, 2019; Botvin, Griffin & Nichols, 2006). Substance use at school and in general can cause poor performance, leading to low levels of academic achievement, and continued on-campus use. With the threat of active substance use on school campuses, users and non-users are at risk while on school grounds. Non-use dangers include tobacco second-hand smoke, proven as unhealthy and dangerous (Butz, 2018; Münzel, Hahad, & Daiber, 2019), and more recent reports of e-cigarette batteries exploding during use (Nguyen & Sheikh, 2019). Each of the above sections describe areas of concern for substance use on campus.

The literature is vague on the influence of specific risk-related factors, particularly in 7th – 9th grade adolescents (Evans-Whipp, Beyers, Lloyd, Lafazia, Toumbourour, Arthur & Catalano, 2004). Based on data from the Centers for Disease Control and Prevention (2018), 17% of high school students report having had alcohol before the age of 13 years old, 34% of high school students report having used marijuana at least once in their lifetime, and 47% of Texas high school seniors reported trying to quit using any and all tobacco products including cigarettes, electronic vapor products and smokeless tobacco. This study will examine the risk-related factors that may contribute to substance use specifically among adolescents during their middle school years, and will expand on the probability of motivation for use, adding to the scant literature on this population (11 - 16 years of age).

The number of prevention efforts has significantly increased in the past 10 years, but schools have a harder time identifying the appropriate components that equal reduced substance

use and related problems. Gottfredson (2017) reported on the immense awareness regarding characteristics of predicting problem behaviors in adolescence, yet school environments remain the same, with consequences equal to punishment and less on the progress of reconstructing behaviors. Although most identified risk factors regarding substance use pertain to older adolescents and adolescents in high school, and not middle school adolescents.

The proposed study will expand on the scarce literature of drug prevalence among adolescents in 7^{th} – 9^{th} grade, and examine the influence of "close-friend" substance use, access and environments in increasing the odds of substance use. The significance of the study at the micro-level will examine 1) quantitative evidence regarding substance use risk factors for adolescents in 7^{th} – 9^{th} grade levels, 2) increase the awareness in the differences of risk-related factors from younger to older adolescents and indicators of use, and 3) examine and identify the school environment as a variable of interest for adolescent substance use. The macro level significance includes adding and contributing to the growing literature on adolescent substance use, and provide information to school practitioners in improving practices and policies on current substance use prevention efforts.

The next chapters will discuss past findings regarding prevalence in adolescent substance use, the importance of examining relationships of factors for use, and the theoretical models used for the study. Chapter 3 focuses on the analytical procedures used to derive research questions and hypothesis, Chapter 4 will provide results from the analysis, and Chapter 5 will discuss the findings and their practical implications on adolescent substance use of alcohol, tobacco and other drugs for school officials, principals, teachers, and counselors.

Chapter 2

Literature Review

The review of the literature is to understand and connect with relevant research on the topic. Such reviews help to locate gaps in the research, provide a background knowledge of the topic, and explore competing approaches. This study is formulated through the analysis of library research, internet databases, journal articles, government documents, education websites and academic textbook material. The primary source of research in the examination of adolescent substance use was gathered from peer-reviewed journals.

The library at The University of Texas at El Paso provides access to online journals through search engines. To examine the topic of substance use among adolescents, specific databases included; Academic Search Complete, Cinahl, Educational Administration Abstracts, MEDLINE, Psychology and Behavioral Sciences Collection and ProQuest. The databases were used due to their available access and their crossover in a variety of disciplines. A review of the literature identified 4,225 studies on adolescent drug use, 220 on adolescent factors in substance use in schools, 15 on school environment and substance use and 128 that included all of the above criteria. Each of the research literature searches were separately executed within their respective databases. The topic of adolescent substance use crosses many disciplines and the data analyzed in this study could add to the generalized knowledge, and aid in identifying the relationship of risk factors in 7^{th} – 9^{th} grade adolescents, a cohort population that is rarely examined. As mentioned earlier, the literature is limited on comparing substance use trends among adolescents in their school environment and the interactional relationship of "close-friend" substance use, access and environment. The literature review examines details about school environments, generalizations of substance use, impacts, and school prevention, all in

association with adolescent substance use and reasons for the likelihood of use. The next section will address the variety of terms associated with the study of substance use.

Definition of Terms

Throughout this study there will the repeated terms that may have multiple meanings. The study focuses on substances that are found to be the most accessible to younger adolescents, which include tobacco (including electronic cigarettes), alcohol, and marijuana. The use of a substance will mean onset use, likelihood or pre-mature use of the legal and illegal substances. The substance users under the examination of this study will be adolescents in middle school grades 7^{th} – 9^{th} grade, 12 - 16 years of age. Some districts include their 9^{th} grade adolescents as middle school students. The substance of tobacco including electronic cigarettes is of great importance in the examination of initiation due to current alarming statistics of use across all school grade levels. Alcohol is still the number one substance used and abused by underage minors. Marijuana, while legal in many parts of the nation is still considered an illegal drug in the State of Texas and will be examined as an illegal substance by the user.

Adolescent Substance Use

This study will use the term '*substance use'* to refer to tobacco, alcohol, and marijuana. The literature varies on the definition of adolescent substance use. The following are not inclusive but were most prominent: substance abuse, substance misuse, substance dependence, harmful use, hazardous use, experimental, problem use, addiction, chemical use and chemical dependence (Hasin, O'Brien, Auriacombe, Borges, Bucholz, Budney, Compton, Crowley, Ling, Petry & Schuckit, 2013).

The Diagnostic and Statistical Manual of Mental Disorder, fifth Edition (DSM-5) classifies individuals with substance use problems into two categories – substance abuse and

substance dependence. Substance abuse implies a maladaptive use leading to failure to fulfill work school or social responsibilities. Substance dependence is more severe, often involving the increased use of a substance with a higher tolerance and stronger desire to use despite physical and social impairment (American Psychiatric Association, 2013).

Substance use Prevalence among Adolescents

Facts and figures for adolescent drug use are important in understanding the issues that pervade schools today and the need for the implementation of health policies, district compliance with state policies, and internal prevention strategies as it relates to successful student success and prevention of long term adverse consequences of drug misuse (Evans-Whipp et al., 2004; Guyll, Madon, Spoth, & Lannin, 2014; Agabio, Trincas, Floris, Mura, Sancassiani, & Angermeyer, 2015; Janssen, Treloar-Padovano, Merrill, & Jackson, 2018). Examination of data collected among adolescents 7^{th} - 9^{th} grade may provide information in guiding new preventive policy measures. While the data from national and state databases are available as public domain, comparison of local drug use data is harder to come by due to school district policies regarding release of campus information. Transparency of this type of information would lend itself for opportunities in transformative policy changes for positive outcomes.

Environment and Access

The research on adolescent substance abuse as it relates to access and environment in middle schools is scant (Evans-Whipp et al., 2004; Hennessy, & Tanner-Smith, 2015), so it was prudent to filter out studies in the literature that did not discuss school substance misuse of tobacco, alcohol, and/or drugs among adolescents on school grounds. Adolescent substance use is characterized as either using legal substances such as tobacco and alcohol, or illicit use of substances such as marijuana, cocaine, heroin and prescription medication (Maslowsky, Whelan,

Moberg, & Brown, 2017; Montes et al., 2019). Adolescents are not legally allowed to consume alcohol or purchase tobacco products, so it is important to note that school policies must include both for preventive measure. A student's access to legal or illegal substances is of concern when higher incidences of use occur on-campus, such as vaping (electronic cigarettes). Policies in schools related to substance use prevention rely primarily on district and state-mandated requirements. Across K-12 campuses in the State of Texas, varying degrees of compliance exists. This, during a time when an opioid epidemic has taken hold of the nation with 130 opioid-related deaths per day (CDC/NCHS, 2018), and the 2010 invention of electronic cigarettes, a form of vaping marketed directly to youth, has school officials searching for ways to prevent and reduce the number of students engaging in substance use on campus. Investigating earlier ages of substance use among middle school students will aid in the search for preventive strategies.

Risk Factors of Substance Use among Adolescents

The rate of vaping or electronic cigarette use among 7th - 12th graders has dangerously increased 900% from 2011-2015, alcohol use among teens 7-12th grade was 30% as of 2016, 17% of them admitted to riding with a driver who had been drinking alcohol, (CDC/NCHS, 2018), and marijuana lifetime use was 53% (National Institute of Health, 2019). State-wide, the Texas School Survey reported alcohol use among 12th graders at 68.5%, and illicit drug use for having "ever used" was at 41% (Texas Health and Human Services Commission, 2018). The literature identifies initiation of these substances based on factors of stress, peer pressure, accessibility, social norms, trauma and depression (Baiden, Mengo, Boateng & Small, 2019; Catalano et al., 2011; Chapman, 2018; Green, Madon, Spoth & Lannin, 2014; Janssen, Treloar, Merrill & Jackson, 2018; Luthar, Small & Ciciolla, 2018). These factors while not all inclusive, aid in drawing conclusions to alternative strategies in combating the issue for on-campus

substance use. Among the studies that have looked at controlling a drug free school environment, the vast majority of the literature focuses on drug-testing in schools or lack of enforcement in varying degrees (Committee on Substance Abuse, 2007; Kann, et al., 2007). The available literature on adolescent drug use remains consistent, but studies that look at both adolescent drug use, and limiting access to legal and illegal substances on school grounds are scant. Increasing nationwide overdoses, and subsequent low perception of harm in vaping and marijuana use, and access factors, may inform education leadership, and school administrators in understanding the potential influence on a student's behavior as it relates to substance misuse.

Information regarding mandates for substance use prevention was located through the Centers for Disease Control and Prevention (CDC) web site which promotes healthy environments for adolescents. Data extracted from the website included information in the prevalence of alcohol and other substance use among the states in the United States (Centers for Disease Control and Prevention, 2019). The CDC also prepares a bi-annual report on Health Policies and Practices for all school districts. The report measures the progress of school policies and practices pertaining to health behaviors. Data from the report includes figures for elementary, middle and high school instruction including tobacco use prevention. The module contents did not mention substance misuse or alcohol use initiation as a focus, although data tables did outline percentage of districts adopting a policy with a specific health topic, including alcohol or other drug use prevention. Texas, Arkansas, Louisiana, and Oklahoma districts within the report were grouped regionally as West South Central, for a total number of 146 school districts, 72 specifically for Texas.

Overall, the findings on adolescent substance misuse point to causal factors that include, sociobehavioral, environmental, and social norming as main indicators in the initiation of

substances such as tobacco, alcohol, marijuana and prescription medication (Catalano, Haggerty, Hawkins, & Elgin, 2011; Green et al., 2016; Hawkins, Catalano, & Miller, 1992; Hawkins et al., 1997; Montes et al., 2019). It is important to note that while the subsequent studies identify causal factors, identification of preventive strategies and/or successful campaigns seemed harder to find in the narrative of the analysis and results.

Education and Health Reform

Historically, health behavior for students has been a topic of reform since the late 1970s. The Annual Drug Control Strategy Report was first published in 1989. The goal of the first report was to tackle the issue of recreational drug use and also the first mention of adolescent drug use (Centers for Disease Control, 1989). The next ten years found an emphasis on limiting recreational drugs and use by adolescents (Xuan, Blanchette, Nelson, Nguyen, Hadland, Oussayef, Herren and Naimi, 2015). Purposefully, the theory behind the movement leaned more toward group learning, and less on self-help derived in part from the belief that individual drug education was harmful. The political community was unaware that the prevention community had a far better understanding in the powerful psychological, internal, and chemical factors that can create an addiction in an individual (Newton, Champion, Slade, Chapman, Stapinski, Koning, Tonks, and Teesson, 2017). As mentioned early on, the example of vaping has created an epidemic of harmful e-cigarette use. Schools and communities become reactive to the situation, with punitive zero policies in place, and little to no information passed on to school officials, and/or educators regarding the negative health consequences and addictive nature the electronic nicotine devices have on adolescents.

Prevention in Schools

In 1983 the Drug Abuse Resistance Education Program (D.A.R.E) was created in Los Angeles, California (Flynn et al., 2015). For the last 35 years, the D.A.R.E program has been implemented in schools across the nation, including elementary, middle and high schools. The D.A.R.E program focus is teaching students to resist the social pressures surrounding drug use. The curriculum is facilitated by local law enforcement over a 17-lesson curriculum. Unfortunately, the curriculum is consistently shown to be ineffective. An evaluation review by Gorman and Huber (2009) re-analyzed data from the original D.A.R.E. evaluation and found the program to have no effect on students' initiating tobacco, alcohol or drug use.

The D.A.R.E. program has yet to show long term direct association in preventing adolescent substance use. Although some of the literature has found D.A.R.E to share in its' intent in changing attitudes towards substance use, the question remains on its' effectiveness to reduce substance use among students' (Ennett et al., 1994; Gorman & Huber, 2009; Lynam et al., 1999).

In 1986 the "Just Say No" campaign was offered as another solution to mediate the problem of substance abuse in America. While the intention of the program was to bring awareness to the issue of alcohol and drugs, the overall consensus was that the curriculum was too simplistic, vague and lacking weighted content (Kelly & Barker, 2016). The messages were provided by local law enforcement with little to no training in implementing a prevention program to adolescents. The campaign was followed by the "Your Brain on Drugs" television message. Fear and ignorance on the topic of substance use did more harm than good, Stibe & Cugelman, (2016) found the messages to have a negative effect among adolescents.

In 1998 the U.S. Department of Education promoted the "Principles of Effectiveness" with the use of evidenced-based drug prevention programs among schools (Hallfors & Godette, 2002). These principles required schools to accept "Safe and Drug-Free" school funds for evidence-based drug use prevention curricula. The prevalence of schools with issues of substance use, along with the principles, the doctrine *No Child Left Behind* became law, with schools now at risk for losing funding if the implementation of drug-free curricula was not incorporated.

Behavior Change among Adolescents

Impacting behavior for positive change has been a challenge for schools for many years. Comprehensive policies that are inclusive of precise information, specifically policy association and application, may have more positive outcomes (Centers for Disease Control and Prevention, 2017; Evans-Whipp et al., 2004). One study found that schools with more detailed adolescent use policy, reported a lower overall amount of initiation among their students (Moore, Roberts, & Tudor-Smith, 2001). There is a large degree of variation among schools that are targeting control over tobacco, alcohol, and drugs among students.

Overall schools are well intentioned at reducing substance use among students, but the effectiveness of their efforts is no longer making a difference in an adolescents' behavior toward substance use (Evans et al., 2004; Ross et al., 1995; Yeager, Dahl & Dweck, 2018). Higher reported rates of substance were found to be associated to a zero-tolerance policy approach, along with overall abstinence policies (Kann et al., 2007; Montes et al., 2019). Policy violations among adolescents were attributed to the motivation to violate those same policies, due to their need to act out as part of their rebellious nature as an adolescent (Heilbrun, Cornell & Lovegrove, 2015).

Poor school performance is a result of many different factors including socioeconomic status, parental support, accessibility, and in particular their environment. A primary cause of substance use or risky behavior, may be their school environment in which the space offers comfort, pressures, or resistance to use substances, and helps in shaping a decision to use by an adolescent (Catalano, Haggerty, Hawkins & Elgin, 2011). A direct consequence in performing poorly at school may have more to do with problematic close-friend substance use who are an influence in the initiation of substance use, and neglect for their academic responsibilities (Baiden, et al., 2019). Studies have found that students' poor motivation toward academic achievement were more likely to initiate substance use. Influencing a students' knowledge of substance use, increased motivation for academic achievement, and increased awareness of negative lifelong consequences are more in line with preventive curriculum practices than punitive ones (Catalano, et al., 2011; CDC, 2017; Cohen et al., 2009; Evans-Whipp et al., 2004; Green et al., 2016; Hawkins et al., 1992; Hennessy & Tanner-Smith, 2015; Li et al., 2011; Newton et al., 2017).

Gateway Hypothesis

Nearly all research literature discussing adolescent drug use is in some way based on the seminal work of the *Gateway Hypothesis*, also referred to in venues of drug use prevention as *Gateway Drug* theory. The *Gateway Hypothesis* was first termed in the late 70's early 80's, by the director of the National Institute of Drug Abuse, Robert Dupont (Kleinig, 2015). The term is based on the initiation of drug use as a precursor for further drug use, and/or higher classes of drugs. For example, if an adolescent initiated tobacco use at an early age, the *Gateway Theory* hypothesizes that the adolescent will move toward marijuana use, then into a higher class of drugs in their adulthood, possibly heroin or cocaine (Bell & Keane, 2014). Premature-initiation

of drug use under the *Gateway Hypothesis* aids in understanding the pathways and patterns as it relates directly to adolescents, which further helps in the development of positive prevention strategies.

The *Gateway Hypothesis* is not without scrutiny and critique (Chapman, Bareham, Maziak, 2018; Kleining, 2017), and for this study, the use of the theory aids in framing the specific use of alcohol, tobacco and other drugs on school-campus among adolescents. The research literature points to other consistent findings in the initiation of substance use, such as individual factors, intrapersonal factors, accessibility, mental health challenges and environmental challenges, particularly those that have a clear impact, such as familial drug use (Baiden, Mengo, Boateng & Small, 2019; Catalano et al., 2011; Chapman, 2018; Green, Madon, Spoth & Lannin, 2014; Hawkins et al., 1997; Janssen, Treloar, Merrill & Jackson, 2018; Luthar, Small & Ciciolla, 2018; Yacoubian, 2003).

While there are numerous findings and analysis, there are still no clear, concise answers as to why an adolescent has an increased likelihood of substance use on school campuses. Predominantly, the literature and consensus on adolescent drug use are derived in large part from national and state surveys on youth health and behaviors. The consensus on the data, while valid and reliable, may leave a void for those schools within districts that are geographically omitted, or younger adolescent's age 11-17 years old. Particularly rural areas such as in Public Health Region 10 (locality of the study) where school districts may have a student body under 500, and with unique factors other than those listed for use of alcohol, tobacco and other drugs. This study will examine the available data within the Texas School Survey and examine the relationship of close-friend substance use, access and environment as factors of risk and the impact on the likelihood of substance use. The examination is building on the current deficiencies in the

literature and increasing rates of substance use among 7th – 9th grade adolescents identified in state and national survey results.

Theoretical Frameworks

The complex issue of adolescent substance use entails many risk factors, this study will examine "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus) through three theoretical lenses. First, the Ecological Model of Behavior and Health will help to explain the various working parts that may be associated to an adolescent's premature use of alcohol, tobacco and other drugs. Second, Reactance Theory will be explained in terms of why student substance use may occur on school campuses, specific to the adolescent-institution relationship. And finally, the Theory of Triadic Influence is grounded in the cognitive influences that occur during an adolescent's life.

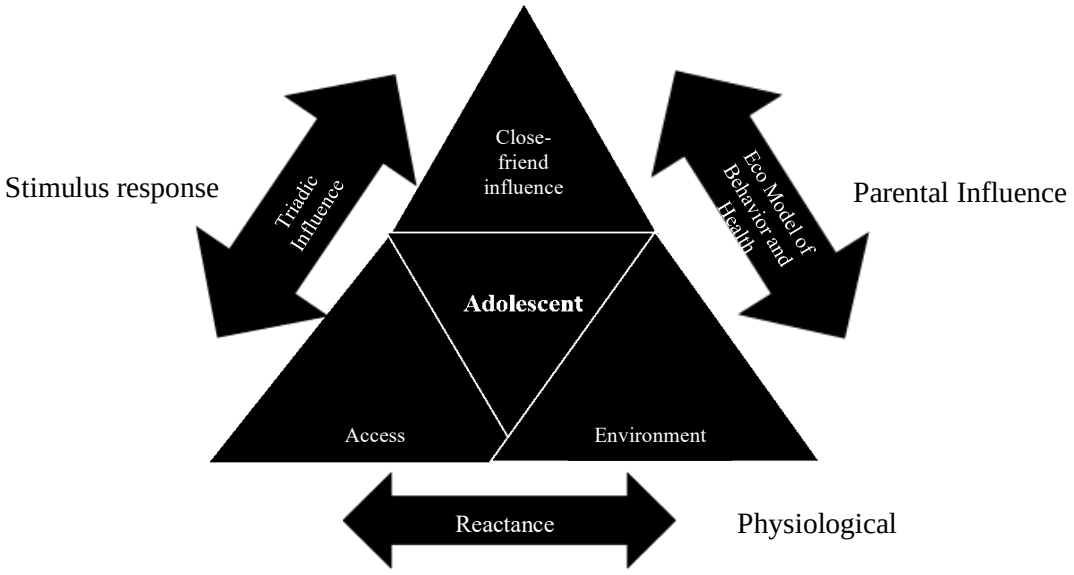


Figure 2 Theoretical Concepts in the Examination of Adolescent Substance Use

As mentioned earlier, the stress and challenges of transitioning from elementary to middle school include the developmental and physical demands, so analyzing these challenges through different theoretical lenses is prudent for the study. All three of the theories have their foundation through Bandura's Social Learning Theory (1977).

While there is an abundance of information related to adolescent substance use suggestive of factors outside of a school environment, this study focuses on adolescent substance use risk factors and the influence of "close-friend" substance use, access and environment working in combination, and increasing the magnitude of risky behavior for use. Adolescents ages 11-17, are the primary population of focus for this study. Their substance use will be examined through frameworks that are viewed as related to their risk in the probability of substance use. The interpretation of the frameworks is, such that the lens is clearly focused on adolescent substance use among 7^{th} – 9^{th} graders. Each of the theories may explain areas of situations particular to adolescents in 7^{th} – 9^{th} grade, such as the *Triadic Influence Theory* focused on the influence of close-friend substance use through a stimulus response, but would not necessarily explain the relationship of access or setting. While the *Ecological Model of Behavior and Health Theory* will aid in understanding the working parts of a school setting and access, through an intra and inter-personal lens. The *Reactance Theory* will be examined through the lens of motivation from a rebellion stand-point, with "close-friend" influence and the school environment combined. The diagram above illustrates how each of the theories can stand alone, but also intersect and overlap with the 3 possible risk-related factors of "close-friend" influence, access and environment.

Ecological Model of Health and Behavior

The Ecological Model of Health and Behavior (McLeory, Bibeau, Steckler & Glanz, 1988) will be used as the framework to guide the examination of adolescent drug trends. The ecological approach focuses on the population-level and the individual level determinants of health and interventions. The framework will aid in understanding the many interlocking levels of an individuals' influence of substance use.

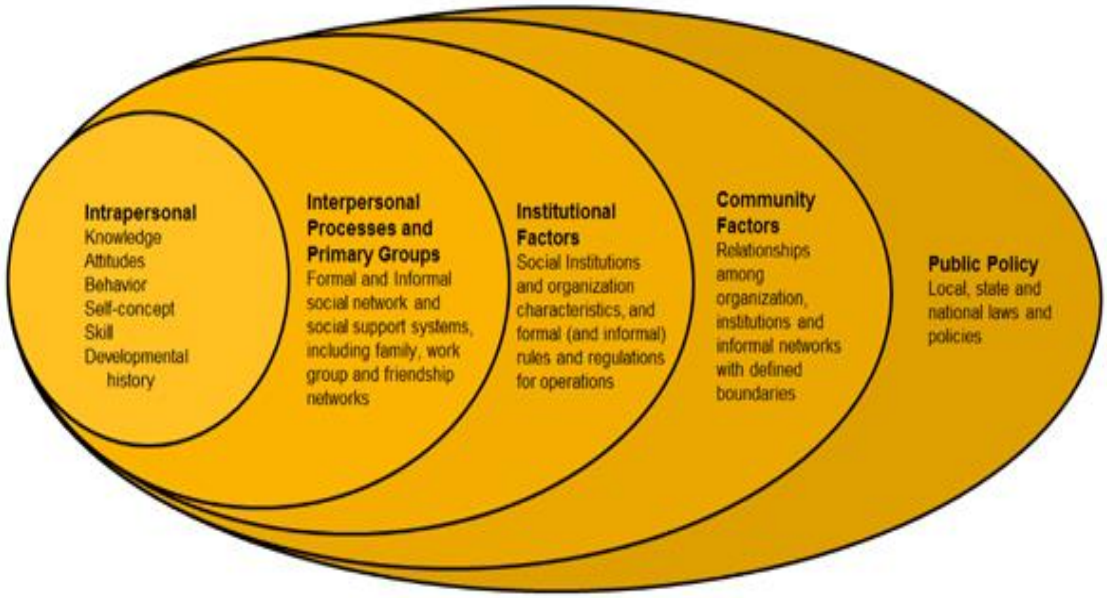


Figure 3 Ecological Model of Behavior and Health

In the framework, a person's health perspective has multiple levels of environmental influences such as public policy, community, institutional, interpersonal and intrapersonal factors (McLeroy et al., p. 355, 1988). The ecological model components of health status and behavior are the prominent outcomes of interest particular to adolescents, and are determined by factors that overlap within the model. The perspective is a useful framework for understanding the wide range of factors that influence health and well-being. Each of the levels in the model can frame a research question as it applies to an adolescent's health and behavior. A student's relationship outside of the family includes schools, clubs, and networks within their own environmental boundaries. In this study, we define the boundary as the school campus. The context of a student's use of tobacco, alcohol or other drugs is determined to be a risk factor if the relationship within any of these networks is less than positive (Petraitis, Flay & Miller, 1995; Petraitis, Flay, Miller, Torpy & Greiner, 1998).

The model is a key aspect of this study, as it incorporates facets of environment and close-friend" substance use as key risk-related factors for adolescent shifts toward either being a

substance user or non-user (Catalano, Haggerty, Hawkins & Elgin, 2011; Connell, Gilreath, Aklin & Brex, 2010; Guyll, Madon, Spoth & Lannin, 2014; Hawkins, Catalano & Miller, 1992). The research indicates that as children progress through adolescence, the influence of their parents decreases while close-friend influences increase (Weishew & Peng, 1993). One of the few studies found to examine school environment for substance use and the influence of close-friend substance use, Weishew and Peng (1993) found that a student's perception of school climate on drug use was impactful on their choice to initiate substance use. The researchers also stated their surprise as to why school environment has not been included in more research as a measure for predicting substance use among adolescents, particularly in conjunction with other risk factors within the model.

Reactance Theory

Reactance theory is founded on the principals of cognitive development and physiological changes. The theory will be used to discuss motivation for substance use among adolescence. Adolescence is a time of experience and rebellion. Adolescents' behaviors have been conceptually studied for many years. In understanding the pressures of adolescent development, one must take into consideration the brain's physiological changes that also occur. An adolescent's brain is not fully developed until the age of 19 and in some cases until age 25. The area of the brain that determines judgment and emotions is not at its full capacity during adolescent development (Tapert, Granholm, Leedy & Brown, 2002). Furthermore, couple impaired judgment, with adolescent pre-mature substance use, access, rebellion, and peer pressure, could lead to experimentation to relieve stress from any one of these issues. An adolescent's rebellious nature while on school campus is subconsciously undermining institutional rules and policies by risking use of legal or illegal substances. By undermining the

relationship of an institution (judgment based on perceived right vs. wrong), the adolescent has a sense of perceived threat (consequences) to their desired (impulsivity) behavior, experiencing what is called "reactance" (Granpre, Alvaro, Burgoon, Miller & Hall, 2003). *Reactance theory* may explain the motivation to perform a behavior that is compromising a freedom of choice (rebellion). This can be applied to both the interpersonal and intrapersonal processes within the *Ecological Model of Health and Behavior*, as adolescent development, particularly during the stages of puberty, the freedom of choice for a particular behavior is the catalyst for experimentation and defiance of rules and regulations.

Theory of Triadic Influence

Flay et al., (1999) have also found the *Theory of Triadic Influence* useful in explaining the cognitive role each of these factors may have in influencing an adolescent's behavior toward substance use. In using the *Theory of Triadic Influence*, this study examines an adolescents' behavior in learning from their close-friends, most of which, is time spent in school and on school grounds during their adolescence. The *Theory of Triadic Influence* was founded by Social Psychologists in understanding behavior through stimulus-response, an individual's ability to learn from events and change behavior for a particular outcome (Botvin et al., 2006). The theory is of particular interest to the study because the nature of adolescence is determined by behaviors that may be learned from close-friend substance use. There are many activities in which adolescents can be involved in during 7^{th} - 9^{th} grade, including social events, football games and off-campus parties. Adolescent behaviors are learned at these events and from close-friend influences.

The principle also states, that individuals who view use behaviors of others in their surrounding environment may utilize it as a reference for their own behavior. While this may

seem more like the peer use phenomenon, the larger dimension is the environment, and in this case, school ground access to substances such as tobacco, alcohol and other drugs. The principle is arguably easier to infer the relationship of those students who merely observe other students, teachers, school administrators, and community members, in establishing the behavior to act and react, in regard to school policy measures. Additionally, for first-time use, situations of ambiguity, wherein if an adolescent perceives a situation in which substance use is confusing, they may simply follow others as a way of reducing their ambivalence.

Pressures for adolescents increase as they advance to high school. Students are having to adjust to a demanding environment that includes judgment by other teens, fitting in, and academic achievement (Guyll et al., 2014). Campus environments specific to adolescents should contain targeted prevention efforts, in particular, changing social norms inclusive of normalcy for the willingness to decline substance use (Kumar, O'Malley, Johnston, Schulenberg & Bachman, 2002). Kumar (2002) further suggest that an adolescent's well-being while in school is highly dependent on an environment that is looking out for the safety and well-being of the student. The greater the importance of measures to deter substance use while focused on a supportive environment, the more likely an adolescent will feel comfortable in refusing the pressures to initiate substance use.

Summary in the use of Theoretical Frameworks

The literature has found similarities across each of these theories, and all are grounded by the *Social Learning Theory* (Bandura, 1977). The science behind the *Social Learning Theory* as applied to adolescent substance use is comprised of these key elements: modeling, imitation, reinforcement, and an adolescent's susceptibility and access in favor of substance use (Botvin, Epstein, Diaz, & Botvin, 1995; Hawkins et al., 1992). This study uses the premise of Bandura's

Theory in furthering the explanation on behavior motivation, and external influences in risk-related substance misuse. External influences, such as "close-friend" substance use, provide the reinforcement that enables maintaining the behavior. Close-friend acceptance or rejection, can serve as a powerful influence of behavior, including substance misuse, according to this model. The theory also suggests that parents served as either enforcers or punishers of the behavior, by either as role models of acceptable behavior or demonstrating consequences of unacceptable behavior. The seminal research is an important aspect of the study, but also concluded that researchers within the last 10 decades have refined the theory, and it was prudent in mentioning Bandura's initial work in the area of behavior influences, particularly in adolescents.

School environments are often viewed as having the singular responsibility of the prevention of substance use by adolescents (Carpenter, Bruckner, Domina, Gerlinger & Wakefiled, 2019). Research suggests that with even with policies and prevention efforts by school officials, an adolescent may still be at risk for substance use (Gershman, 2012). The research further indicates that while school atmospheres have the opportunity in preventing substance use, it cannot be done alone, or in a silo excluding parental figures, communities and family environments (Hawkins, Catalano & Miller, 1992; Kristjansson, Mann, Smith & Sigfusdottir, 2018). A facet of this research is to build on the work conducted by previous researchers on the factors that impact policies school districts in preventing substance use on campus. In the process, the study will highlight important factors or strategies as useful tools for reducing substance use among adolescents. This may include educating school practitioners on the susceptibly and dangers of new drugs and devices such as the JUUL electronic cigarette.

Overall the above models and theories have significant importance in framing the research, yet it is unclear how, if any impact theoretical approaches have, on influencing the

formation and implementation in the efforts of reducing substance use in schools. Each of the theories have science behind their findings, yet over the past 20 years, a formula has yet to yield a successful approach inclusive of prominent features of success in decreasing adolescent substance use and/or initiation.

Limitations of Prior Research

Potential confounding factors. Many of the findings in the literature recommended continued research on school environment, and positive preventive methods in dealing with adolescent substance use. Several of the differences associated with the literature acknowledged limitations based on the contextual, economic, cultural, race and regional factors. The influence and the likelihood of substance use may not have any association with access and environment, and more with choice of close-friend substance use, parents, and personality traits. Although some studies found a link between familial use factors and school environment as a predictor for early initiation of substance use among adolescents.

Measurement of access. There is a lack of studies that examine adolescent substance use with access to legal and illegal substances. It is always a challenge to gather valid data from districts that include substance use among their students, as many would rather not be identified as a school with a drug use issue.

Frequency of use among students across grade, age, sex and location of school district is also imperative to make a distinction between consumption on school campuses and overall use. For example, a better point of comparison on self-reported use among those students that answer yes to using alcohol and drugs, would be more accurate if a range of use pinpoints by day, week or month, rather than use in the past month or lifetime use (Maslowsky et al., 2017; Texas Health and Human Services Commission, 2018). Even the availability of events, including off-campus

would provide a clearer picture of use and involvement with drinking and drug use behavior (Monitoring the Future, 2017; Toth, Evans, O'Neal & Highfill, 2018).

Summary

This chapter traced the literature on substance use by adolescents, primarily focused in identifying the gap of research specifically looking at 7^{th} - 9^{th} grade adolescents. Key evidence found in the literature, discussed factors associated with high school students, and their corresponding risk factors, including trauma, self-esteem, and close-friend substance use. Less was found on middle school adolescents and the increasing trend to begin using legal and illegal substances at an earlier age. This study will examine the relationship of "close-friend" substance use, access and environment as risk-related factors for use by adolescents. Outcomes from the study may be able to aid school officials in reducing the trend of substance use among adolescents by implementing strategies focused on that population.

Chapter 3, will include the predictive research design, analysis and methods that explores operationalizing variables from the Texas State School Survey in examining variances of substance use among middle school adolescents.

Chapter 3

Research Methods and Procedures

The purpose of this study is to examine the relationship of "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus) as risk-related factors of use by middle school adolescents. In order to properly assess the influence of substance use by adolescents, data was extracted from the Texas School Survey, 2016. The survey data is in the public domain and can be accessed for analysis on the topic. More specifically, for this study, adolescents in grades 7^{th} – 9^{th} grade are examined through their self-administered survey responses for use of alcohol, tobacco, other drugs, behavioral issues, peer and parent perceptions and environments.

Population

Adolescents from the Texas State School Survey – Public Policy Research Institute

Since 1988, the Texas State School Survey of Drug and Alcohol Use (TSS) has been administered bi-annually in a collaborative effort with the Texas Health and Human Services Commission (HHSC), and the Public Policy Research Institute at Texas A & M to a sample of schools within the State of Texas. The data serves to inform state and local policymakers on the extent of substance use among students in public schools (Ross et al., 1995) and district comparisons for local assessments of drug and alcohol use.

The most recent Texas School Survey administration among early adolescents, middle school youth ages 11 or younger to 17 or older for grades 7^{th} – 12^{th} grade, occurred during the 2015-2016 academic year. During the spring of 2016, the Texas School Survey was administered among 7^{th} – 12^{th} graders within a sample of school districts in the State of Texas. For this research, data from this original study will be used for secondary analysis.

Sampled schools were given the option of administration through an online or paper format. Of the 140 schools participating, 53 elected for the online version, and 87 administered the traditional paper-pencil format. Parents of students whose school participated in the survey were given the option for their child to opt-out of the anonymous survey. Public Policy Research Institute in their attempt to effectively and efficiently support the schools in the administration of the survey provided an informational packet as well as a website for questions in order to minimize disruption to the traditional school process.

The report from Public Policy Research Institute noted a decline in participation from school districts for a number of reasons including, 1) reluctance for class time due to pressures of standardized testing, 2) abundance of requests for surveys (schools have elected to no longer participate in survey requests) and lack of interest by administration due to extra workload on-campus staff. It is unlikely that all students within the selected school or classroom will participate in the survey. To ensure proportions in actual districts per region, weights were applied to each case based on their location, grade, and ethnicity by the researchers at Public Policy Research Institute.

Sample

The original sample included (N = 49,070) students who completed the initial survey in the fall of 2016. These students were drawn from the entire population of 7^{th} - 12^{th} graders enrolled in the school districts in the State of Texas. A sample of the original population includes only students who responded as 7^{th} - 9^{th} graders (n=27,035). The study sample also includes El Paso students that participated in the 2016 Texas School Survey (n = 3,666) of schools included in the overall analysis of (n = 27,035).

Below in Table 1 are the number of surveys included in the original survey sample.

Table 1

Number of Surveys Included in State Sample

	Non-blank surveys	Usable surveys	Number rejected by PPRI	Rejected
Total	50,143	49,070	1,073*	2.1%

**Surveys were rejected because the response indicated exaggeration or the survey could not be matched to a sampled school or grade*

Texas State School Survey, Drug, and Alcohol Use Methodology Report, 2016

Locality of Study

El Paso, Texas

The sample of surveys to be examined, include schools from the county of El Paso, Texas. While the analysis includes all of the adolescents whom answered the survey within the school districts of Texas, El Paso had 5 school districts that were part of the overall sample grades 7^{th} – 9^{th} grade. The geographical area of El Paso County is located in what is labeled Public Health Region 10. Public Health Region 10 consists of the 6 counties of Brewster, Culberson, Hudspeth, Jeff Davis, Presidio and El Paso for a total population of nearly 931,965 as of 2017 U.S. Census data (Texas Prevention Resource Center, 2018). The Region 10 counties are served by Education Service Center 18 and 19 for a total of 29 combined school districts. Five schools of the 29 districts were chosen to participate in the Texas State School Survey. A total of 3,666 student surveys for Public Health Region 10 are represented in the dataset (N=49,070) under the 2016 Texas School Survey resulting reports, facts and figures (Texas Health and Human Services Commission, 2018).

El Paso County is one of the largest cities that geographically rests on the Mexican border. The combined population of El Paso and Juarez (Mexican sister-city) totals more than 3 million persons. El Paso Independent School district is the largest in the county serving 60,000

students on 94 campuses. In Texas, there are approximately 1,031 school districts (Texas Health and Human Services Commission, 2018).

El Paso also serves as a major thoroughfare for many of the illicit drugs coming into the United States (U.S. Department of Justice Drug Enforcement Administration, 2018). The West Texas Division of the Drug Enforcement Agency has identified 8 drug trafficking routes coming in and out of El Paso and surrounding border crossings. The complexity of living in a border city is further exasperated for the demand of a quality education, who many see as a challenge due to acculturation, mobility, and student overflow. This along with access and availability of legal and illegal substance on school campuses is a burden on school officials, particularly when state and local laws allow the right to a free public education based solely on the legitimacy of a local address. These issues will be revisited in Chapter 5 discussion for implications and recommendations. Below in Table 2 is a sample of the data derived for the El Paso County schools for the prevalence of alcohol use among students. Alcohol is still the number one substance used by adolescents in grades 7^{th} – 12^{th} (PPRI, 2018). The earliest age of initiation for alcohol is 13 years of age, based on the aggregate data from the Texas School Survey.

Table 2

Prevalence of past 30-day Alcohol use among Students, Texas School Survey

El Paso Schools	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
School A	n/a	25.4%	39.4%	48.9%	53.7%	
School B	8.8%	21.4%	n/a	n/a	n/a	n/a
School C	22.3%	n/a	n/a	n/a	n/a	n/a
School D	n/a	n/a	38.5%	36.1%	47.9%	56.7%
School E	n/a	n/a	30.5%	41.1%	39.4%	38.9%

Texas Prevention Resource Center, Regional Needs Assessment Report. http://prc10tx.org/wp-content/uploads/2019/04/PRC_Region10_2017_2018-RNA_without-graph.pdf. Accessed May 22, 2019

The aim of this study is to examine the relationship of "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus) among 7th - 9th graders through a quantitative design. Use of alcohol, tobacco, and marijuana will be explored based on data from the Texas State School Survey administered in the fall of 2016. The data from the Texas School Survey was developed to inform state and local policymakers on the extent of substance use among students in Texas public schools (Ross et al., 1995) and district comparisons for local assessments of drug and alcohol use.

Instrumentation: Texas School Survey

The 2016 Texas School Survey is based on the original instrument developed in 1988 with minor variations in questions and choice of responses, developed by the Public Policy Institute at Texas A&M. The 2016 Texas School Survey is a 34-item instrument comprised of questions related to demographic, general substance use, alcohol, tobacco and other drug use, perception of use, parental perception of use, access to substances, prevalence of drug use, school absences caused by drug use, and access to information on drugs (Texas Health and Human Services Commission, 2018) See Appendix B for Texas School Survey questionnaire. The orientation of the 2016 Texas School Survey reflects the cumulative evolution of the Texas School Survey since its inception in 1988. Many of the items that remain on the instrument have been in existence, in some form, since the initial administration of the survey.

Design

The predictive design of my study is quantitative, and analysis of the data will be comprised of tests using IBM SPSS Statistics Version 26. The specific syntax for the use of SPSS with the Texas State School Survey data has been provided by Texas A & M University (2018). As a part of research involving quantitative studies, data is used to assist in answering

specific study related questions. The research questions are based on variables that are unique to the study. Variables represent specific characteristics of the population, and when using large databases are instrumental for analysis (Khalilzadeh & Tasci, 2017). Variables in the Texas School Survey are designed to measure risk behaviors, and for the purposes of analysis defines individual variables under 4 scales of measurement listed below:

1. nominal, a level of measurement where each value is a name, category or the label of no particular order or ranking;
2. ordinal, a level of measurement where each value is in order from high to low without equal intervals;
3. interval, a level of measurement where each value is in order from high to low, with equal intervals; and
4. ratio, a level of measurement where each value is in order from high to low, with equal intervals and an absolute zero point;

Nominal measures allow for naming, categorization, or classification. Demographic characteristics such as race and gender are examples of nominal measures found in the Texas School Survey. Ordinal measures have an order or direction such as rankings or levels of agreement. The levels do not provide any type of quantification. An ordinal measure is more likely to assess the perception of likelihood. Interval scales, are also referred to as continuous scales and provide information about an order and will have subsequent equal intervals. An example of a continuous variable would be the age in years.

Survey Administration Procedures

The implementation of the standardized survey was aided by administration procedures developed by the Public Policy Research Institute (PPRI). Schools were required to adhere to the

strict procedures provide by PPRI in order to keep implementation as uniform as possible throughout the State of Texas. The procedures were reviewed and submitted to the Texas A&M review board for approval. In addition to the procedures, an information sheet was provided to parents and/or guardians at least two weeks prior to the administration of the survey. The information sheet provided the voluntary nature of the survey and the ability to opt out of taking the survey overall, and anonymity (Texas Health and Human Services Commission, 2018).

Once the survey was provided to the teachers, the administration took place in the classroom during their regularly scheduled class periods. Teachers were provided a script to read to all students. The scripts themselves were provided to the teachers at least a week in advance, as to allow teacher enough time to review. Students were instructed to fill out the survey as truthfully as possible and when completed, place the survey in a large manila envelope provided by the teacher. Once the surveys were completed, all the envelopes were collected and returned to PPRI for process and data collection (Texas Health and Human Services Commission, 2018). If a student was not in class on that day of the survey administration, there was no opportunity to fill out the survey other than the day scheduled.

The web administration of the survey was similar to the paper format. The surveys were completed either on portable laptops, school computers or desktops in classrooms. Students received a unique, randomly generated 6-digit alpha number, referred to ask tokens, which could only be used once on the Texas School Survey secure website. These survey tokens could only be used once and provided access to the online survey via a secure website.

Missing Data

Before a quantitative analysis can be conducted on data, it is recommended to proceed with a quality check to ensure the missing data is handled properly (Cox, McIntosh, Reason, &

Terenzini, 2014). One of the first steps in cleaning the dataset is to check for random versus nonrandom missing data. Random missing data is inevitable because instances can occur, particularly with an adolescent population for participants to miss or choose not to answer questions. However, nonrandom missing data can pose a serious threat to the validity of the results of the analysis. Nonrandom missing data can occur when, in this case the students, do not have enough time to complete a survey, and there is a pattern of missing data among those questions. However, this is just one example of one instance where missing data can occur. When working with large datasets it might be hard to tell if data is missing randomly. Therefore, Tabachnick and Fidell (2013) suggest performing t-tests on the means of continuous variables in the model with and without missing data to see if there is a significant difference in the outcome of another variable when missing data is deleted, and to observe the percentage distribution among categories of categorical variables.

For example, if the missing data on the age variable is assumed to be nonrandom, then a t-test might be performed on the highly selective variable to see if there is a statistically significant difference in the selectivity of tobacco use from those who reported age compared to those who did not. If the t-test is not significant, that is one way to show that the data is randomly missing on the age variable (Tabachnick & Fidell, 2013). For categorical variables, the percentage distribution of those who are missing gender can be checked to see if it skewed to favor a particular category. If data for a particular variable is not missing randomly then it might be in the best interest to remove the variable from the study. However, this could limit the scope of the study. Therefore, there would be no need to remove the variables.

If data is missing randomly, then there are several ways to handle the issue. There is not necessarily a correct or incorrect way to handle this, but depending on how much data is missing

there are several methods that many researchers have used to handle this problem. One of the most common ways to eliminate missing data is to delete any cases that do not contain complete information. The disadvantage to this method is that the size of the sample for the study could reduce dramatically; but if only a few cases (less than 5%) have to be deleted then this could be the most efficient method (Tabachnick & Fidell, 2013).

A quality check was done on the data to ensure it was handled properly. Working with large datasets it may, or may not affect the overall results. This dataset is considered large and it was necessary to carry out the proper analysis for a goodness-of-fit prior to proceeding with binomial logistic regression analysis. Missing data analysis is more in-depth and vital when special cases such as sub-groups are pulled from the larger analysis. While we used only 7^{th}, 8^{th} and 9^{th} grade cases, the original data set had a total of 49,070 sampled. As mentioned earlier, non-random data can occur when students do not have adequate time to answer survey questions. The chosen method for analysis of missing data was a series of descriptive frequency analysis on the continuous and the categorical percentages on non-continuous variables. Table 3 shows the results of the analysis for age, gender, and grade, close-friend substance use, access and environment. Data for each variable were analyzed in a uniform manner to determine the appropriate procedure for handling missing data.

Table 3

Missing Data Percentages

Variable	% Missing 7th grade	% Missing 8th grade	% Missing 9th grade
Total	9,710	9,048	8,277
Gender	.6 N=61	.9 N=77	.5 N=35
Age	.4 N=39	.6 N=51	.6 N=49
Close-friend substance use	.6 N=299 (tobacco)	2.9 N=263 (tobacco)	2.8 N=233 (tobacco)
Access	4.7 N=452 (tobacco)	4.4 N=400 (tobacco)	5.1 N=418 (tobacco)
Environment	1.5 N=149 (school safety)	1.2 N=106 (school safety)	1.1 N=94 (school safety)
Total Missing	798	897	829

Normally missing data less than 5% will not skew the data analysis (Cox, McIntosh, Reason, & Terenzini, 2014). Observing the data by calculating the frequencies of the total population sample versus selected cases of 7th, 8th and 9th, identified none of the variables over 5% (Table 19). The frequencies were calculated on the original survey question and not the dichotomized variable. Also, noted was the equal amount of missing data across grades 7th, 8th and 9th, in each of the variables. To reduce redundancy, only the analysis for the substance tobacco was discussed most thoroughly. These percentages show that there was a similar distribution across all variables. Therefore, the missing information for each of the variables was most likely not missing systematically. Although not mentioned within their codebook, PPRI may have already eliminated missing variables within the dataset. It appears that missing data will not skew are current data analysis of 7th, 8th and 9th grade adolescents.

Assumptions and Limitations of Logistic Regression analysis

Logistic regression analysis uses maximum likelihood estimation to predict group membership. However, to interpret the results of the prediction of group membership with precision and accuracy, a preliminary analysis of the dataset will be conducted to observe if the assumptions of logistic regression are met. For purposes of the study, using the assumptions that would have the most influence on the results, one of them being the multicollinearity assumption. Prior to analysis of the data, there was a need to collapse the responses from survey that would provide the dependent variable (state of substance use). Very few or no responses were indicated having tried or having access at the other rank levels, thus transformation into a dichotomous yes/no response variable for analysis.

Linearity of the Logit. The assumption of linearity in a binomial logistic regression requires that there is a linear relationship between the continuous independent variables, such as age, and the logit transformation of the dependent variable, substance use by a 7^{th}, 8^{th} or 9^{th} grade adolescent. Hosmer and Lemeshow (2000) recommend using the Box-Tidwell approach to check for a linearity of the logit (Tabachnick & Fidell, 2013). Using this method, a logistic regression model will be created, regressing the dependent variable on each of the continuous predictors, and their interaction terms, which consists of the continuous predictors and its natural log. If at least one interaction is significant then the assumption is violated and a transformation of the variable will be considered (Tabachnick & Fidell, 2013). Outlier, leverage and influential points are also different terms used to represent observations in data that may have an impact on the regression line. Any one of these points can have a negative effect on the regression equation that is used to predict the value of the dependent variable based on the independent variables.

Linearity of the continuous variables. The logit of the dependent variable will be assessed via the Box-Tidwell (1962) procedure. A Bonferroni correction will be applied using all 5 terms (independent variables) in the model resulting in statistical significance being accepted when $p <$ .01 (Tabachnick & Fidell, 2014).

Absence of Multicollinearity. All of the independent variables for all grade levels will be tested for low risk tolerance levels ranging from .23 to .99. Hosmer and Lemeshow (2001) suggest that variables that have tolerance values lower than .20 be used with caution.

Ratio of cases to Variables. When there are too few responses in relation to the number of discrete variables, parameter estimates may inflate, which could produce large standard errors, and ultimately cause the model not to converge (Tabachnick & Fidell, 2013). Therefore, the cell counts were observed for each variable and for each category of the categorical variables. The independent variables of peer, access and environment were collapsed to either yes or no answers and therefore treated as categorical variables.

ROC (Receiving Operating Characteristic) curve. The ROC analysis plots the sensitivity against one minus the specificity (false-positive) to show how well the model discriminates when using our chosen independent variables. As the probability of correctly detecting a non-match (state desired for analysis, i.e. substance use) decreases (specificity), which also increases the likelihood of a false positive (1-specificity). Our interest is the area under the curve, which illustrates the likelihood that the proposed model will determine which 7^{th}, 8^{th}, or 9^{th} grade adolescent will have a higher probability of substance use, than an adolescent who does not match under substance use by the independent variables. The analysis will be run for all three models of tobacco, alcohol and marijuana (Appendix A).

Analysis of Data

This study will apply a predictive research design, using a binomial logistic research analysis as a means of understanding those factors hypothesized as related to risk of adolescent substance use. Since the desire is to provide the probability or odds of risk, that is, whether a student is at risk for substance use based on close-friend substance use, access and environment, logistic regression is the statistical technique chosen for the design. Based on a review of the literature, an analysis will also include descriptive statistics as part of the variable analysis. Logistic Regression analysis will be conducted to establish associations between variables, and to examine the degree to which associations may be present. Chi-Square analysis is commonly used for testing relationships between categorical variables. The null hypothesis of the Chi-Square test is that no relationship exists on the categorical variables in the population. Regression analysis is a reliable method of identifying which variables may have an influence on a topic of interest. In using regression analysis, the research is tasked with defining a dependent variable that is influenced by an independent variable.

Logistic analysis will be employed to examine the relationship between close-friend influence, access, environment and 1) variables of use; 2) interpersonal variables (substance use, safety); and 3) specific substances (tobacco, alcohol, marijuana). Dependent variable: Main factor in trying to understand or identify likelihood of substance use among $7^{th} – 8^{th}$ grade adolescents. Independent variable: Factors that are hypothesized will have an impact on your dependent variable (close-friend substance use, access, and environment). A significance level of $p \leq .05$ will be used throughout hypothesis testing. In statistical hypothesis testing, the p-value or probability value is the probability for a given statistical model that, when the null hypothesis is

true, the statistical summary (such as the sample mean difference between two compared groups) would be the same as or of greater magnitude than the actual observed results.

The goal of this analysis is to correctly identify the probability of risk within the variables of "close-friend" influence, access and environment in effecting the likelihood of substance use in middle school adolescents. This is to be carried out in several steps, starting with determining if a relationship is found between the dependent variable and the predictor variables. For example, this study will determine if substance use can be examined by frequencies, with response on "How recently, if ever have you used tobacco?" "Close-friend" influence can be predicted on "About how many of your close friends use alcohol?", and access/environment can be predicted on "If you wanted some, how difficult would it be to get marijuana?" We will approach this directly, using the standard form for the logistic regression model, generally expressed as:

$$\log(\frac{Y}{1-Y}) = \alpha + B_1X_1 + B_2X_2 + B_2X_3 + \cdots + B_iX_i + \epsilon$$

Where the calculate the ratio of the probability the student will initiate substance use (Y) to the probability that the student will not initiate use (1-Y); questions 14-20, 21, 26, 29, 30 and 34 focused on "close-friend" influence, access and environment of tobacco, alcohol, and marijuana; are represented in the selected predictor variables($X_1, X_{2,}, X_{3,} \ldots, X_i$); the estimated coefficients are represented by ($B_1, B_2, B_3, \ldots, B_i$), with standard error ϵ (Bewick, Cheek, & Ball, 2003).

Further informing the selection of variables and whether the model is specified in a proper manner, is Goodness-of-Fit test. This is an important step as it determines the model's ability to correctly classify those students who use or do not use legal or illegal substances. This step is then followed by a calculation of the probability for use for the 2016 sample data. The hypothesized outcome is that the model will tend towards specificity given that we expect middle

school adolescents use of substances will increase due to the variables (peer influence, access, and environment). The dependent variable (DV) will indicate whether the student has yes to the response of the survey question (1) or no to the response of the survey question (0). Independent variables are discrete, dichotomous, or continuous.

As previously stated, the purpose of this study is to provide an examination of the variables of "close-friend" influence, access and environment as risk-related factors for substance use. The selected variables, are hypothesized to show an association as to whether an adolescent is at risk for substance use.

Research Questions

The research questions associated with the study are grounded in a thorough review of the literature and centered on data detailing prevalence rates among 7^{th}-9^{th} grade adolescents, detailed in the 2016 Texas School Survey. The specificity of choosing three variables to examine substance use among 7^{th} – 9^{th} grade adolescents aids in the overall analysis, particularly in making generalizations to the same population. The relationship of "close-friend" influence, access and environment may play a significant role in middle school students who exhibit risky behavior of substance use.

Demographics

Demographic variables of interest within survey:

Variables of demographics will be questions 1 through 9 within the Texas School Survey including age, gender, grade-level and ethnicity. Demographics related to substance use on campus are of interest for this study. Hispanics males and females tend to initiate alcohol, tobacco and other drug use at higher rates in border communities (Maxwell, 2016).

Research Question 1 for study analysis

Does substance use occur among adolescents' in 7th-9th middle school Texas campuses?

To assess past-month substance use, the question from the survey was used to determine positive or negative substance (tobacco, alcohol or marijuana) in their life-time.

Adolescent substance use – (past-month use)

Questions 14 through 19. "How recently have you used drugs within the past 30 days/since school began in the fall/at least once in your lifetime".

Research Question 2 for study analysis

What is the strength of the association of "close-friend" influence, access or environment in positive substance use of tobacco, alcohol or marijuana by a middle school adolescent?

To assess the strength of the risk-related factors of "close-friend" influence, access and environment, questions 20 and 22 were examined for analysis.

Close-friend influence variable:

Question 20 "About how many of your close friends use:

a. Tobacco?

b. Alcohol?

c. Marijuana?

Access variable:

Question 22 "If you wanted some, how difficult would it be to get:"

a. Tobacco?

b. Alcohol?

c. Marijuana?

Environment variable:

Question 10 “How safe do you feel at school?” evaluates the school environment within the predictive logistical model. Responses available to the student for the questions were, “very safe”, “somewhat safe”, “not very safe”, “not safe at all”, and “don’t know”. The question in the survey is dichotomized to 0 or 1 based on the number of responses available to the student. Positive responses for the feeling safe in school were given a “1”, negative responses were given a “0” for logistic regression computation.

Research Hypothesis

The following hypothesis is presented for analysis with the study population: The risk-related factors of “close-friend” influence, access and environment have a positive association in the likelihood of substance use by middle school adolescents.

Summary

The purpose of this study is to investigate the relationship of the risk-related factors of “close-friend” substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus) of substance use for self-reported behavior by adolescents. It will be informative to learn whether, for instance, if access to substances, influences from close-friend substance use, and school environment would be linked to higher instances of alcohol and drug use among adolescents ages 11-17 years old compared to no substance use. The predictive research design of the study will operationalize questions from the Texas School Survey to examine substance use in a quantitative analysis. Examples such as these variables will aid in defining relationships and parallels within the collected data.

There are no direct questions related to substance use initiation among adolescents within the Texas School Survey questionnaire. Prediction of initiation of substance use is not part of the

study analysis. It is assumed that the enforcement of any policy on substance use on school grounds would lead to a reduction in use and access among adolescents, higher expectation of no use of drugs, higher expected grade for the school year, and access to drug services. The inclusiveness of preventive strategies, screening and assessment and availability of counseling services alongside the policies may prove more effective if the variables of use for adolescents 7^{th} – 9^{th} grade are understood in more detail (Levin & Chisholm, 2016; Li et al., 2011; Maslowsky et al., 2017).

It bears mentioning, substance use by adolescents can occur for a number of reasons, including culture, gender, personality trait and more, but this study will focus on three factors that were not found collaboratively in the literature "close-friend" substance use, access and environment. Earlier stated were the numerous interpersonal, intrapersonal, community and public factors that may alter or affect the relationships of adolescent substance use. Connell, Gilreath, Aklin & Brex, (2010) have reported the most common, such as individual, family, peer, and community domains, with peer substance use are found to have the largest effect as risk factors for substance using adolescents.

As mentioned in Chapter 1, the importance of this study resides in the triangulated risk-related factors that may largely exist among 7^{th} – 9^{th} grade substance-using adolescents, and the transitional period of elementary to middle school.

Chapter 4

Results

This chapter presents the results of the study, and examines the research questions that guided the study. As stated earlier, this study examined only 7^{th} – 9^{th} grade adolescent past-month substance use, and not prediction or dependence of legal or illegal substances. First, exploring increasing rates of substance use among adolescents on school campuses. Second, the likelihood of use with the risk-related factors of "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus), distinctive of 7th – 9^{th} grade adolescents as substance users of tobacco, alcohol and marijuana.

Data Analysis

The data analysis has been made by using the software SPSS version 26.0 (2018), and Excel, and it is composed of two main parts. The first part gathers the descriptive statistics with cross-tabulation of the responses within the survey of 7^{th} – 9^{th} grade adolescents. The second consists in the analysis of the relationship within the variables, using logistic regression analysis, between the selected independent variables and the dependent variable (See Figure 5). The objective was to determine if the independent variables affect substance use among 7^{th} – 9^{th} grade adolescents within a school setting. Three separate predictor models were examined.

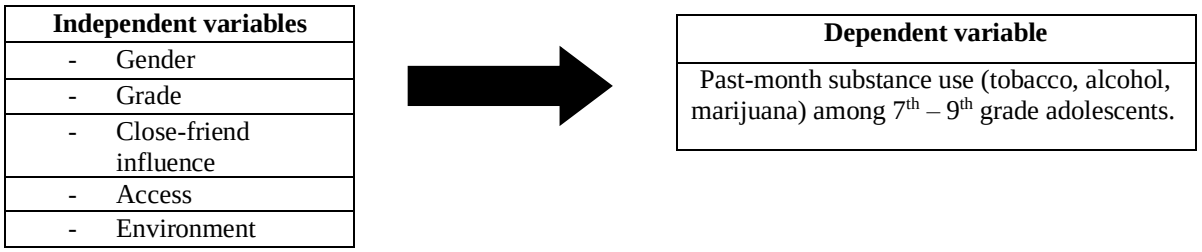


Figure 5 Independent and Dependent Variables

Approval by Human Subjects Committee

This study has complied with the ethical issues and standard of research set forth by the American Psychological Association and the University of Texas at El Paso. Research materials were submitted and approved by the Institutional Review Board of the University of Texas at El Paso for all data analysis.

Participants

Participants consisted of a sample of 27,035 7^{th} – 9^{th} grade adolescents from the original aggregate total of 49,070, 7^{th} – 12^{th} grade adolescents enrolled in Texas school districts, who were administered the Texas School Survey of Drug and Alcohol Use during the fall semester of 2016. The survey consisted of a six-page questionnaire designed to ask questions regarding demographic information, and drug use, including tobacco and alcohol. The survey is administered through the participating school districts who volunteered their campus information through an online website. Schools chosen by the Public Policy Research Institute were stratified, weighted and randomly sampled of all the public-school students between the 7^{th} and 12^{th} grades in Texas. According to the Public Policy Research Institute (PPRI) (2016), each of the schools (140) chosen to participate in the study had the option of the standard pencil and paper administration, or the online version of the questionnaire.

Of the 140 schools who participated in responding to the survey, 53 schools chose to complete the online version, and 87 schools completed the standard paper and pencil method. A script was given to relevant personnel in providing instructions and procedures to the student participants for completing the survey. The survey responses are completely confidential and no identifying student information is provided. PPRI reported that students who did not indicate their grade level on the survey, were estimated based on their age, and the data for the

corresponding responses were retained based on the corresponding grade levels. Table 3 represents the total number of surveys collected by PPRI, and the sample of surveys for 7^{th} – 9^{th} grade for this study.

The total sample surveys for analysis was n= 27,035 of 7^{th} – 9^{th} grade adolescents enrolled in Texas school districts, including El Paso, Texas (locality of the study). Once the data was reviewed, and missing data were eliminated from the sample, a total of 25,961 surveys of 7^{th} – 9^{th} grade adolescents were used for analysis in the study. Examination of the data found several age outliers such as a 16-year-old 8^{th} grader. For this study, all 7^{th}, 8^{th} and 9^{th} graders ages 11 or younger through 15 years of age were included in the analysis to ensure accurate representation of the grade levels. Table 4 and 5 represent the survey distribution by grade, and the assigned age-based grade assignments for aggregate totals.

Table 4

Survey Distribution by Grade

Grade	Usable Surveys	Percentage
Grade 7	9,710	19.8%
Grade 8	9,048	18.4%
Grade 9	8,277	16.9%
Grade 10	8,014	16.3%
Grade 11	7,440	15.2%
Grade 12	6,581	13.4%
Total	49,070	100%

Table 5

Age-based Grade Assignments

Age	Grade
12 years of age or younger	7th grade
13 years of age	8th grade
14 years of age	9th grade
15 years of age	10th grade
16 years of age	11th grade
17 years of age or older	12th grade

Preliminary Analysis

Prior to data analysis, the variables were examined for missing data. In addition, school differences may exist in size, given that data was collected from several different school districts throughout the State of Texas, including El Paso, Texas. Table 6 presents demographic characteristics of the sample population (n=27,035).

Demographic Information

This section of the survey reported various types of demographic information from the students (Table 6). Students in this section reported age, grade level, gender, and ethnicity, and living arrangements. In regard to ethnic background, students were asked if they were Hispanic or Latino. Students were also asked their race.

Table 6

Characteristics of Sample

Characteristics	N	Percentage
Gender		
Male	**13,538**	**50.1%**
Female	13,321	49.3%
Missing	176	.7%
Ethnicity		
American Indian or Alaskan	611	2.3%
Asian American	667	2.5%
Black or African American	1,592	5.9%
Pacific Islander	77	.3%
White	**12,403**	**45.9%**
Some other race	4,975	18.4%
More than one race	3,883	14.4%
Missing	2,827	10.5%
Age		
11 years of age or younger	56	.2%
12 years of age	3,553	12.3%
13 years of age	**8,753**	**32.4%**
14 years of age	8,281	30.6%
15 years of age	5,484	20.3%
16 years of age	695	2.6%
Missing	139	.5%
Grade level		
7^{th} grade	**9,710**	**35.9%**
8^{th} grade	9,048	33.5%
9^{th} grade	8,277	30.6%
Hispanic or Latino		
Yes	**13,381**	**49.5%**
No	12,728	47.1%
Missing	926	3.4%

In Table 6, we observe that the sample seems well proportionate in terms of gender, with only 27 less male responses. Concerning the age, more adolescents 13 years of age (32.4%)

answered the survey, which may also explain the larger 7th grade (35.9%) representation. Furthermore, depending on where the surveys were distributed within each school district, while random, may have only included the classrooms who volunteered participation. Also, there were 56 adolescents 11 years of age or younger that may be included in the 7th grade representation due to the age – grade level categories.

Regarding ethnicity, overwhelming the "White" (45.9%) category was selected, followed by "Some other race" (18.4%), and "More than one race" (14.4%). An additional question in the survey allows to respond to the question of whether or not they are Hispanic or Latino, again proportionate to the sample population, with (49.5%) yes response and (47.1%) no response from the sample population.

Dependent Variable

The dependent variable used to test the hypotheses in this study, is past-month substance use (tobacco, alcohol, marijuana) among 7th – 9th grade adolescents. In grades 7th – 9th grades, students were asked about their lifetime use of tobacco, alcohol and marijuana with 2 questions, "how recently having ever used drugs," and "use in the past 30 days." The response categories for having recently used (tobacco, alcohol, marijuana) were, "used at least once in the past month," "used at least once since school began," "used at least once in lifetime," and "never heard of/never used it." Students could only bubble one response from each of the categories.

In order to label past-month substance use among 7th – 9th grade adolescents, the dependent variable used the highest category of positive responses in the use of tobacco, alcohol, or marijuana from these survey questions. Responses were collapsed to create a binary (yes/no) measure of substance use: students who indicated that they had use tobacco/alcohol/marijuana at least once since school began, or at least once in a lifetime from the survey questions were

classified as substance using ("yes"), and those who had not used tobacco/alcohol/marijuana in the past 30 days or in their lifetime, or did not know of tobacco/alcohol/marijuana were classified as not having used substances ("no").

The dependent variable was recoded as a different variable for a dichotomous value of either "0" or "1." The dependent variable was coded as "0" for no use of substances if the category of "never heard of/never used" was chosen. A value of "1" was coded for all other responses of tobacco, alcohol or marijuana use from the remaining categories with a positive response of substance using. Table 7 outlines the dependent variable for "Individual use" for survey questions 15 and 16, and the independent variables to be included in the logistic model for either tobacco, alcohol, or marijuana.

Independent Variables

The predictor variables included, gender (male or female), grade level (7^{th}, 8^{th} and 9^{th}), "close-friend" influence, environment and access. Gender is already a dichotomous variable with "1" as a male and "0" as a female. Grade level was filtered from the original sample N = 49,070 and selected cases included only those who were in grades 7^{th}, 8^{th} or 9^{th} grade. Grade levels 10, 11 and 12 were not included in the study analysis.

To determine "close-friend" influence (positive substance use by a close-friend), survey question Q. 20 asked, "About how many of your close friends use Tobacco/Alcohol/Marijuana?" Students had the following response options, "none," "a few," "some," "most all." The responses were dichotomized to either "0" or "1". The value of "0" equal responses of "none" for friends who use tobacco, alcohol or marijuana. All other responses of "a few," "some," or "most all," were categorized to a "1" as a positive for "close-friend" influence of substance use.

Access (ability to acquire tobacco, alcohol or marijuana) was assessed with survey Q. 21, "If you wanted some, how difficult would it be to get: Tobacco/Alcohol/Marijuana?" Students had the following response options, "never heard of it," "impossible," "very difficult," "somewhat difficult," "somewhat easy," and "very easy." For analysis within a logistic regression model, the responses were dichotomized to a value of "0", or "1." Responses chosen as "never heard of it," "impossible," "very difficult," or "somewhat difficult" were given a value of "0." Positive responses for access, "somewhat easy," or "very easy," were given a value of "1" as the variable measure.

The variable for environment (school environment as related to substance use) was difficult to ascertain within the survey questionnaire. It was decided survey Q. 10 "How safe do you feel at school?" would evaluate the school environment within the predictive logistical model. Responses available to the student for the questions were, "very safe," "somewhat safe," "not very safe," "not safe at all," and "don't know." The responses were dichotomized to either "0" or "1". The value of "0" equal responses of "not very safe", "not safe at all", and "don't know" were coded as "0" for a negative response to the safety question. The responses of "very safe" and "somewhat safe" were coded as "1" for a positive response to the safety survey question.

The school safety characteristic may partly explain variance in substance use patterns that is not explained by student characteristics alone (Sampasa-Kanyinga, Hamilton, LeBlanc, & Chaput, 2018). Further reasoning in using safety responses, may fall under educational policies that are usually implemented through schools, and the policies influence on the overall health and behavior of students.

Table 7 below provides an overview of the variable measures for this study. The table describes the variable, survey question related to the variable and the rating scale/responses available to the student.

Table 7

Measures of "Close-friend" Influence, Access and Environment

Variable	Measure item	Rating Scale
Past-month substance use	Q. 15., Q. 16	Never heard of/Never used it, Used at least once in the past month, Used at least once since school began in the fall, Used at least once in your lifetime
	How recently, if ever, have you used the following TOBACCO, ALCOHOL, MARIJUANA?	Dichotomized sum of items Never heard of/Never used it = 0, Sum of items Used at least once in the past month, Used at least once since school began in the fall, Used at least once in your lifetime = 1
	IN THE PAST 30 DAYS, how many times, if any, have you used TOBACCO, ALCOHOL, MARIJUANA?	Dichotomized sum of items Never heard of/Never used it = 0, Sum of items 1-2 times, 3-10 times, 11+ times = 1
Close-friend Influence	Q.20.	None, A few, Some, Most all
	About how many of your close friends use: a. Tobacco? b. Alcohol? c. Marijuana?	Dichotomized None = 0, Sum of items, A few, Some, Most all =1
Access	Q. 21.	Never heard of it, Impossible, Very difficult, Somewhat difficult, Somewhat easy, Very Easy
	If you wanted some, how difficult would it be to get: a. Tobacco b. Alcohol a. Marijuana	Dichotomized Never heard of it, Impossible, Very difficult = 0, Sum of items, Somewhat easy, Very easy = 1
Environment	Q.10	Very safe, Somewhat Safe, Not Very Safe, Not Safe At All, Don't Know
	How safe do you feel when you are: a. In your home? b. Out in your neighborhood? c. At school?	Dichotomized Not Very Safe, Not Safe At All = 0, Sum of items Very safe, Somewhat Safe = 1

Analytical Strategy

Frequencies. The univariate testing was focused on the variables' individual characteristic. The testing strategy was to first do frequency testing for the categorical variables

such as gender and having ever used tobacco. This method of testing is used to report the frequency responses to the quantitative data.

Logistic Regression. The goal of logistic regression is to develop a model that will provide the probability and the odds of being a substance using adolescent in grades 7th, 8th or 9th. The objective is to determine if particular factors have an effect in the probability of substance use. In this study the factors of "close-friend" influence, access and environment will be part of the model in determining the probability of substance use. The reported coefficients of each independent variable (close-friend substance use, access, and environment) are evaluated in strength for their influence on the dependent variable (substance use) within a logistic regression model.

Population analysis – substance use

Preliminary analysis was conducted to determine frequency of use among 7th – 9th grade levels. Students were asked the level of substance use for tobacco, alcohol and marijuana in the past month. Choices for responses included "never ever heard" or "never use", overall tobacco use was found to be the largest amount across all grades in the 1-2 times per month response, n=473. Of the 25,297 students responding to the variable of alcohol use in the past 30 days, 2,661 students or 10.5% reported having used alcohol 1-2 times in the past 30 days, and 21,309 students or 81.0% reported "never heard/used" alcohol in the past 30 days. Interestingly the largest jump in grade level use occurred from 7th to 8th grade, with all levels of use ascending over time.

Concerning marijuana use among 7th – 9th grade adolescents, 9th grade adolescents had the highest use at "1-2" times (n=163) overall. Adolescents who are in the 9th grade are typically 14 years of age. The data also shows a significant increase from one grade level to the next in the

"3-10 times" category with the biggest increase between 7th grade (n=193) to 9th grade (n=424). Of the 7th graders (typically 13 years of age) the majority of responses were alarming "1-2 times" (n=639), almost 9% of the sample population and 7.6% of the 7th grade sample.

Marijuana use among adolescents surpassed tobacco use for past month use, particularly in the "1 – 2 times" category. The data shows an increase of use over grade level among 7th – 9th grade adolescents. Significant increase of use occurs between 7th (187 times reported) and 9th (361 times reported) "1 - 2" times use of marijuana in the past month. Students in these grade levels are usually 13-15 years old.

Tobacco use and gender. The subsequent hypothesis was tested using bivariate analysis. A cross-tabulation for the variable "Tobacco use in the past month" indicated that 6.1% of males and 3.9% of females reported tobacco use in the past 30 days. The data indicated 2.2% males were more likely to report past month use than females [There was a statistically significant association between gender and tobacco use in the past month ($p < .05$)].

Tobacco use and grade level. A cross-tabulation for the variable "Tobacco use in the past month" along with grade level indicated that overall 1,312 students responded "Yes" to 30-day use of tobacco within the last 30 days. The data indicated 7.8% of 9th graders responded yes to "30-day past use." There was a statistically significant association between grade levels and "30-day past use," ($p < .05$). The largest jump of grade level use occurs from 7th (2.6%) to 8th (4.9%) grade students (Table 8).

Table 8

Past-month Tobacco use by Grade Level (7^{th} – 9^{th})

Gender	Male	6.1%
	Female	3.9%
Grade	7^{th}	2.6%
	8^{th}	4.9%
	9^{th}	7.8%

*p < .05

Alcohol use and gender. A cross-tabulation for the variable "Alcohol use in the past month" along with gender indicated that overall 6,273 students responded "Yes" to 30-day use of alcohol, with the largest percentage of use among females at 16.9% (Table 9). The data indicated that females responded "Yes" to past month alcohol use over males by 1.2%. [There was a statistically significant association between gender and "past month alcohol use", p = .006.]

Alcohol use and grade-level. The subsequent hypothesis was tested using bivariate analysis for 30-day alcohol use. A cross-tabulation for the variable "Alcohol use in the past month" indicated 9^{th} graders responded "Yes" to 30-day use of alcohol 1,901 times or 44.8%, much higher than 7^{th} (9.8%), and 8^{th} (16.3%) graders among n=26,160 who responded to the survey question. Another indicator of significance is the 23.7% of the 9^{th} grade population responded "Yes" to past month alcohol use. [There was a statistically significant association between grade level and "past month alcohol use", (p < .05)].

Table 9

Past-month Alcohol use by Grade Level (7^{th} – 9^{th})

Gender	Male	15.6%
	Female	16.8%
Grade	7^{th}	9.8%
	8^{th}	16.3%
	9^{th}	23.7%

*p < .05

Marijuana use and gender. The subsequent hypothesis was tested using bivariate analysis. A cross-tabulation for the variable "Marijuana use in the past month" indicated that males responded "Yes" to 30-day use of marijuana within the last 30 days 908 times or 6.9%, and "No" to 30-day use of marijuana 12,200 or 93.1% to the question. Female students responded "Yes" to 30-day use of marijuana within the last 30 days, 885 times or 6.8% and "No" to 30-day use of marijuana 12,147 or 93.2%. The data indicated that males and females equally responded to the survey question for marijuana past month use. [There was no significant association of gender and marijuana use among 7^{th}, 8^{th} and 9^{th} graders, ($p > .05$).]

Marijuana use and grade-level. A cross-tabulation for the variable "Marijuana use in the past 30 days" along with grade level indicated that overall 1,805 students responded "Yes" to 30-day use of marijuana. The 859 students (14 years of age) in 9^{th} grade who responded yes to "Marijuana use in the past 30 days," were almost half (47.6%) of the entire aggregate population from all grade levels (Table 10). The data also indicated higher percentages of use overall than tobacco, with 1,805 students responding yes to marijuana use and 1,312 students responding yes

to tobacco use across all grade levels [There was a statistically significant association between grade levels and "Marijuana use within the last 30 days", ($p < .05$)].

Table 10

Past-month Marijuana us by Grade Level ($7^{th} – 9^{th}$)

Gender	Male	6.9%
	Female	6.8%
Grade	7^{th}	3.5%
	8^{th}	6.9%
	9^{th}	10.6%

*$p < .05$

Aggregate cross-tab totals of substance use among $7^{th} – 9^{th}$ grade adolescents. Totals for adolescents across grade levels, indicates substance use increase as a student progresses through their $7^{th} – 9^{th}$ grade transitions. For example, past month tobacco use increased from 2.6% 7^{th} grade adolescents using tobacco, to 7.8% 9^{th} grade adolescents using tobacco. The same can be said for alcohol use as 9.8% 7^{th} graders, 11.2% 8^{th} graders, and 23.7% 9^{th} grade adolescent were found to use alcohol over a 30-day period. Marijuana, is illegal in Texas, and found $7^{th} – 9^{th}$ grade adolescent's rate increased as well from 3.5% using marijuana in 7^{th} grade, up to 10.6% using marijuana in 9^{th} grade.

Assumptions Analysis

Absence of Multicollinearity. Table 11 shows all of the independent variables for grade level 7^{th}, 8^{th}, & 9^{th} had low risk tolerance levels ranging from .365 – 2.738. If a variable were to have been 3.0-5.0 there would a risk of multicollinearity. Also, Archer and Lemeshow (2006) suggest that variables that have tolerance variables lower than .20 be used with caution as they

may affect interpretation of results within the logistic regression model. The response variables for tobacco responses are shown below.

Table 11

Independent Variables Tolerance Level Analysis Outcome

	Tolerance	VIF
Grade	.365	2.738
Age	.366	2.735
Tobacco "close-friend" variable	.827	1.209
Tobacco Access variable	.837	1.195
Tobacco Environment variable	.990	1.011

*tolerance level below .20 or over 3.0 are considered at risk for multicollinearity.
** tobacco use response questions only

Ratio of cases to Variables. When there are too few responses in relation to the number of discrete variables, parameter estimates may inflate, which could produce large standard errors, and ultimately cause the model not to converge (Tabachnick & Fidell, 2003). Therefore, the cell counts were observed for each variable and for each category of the categorical variables (Table 12). The independent variables of "close-friend", access and environment were collapsed to either yes or no answers and therefore treated as categorical variables.

The 7th grade sample has a mean sample age of 12.71 with the largest representation at n = 9,710. Upon inspection of the categorical variables Table 13, all cell counts appear representative of the overall sample of n = 27,035. The "close-friend," access and environment variables were chosen from responses to tobacco use. The 100% representation for responses to access and environment will provide a more accurate model in the binomial logistic regression analysis.

Table 12

Sample Description – Age

Means for continuous variable			
Sample	7th grade	8th grade	9th grade
n = 27,035	n = 9,710	n = 9,048	n = 8,277
Age	12.71	13.70	14.76

Table 13

Categorical Variable Percentages

Sample n = 27,035	7th grade n = 9,710	8th grade n = 9,048	9th grade n = 8,277
Gender	Male = 4,812 (49.6%) Female = 4,837 (49.8%)	Male = 4,501 (50.2%) Female = 4,470 (49.4)	Male = 4,225 (51.3%) Female = 4,014 (48.5%)
"Close-friend"	9,411 (96.9%)	8,785 (97.1%)	8,044 (97.2%)
Access	9,710 (100%)	9,048 (100%)	8,277 (100%)
Environment	9,710 (100%)	9,048 (100%)	8,277 (100%)

Independence. Logistic regression analysis also requires that the dependent variable only have mutually exhaustive categories that are mutually exclusive of each other. The requirement was met in this analysis, since students' choice is either yes or no to the independent variables. In addition, each of the students' response come from a different unrelated response, so there was no dependency of responses.

Logistic Regression Analysis

Logistic regression analysis was be employed to examine the relationship between "close-friend" influence, access, environment and 1) variables of use; 2) interpersonal variables ("close-friend" substance use, safety); and 3) specific substances (tobacco, alcohol, marijuana). Dependent variable: likelihood of substance use among 7th – 9th grade adolescents. Independent variable: Factors hypothesized to have an influence on the dependent variable (close-friend substance use, access, and environment). A significance level of $p \leq .05$ was used throughout hypothesis testing phase.

The goal of the analysis was to correctly identify the probability of risk for the "close-friend", access and environment variables, in effecting the likelihood of substance use in 7th, 8th and 9th grade adolescents. This was carried out in several steps, starting with determining if a relationship is found between the dependent variable and the predictor variables. In order to identify association of the chosen variables of close-friend substance use, access and environment, logistic regression analysis was performed. The variables were transformed from discrete independent variables, to dichotomous 0/1 variable that were entered into the logistic analysis.

Logistic Regression Analysis Model 1 – tobacco

A binomial logistic regression analysis was performed to ascertain the association of close-friend substance use, access and environment on the likelihood of tobacco use among 7th, 8th and 9th grade adolescents. The total number of participants included in the analysis was n = 25,594, with 1,200 missing cases. The dependent variable was "yes" to tobacco use within the last 30 days. The independent variables included in the binomial logistic regression model included, gender, grade level, close-friend substance use, access and environment (recoded as dichotomous variables 0/1). The running of a logistic regression analysis and testing of the data is to, 1) determine which of the independent variables, if any, have a statistically significant association on the dependent variable, and 2) how well the binomial regression model is able to predict the dependent variable (substance use of tobacco, alcohol or marijuana).

The first logistic regression model was tested on the dependent variable of tobacco use. A test of the full model against the constant only model was statistically significant, indicating that the independent variables of close-friend substance use, access and environment distinguishes those adolescents who had and had not used tobacco (p value = < .05, with df

(degrees of freedom) = 7). The model (Table 14) explained 36.1% (Nagelkerke R^2) of the variance in tobacco use and correctly classified 95% of cases. The environment variable used the safety question to assess a student's perception of: "How safe do you feel when you are: in your home? Out in your neighborhood? At school? Options for responses included: Very Safe, Somewhat Safe, Not Very Safe, Not Safe at All, Don't Know. For analysis purposes, the safety question was included, as the literature had little to no research on an adolescents' school environment related to substance use among middle school adolescents.

Table 14

Logistic Regression Predicting Likelihood of Tobacco use based on Gender, Grade-Level, Close Friend Substance Use, Access and Environment (n = 25,994; <.01 <.05)

	B	SE	Wald	*df*	Sig.	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Gender	-.476	.065	54.007	1	<.01	.621	.547	.705
Grade Level	.065	.042	2.408	1	>.01	1.067	.983	1.158
Close-friend (influence of tobacco use)	2.798	.089	996.546	1	<.01	16.48	13.79	19.52
Access (availability of tobacco)	1.447	.073	388.991	1	<.01	4.25	3.682	4.905
Environment (perception of safety on campus)	-.385	.076	22.880	1	<.01	.680	.586	.789

Note: Variable Gender = male (1) or female (0); Variable Grade Level = 7th, 8th and 9th grade adolescents; Variable Close-Friend = (1) positive response to close-friend tobacco use = A few, Some, Most all; Response None = (0); Variable Access = (1) positive response to Somewhat easy, Very easy; Response Never heard of it, Impossible, Very difficult = (0); Variable Environment = (1) positive response to Very safe, Somewhat safe; Response Not very safe, Not safe at all = (0).

The results of the analysis found there were statistical differences as it relates to gender when included in the model for tobacco use (OR = .621, 95% CI [.547, .705] p = .000), but this may be due to the large number of respondents included in the analysis (n = 25,994). Grade level of adolescents who use tobacco did not have a statistical difference from 7th, 8th, or 9th grade within this model (OR = 1.067, 95% CI [.983, 1.158] p = .121). The variable of "close-

friend" substance use was the strongest association for positive likelihood of tobacco use among adolescents (11-16 years of age) in all grade-levels (OR = 16.48, 95% CI [13.79, 19.52] p = .000]. Additionally, adolescents had a higher statistical difference when responding yes to availability of tobacco (OR = 4.25, 95% CI [3.682, 4.905] p =.000). The variable environment (perception of safety on campus) had a statistical difference in the tobacco model (OR = .680, 95% CI [.586, .789] p = .000) more so than if an adolescent was male or female. And while the question of environment was not related to substance use (How safe do you feel at school?), the positive association within the model was an interesting finding.

Logistic Regression Analysis Model 2 – alcohol

A logistic regression analysis was conducted to determine the association between close-friend substance use, access, environment and demographic variables, and the likelihood of alcohol use among 7th, 8th and 9th grade adolescents. The total number of participants included in the analysis was n = 25,994, with 1,041 missing cases. The dependent variable was "yes" to alcohol use within the last 30 days.

A test of the full model (Table 15) indicated that the predictors distinguished adolescents who did and did not use alcohol in the past 30 days (p value = .000), df = 7). The Nagelkerke R^2 .38 suggests a slight moderate relationship between prediction and grouping, in which prediction success overall was 84% (94.0% for no use and 6.0% for use).

The results of the analysis found there were statistical differences as it relates to gender when included in the model for alcohol use (OR = .870, 95% CI [.805, .940] p = .000), but again this may be due to the large number of respondents included in the analysis (n = 25,994). Grade level of adolescents who use alcohol did not have a statistical difference from 7th, 8th, or 9th grade within this model (OR = 1.057, 95% CI [1.006, 1.111] p = .028). The variable of "close-friend"

substance use was the strongest association for positive likelihood of alcohol use among adolescents (11-16 years of age) in all grade-levels (OR = 11.734, 95% CI [10.622, 12.963] p = .000]. Additionally, adolescents had a higher statistical difference when responding yes to availability of alcohol (OR = 3.419, 95% CI [3.144, 3.718] p =.000). The variable environment (perception of safety on campus) had a statistical difference in the alcohol model (OR = .669, 95% CI [.607, .738] p = .000) more so than if an adolescent was male or female. Odds ratio results revealed that if an adolescent has the perception of safety on a school campus by 1 unit, the variable decreases the overall odds of a positive adolescent alcohol use within this model.

Table 15

Logistic Regression Predicting Likelihood of Alcohol use based on Gender, Grade-Level, Close Friend Substance Use, Access and Environment (n = 25,994; <.01 <.05)

	B	SE	Wald	*df*	*p*	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Gender	.115	.040	8.345	1	<.01	1.122	1.038	1.213
Grade Level	-.397	.079	25.123	1	>.01	.672	.575	.785
Close-friend substance use	2.455	.051	2305.772	1	<.01	11.65	10.539	12.878
Access	1.228	.043	814.804	1	<.01	3.414	3.138	3.715
Environment	-.393	.050	61.331	1	<.01	.675	.612	.745

Note: Variable Gender = male (1) or female (0); Variable Grade Level = 7th, 8th and 9th grade adolescents; Variable Close-Friend = (1) positive response to close-friend alcohol use = A few, Some, Most all; Response None = (0); Variable Access = (1) positive response to Somewhat easy, Very easy; Response Never heard of it, Impossible, Very difficult = (0); Variable Environment = (1) positive response to Very safe, Somewhat safe; Response Not very safe, Not safe at all = (0).

Logistic Regression Analysis Model 3 – marijuana

A logistic regression analysis was conducted using close-friend substance use, access, environment and demographic variables to predict the likelihood of marijuana use of 7th, 8th and 9th grade adolescents. The total number of participants included in the analysis was n = 26,140. The dependent variable was "yes" to marijuana use within the last 30 days. Of the 26,140 adolescents included in the analysis, 895 were missing for marijuana use variable.

Table 16

Logistic Regression Predicting Likelihood of Marijuana use based on Gender, Grade-Level, Close-Friend Substance Use, Access and Environment (n = 26,140; <.01 <.05)

	B	SE	Wald	*df*	*p*	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Gender	-.166	.056	8.874	1	<.01	.847	.759	.945
Grade Level	-.014	.037	.137	1	>.01	.986	.917	1.061
Close-friend substance use	3.095	.104	885.14	1	<.01	22.095	18.02	27.092
Access	1.658	.066	638.47	1	<.01	5.247	4.614	5.96
Environment	-.559	.065	74.035	1	<.01	.572	.503	.649

Note: Variable Gender = male (1) or female (0); Variable Grade Level = 7th, 8th and 9th grade adolescents; Variable Close-Friend = (1) positive response to close-friend marijuana use = A few, Some, Most all; Response None = (0); Variable Access = (1) positive response to Somewhat easy, Very easy; Response Never heard of it, Impossible, Very difficult = (0); Variable Environment = (1) positive response to Very safe, Somewhat safe; Response Not very safe, Not safe at all = (0).

A test of the full model (Table 16) indicated that the predictors distinguished adolescents who did and did not use marijuana in the past 30 days (p value = .000, df = 1). The Nagelkerke R^2 .407 suggests a strong relationship between prediction and grouping, in which prediction success overall was 93% (94.8% for no use and 5.2% for use) (Table 16). Individual examination of the predictors indicated that all variables within the model contributed to the predictive likelihood of marijuana use. Odds ratio revealed that when a "close-friend" uses marijuana, increased by one unit (with a 1 indicating a positive use of marijuana), the odds of an adolescent using marijuana in the past-month was 22 times more likely, than an adolescent with no friends using.

The results of the analysis found there were statistical differences as it relates to gender when included in the model for alcohol use (OR = .847, 95% CI [.759, .945] p = .000) (n = 25,994). Grade level of adolescents with past-month marijuana use did not have a statistical difference from 7th, 8th, or 9th grade within this model (OR = .986, 95% CI [.917, 1.061] p = .137). The variable of "close-friend" marijuana use was the strongest association for positive likelihood of marijuana use among adolescents (11-16 years of age) within all grade-levels (OR = 22.095, 95% CI [18.020,

27.092] p = .000]. Additionally, adolescents had a higher statistical difference when responding yes to availability of marijuana (OR = 5.247, 95% CI [4.614, 5.967] p =.000). The variable environment (perception of safety on campus) had a statistical difference in the marijuana model (OR = .572, 95% CI [.503, .649] p = .000). Odds ratio results revealed that if an adolescent has the perception of safety on a school campus by 1 unit, the variable could decrease the overall odds of a positive adolescent marijuana use.

Summary of Analysis

The proposed research questions sought to determine if access and environment are associated with substance use among the 7^{th} – 9^{th} grades. There is a greater chance an adolescent will illicit use of a substance if they believe a "close-friend" is also a subsequent user (Table 17).

Table 17

Logistic Regression Odds Ratio totals Predicting Likelihood of Substance Use among 7^{th} – 9^{th} Grade adolescents

	Close-friend substance use	Access Odds Ratio	Environment Odds Ratio	*p*
	Odds Ratio			
Tobacco	16.40	4.24	.680	<.01
Alcohol	11.73	3.41	.669	<.01
Marijuana	22.09	5.24	.572	<.01

The binominal logistic regression analysis found strong associations within the independent variables of substance use (tobacco, alcohol, marijuana) among adolescents. The strongest association was the "close-friend" marijuana, where adolescents were 22 times more likely to use marijuana if their close-friend was also using. In the next chapter a discussion on the findings, implications, and a discussion for further research will discuss the impact of the analysis as well as recommendations for prevention, intervention among adolescents in middle school campuses.

Chapter 5

Discussion and Conclusions

The purpose of this quantitative study was to examine the association of "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus) on the likelihood of use by 7th, 8th and 9th grade adolescents who responded to the Texas State School Survey in the fall of 2016 (Texas Health and Human Services Commission, 2018). This study was undertaken to examine the relationships between alcohol, tobacco, and marijuana use among adolescents, and the susceptibility to substance use with association factors of close-friend substance use, access and environment. The main research question of substance use among adolescents was based on the strength/weakness related to the relationship of close-friend substance use, access or environment in the use of tobacco, alcohol or marijuana.

This study confirms previous research regarding relationships between individual factors and substance use among adolescents. The individual characteristics related to tobacco, alcohol and marijuana use resulted in expected directions of use over grade level and increased use, if a "close-friend" used a substance as well. Like earlier studies that have shown higher instances of use with older adolescents, the same appears as much for adolescents who are 11-12 years of age. The likelihood of use by adolescents was confirmed by the results of the logistic regression analysis models. Although few studies have looked at much younger adolescents (11-16 years old) and their use of legal and illegal substances, the findings are similar with studies of high school and college age adolescents. The findings of this study are generally consistent with discussion of "close-friend" use, access and environment as it relates to feeling safe on a school

campus, and the findings are robust in making inferences as it relates to younger age substance use.

Discussion of Results

Results of the study indicated that "close-friend" influence is a strong association as a risk-related variable for substance use among adolescents. The results from the analysis pinpointed specifically to the strength of "close-friend" influence (responding "yes" to close-friend substance use using either tobacco, alcohol or marijuana). Adolescents who are enrolled in 7^{th}, 8^{th} or 9^{th} grade level courses are transitioning from elementary schools, are within the ages of 11-16. Much of their influences of behavior, including rebellion, risk and health are normalized through their relationship with close-friend substance use and less with the parents at this period of their life (Cambron, C., et al., 2018). The relationship of "close-friend" influence is a determining factor of adolescent substance use, thought to be more in latter adolescence (Mayes, L. C., & Schuman, N. E., 2015), but a positive relationship of "close-friend" influence and substance use at ages 11 - 16 increases the likelihood of substance use based on the study findings. Close-friend substance use can either promote or discourage substance use at any age (Sampasa-Kanyinga, et al., 2018). If an adolescent frequents with friends who engage in substance use, and have access to the substance, the behavior is accepted and odds of substance use are much more likely (Catalano, et al., 2011).

The results of the environment (perception of safety on campus) was found to be a strong variable, even when controlling for "close-friend" substance use, and perceived availability of substances (tobacco, alcohol or marijuana). This finding is the most significant among all three models as there appears to be a dynamic influence on the perception of being safe that may compel a student to either refrain or exhibit risky substance use behavior. And while there was

only the one question regarding environment asking, “How safe do you feel at school?” the results confirm researchers citing the associated influence on substance use among adolescents (Evans-Whipp et al., 2004; Hennessy, & Tanner-Smith, 2015). With this finding, further research is warranted in recognizing positive environmental influences on middle-school campuses, as research continues in identifying risk factors for younger adolescents (11-16 years of age). The variable of their school environment (elementary/middle school) specific to younger adolescents should be considered for prevention/intervention strategies, policies and programmatic prevention efforts. Studies have found that policies in middle school grades have the opportunity to regulate an appropriate positive environment for adolescents, and the ability to negate the curiosity of substance use overall (Li, Ahang, Liu, Arbeit, Schwartz, Bowers, & Lerner, 2011; Noland, Rayens, Riggs, Staten, Hahn & Riker, 2011).

The increasing emphasis on creating a wider net for specific social and environmental influences in substance use is partly based on the limited effectiveness of past approaches targeting adolescent risk factors (Edalati, Doucet, & Conrod, 2018). As confirmed in this study, the association of “close-friend” influence is a social variable that bears further scrutiny. Research suggests that the normalcy of no-use increases the odds of an adolescent of not using substances, if their close-friends do not use substances (tobacco, alcohol, or marijuana) (Gottfredson, 2017; Guyll, Madon, Spoth & Lannin, 2014; Hawkins, Graham Maguin, Abbott, Hill & Catalon, 1997; Janssen, Treloar-Padovano, Merrill, & Jackson, 2018). However, modifying individual risk factors is a daunting task for both public and education policy makers seeking to reduce substance use. Compared to individual risk factors, policy makers are more likely to have a greater control over the characteristics of school context and environment. Therefore, identifying school components (particularly an environment of safety/perception of

safety from a students' standpoint) that can alter or prevent substance use among 7th, 8th and 9th grade adolescents may provide more effect tools for substance use reduction programs, and policies.

Access of tobacco, alcohol or marijuana continues to be a risk-related factor, as findings suggest an association in all three logistic regression models. While the variable of accessibility has not yet been widely studied, particularly access on middle-school campuses, the association along with "close-friend" influence may have implications consistent with increased substance use. There is a growing body of research that is focused on marijuana availability, particularly in states that have legalized recreational marijuana (Reboussin, et al.). Further research on perception of harm may partially explain increased exposure and opportunities to use tobacco, alcohol, or marijuana.

Conclusions

As hypothesized, there was a positive relationship of adolescent substance use and the risk-related factors of "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus). The study did not attempt to predict when an adolescent will commence substance use, but whether, the likelihood of use would occur with the influence of close-friend substance use, access and environment. What cannot be concluded from this study is the timing of the interactions, or the timing of the relationship. There appears to be an increase of curiosity and/or rebellion at this age, but whether it's due to a transitional period or other factors at play, are unknown with this study. The timing of initiation of tobacco, alcohol or marijuana cannot be concluded, or if there was in anyway a "gateway effect." It can, however, be concluded that tobacco, alcohol, and marijuana are being

used at this grade level, and at an age where the biological development of an adolescent is critical (11 - 16 years old).

The drug of choice for adolescents in this study was alcohol, closely followed by marijuana and tobacco. Alcohol use was significantly higher marijuana and tobacco use as reports of use were higher proportionally. This may imply, that access to alcohol and marijuana seems much easier for adolescents and may be cheaper to acquire than tobacco. These findings suggest that additional research is still warranted, due to continued substance use among adolescents' ages 11-16 years of age, of legal and illegal substances such as marijuana. Some studies suggest a strong connection between smoking tobacco and the normalizing of smoking marijuana (Kristjansson et al, 2018; Leatherdale, Hammond & Ahmed, 2008). This in part, may be linked to the actual physical know-how of smoking itself, a common method of transmission known to adolescents. There may be a missing mechanism, factor or normalizing issue overlooked in younger adolescent substance use prevention and treatment efforts. Further examination of younger adolescents and their behavior patterns as it relates to substance use is suggested.

The intent of this study was to show evidence that younger adolescents (11 - 16 years of age) are using substances proportionally the same to high school adolescents (Centers for Disease Control and Prevention, 2017; Guyll, et al., 2014; Hawkins, Catalano & Miller, 1992). More specifically, the study was focused on confirming the association of "close-friend" substance use, access and environment on the influence of risky behavior of substance use. There were in fact differences among the variables on their influence for this population, and the innovative part of this study lies in how it looked at close-friend substance use, access and

environment differentially influencing association of adolescent substance use in middle school adolescents (11 – 16 years of age).

An adolescents' "close-friend" substance use increased the likelihood of use across, grade, gender and substance. This may further imply that more prevention/intervention efforts should be inclusive of age-related adolescents, who can suggest innovative strategies that may have an impact on school campuses. The findings suggest middle school adolescents are finding ways to experiment with substance use, and will continually test the boundaries of their environment (safe to decline substance use/no accessibility of substances on campus). If a school has prevention strategies to reduce substance use on campus, the likelihood an adolescent will use decreases significantly (Hennessy & Tanner-Smith, 2015). More importantly, parents should be concerned, with the influence "close-friend substance use have on adolescent's risky and rebellious nature to use substances such as tobacco, alcohol and marijuana. Their input and feedback for policy implementation on school campus, would complement both adolescent and school official prevention efforts.

Theory Model Associations

The study was guided by three theoretical lenses, Ecological Model of Behavior and Health, Theory of Triadic Influence Theory and the Reactance theory. Each having their foundation based on Bandura's Social Learning Theory (1977). The diagram in Chapter 3 was created to show relationships across theory and variables. The diagram below highlights close-friend substance use, as a strong association in the influence of substance use among adolescents. The variables of gender, and grade also had an influence in the likelihood of substance use (Figure 9). Findings regarding the variable of environment (perception of safety on campus), was surprisingly an important factor beyond substance use among adolescents. Identifying a

protective factor within the models was an important implication that highlighted the importance of an adolescent's perception of being safe while at school. A survey that includes specific questions related to a student's school environment involving substance use is further warranted, as well as identifying other interactional factors that may be occurring in an adolescent at this transitional stage of their life.

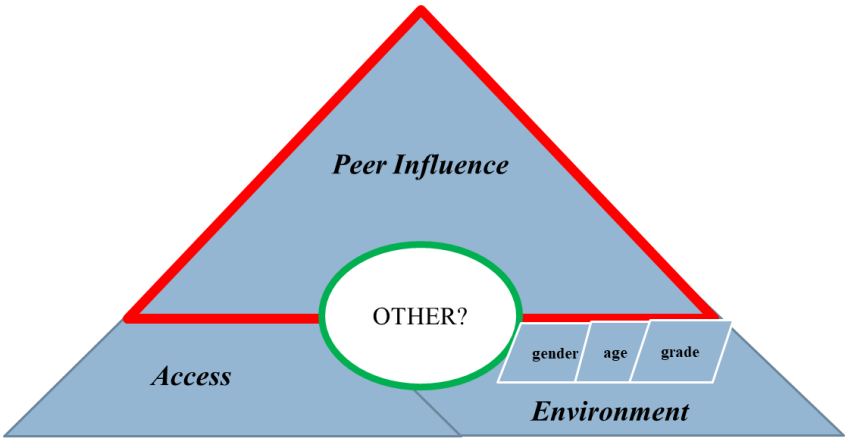


Figure 4 Theory Model Associations

The Theory of Triadic Influence is grounded in the cognitive influences that occur during an adolescent's life. The theory was incorporated to explain the biological influences that may be occurring in substance using adolescents. The theory incorporates the environment, person and situation to explain the behavior also known as reciprocal determinism (Petraitis, Flay & Miller, 1995). Based on the above theory, the cultural environment in which an adolescent matures, the more important the immediate situation may become for an "influence-stream." The diagram shows the greater influence in an adolescent are the variables of "close-friend" influence and access, as it relates to substance use among adolescents. As mentioned earlier, the stress and challenges of transitioning from elementary to middle school include developmental and physical demands, so analyzing these challenges through different theoretical lenses was prudent for the study.

Finally, the Ecological Model of Behavior, is a person's health perspective having multiple levels of environmental influences such as public policy, community, institutional, interpersonal and intrapersonal factors (McLeroy et al., p. 355, 1988). The study outcome of interest particular to adolescents were the social and behavioral factors with substance use. A student's relationship outside of the family includes school, clubs, and networks that have defined boundaries. The context of a student's use of tobacco, alcohol or other drugs is determined to be a risk factor if the relationship within any of these networks is less than positive (Petraitis, Flay & Miller, 1995; Petraitis, Flay, Miller, Torpy & Greiner, 1998). The study outcomes found close-friend influences as the strongest factor for an adolescents' likelihood of substance use.

Implications

What this may mean overall, is when looking at substance use in adolescents, it should not be in a vacuum. So, while this study attempted to explain the likelihood of substance use with 3 risk-related factors, there may be more to extrapolate from further research in this age group. This is necessary for determining factors that are contributing to increasing use of substances overall within this age population (11-17 years of age).

There obviously needs to be some long-term longitudinal studies to address these, and many other questions concerning the problem of substance use and the relationship to age, alcohol, attachment, gender, environment and access. In follow-up studies, it would also be useful to try to explain external variable association on marijuana use, and to possibly include a correlation with other variables that would be considered risk-taking behaviors other than substance use.

Education Policy Recommendations

In the short term and from a practical standpoint, it would be prudent education policy to try to reduce alcohol and marijuana use, not only as a drug-reduction strategy but also for the long-term association and consequences (Green et al., 2016; Luthar, Small, & Ciciolla, 2018). Questions should be asked in these types of studies as well as longitudinal studies, to try to learn what other variables are occurring in a younger adolescent's life emotionally, spiritually, physically, and academically when they made the decision to use marijuana, alcohol, and/or tobacco. It would be useful to develop a scale to measure the association of close-friend influence on these decisions. Specifically, being able to identify in what environment is an adolescent most susceptible for the likelihood of close-friend influence or persuasion for substance use. For example, a house party would rate a higher susceptibility for alcohol risk-taking behavior, the levels of susceptibility would explain when and where intervention/prevention efforts would mediate their curiosity for substance use.

The problem of adolescent substance use of tobacco, alcohol, and marijuana is complex and needs addressing from a behavioral as well as a biological perspective (Luther, Small, & Ciciolla, 2018). If adolescents are able to learn a multitude of positive behavioral, physical and language skills, how then are we surprised at their learning negative behaviors at this age? The problem of adolescent substance abuse needs a holistic approach from every discipline in order to make a positive change for adolescents at this age (11-16). As this was a quantitative study focused merely on the factors available within the survey, other areas of interest could not be identified. Prediction of first-time use of any substance would help in learning why adolescents take the risk knowing the dangers of substance use. Future studies could incorporate a medical venue in recognizing risk factors for substance use among adolescents. As early as 1993 (Elster,

A. B. & Kuznets, 1994) physicians were provided a patient care guide in identifying symptoms of substance use, this coupled with early interventions in adolescents could provide fruitful prevention efforts. Screening and Brief Intervention studies in emergency room trauma centers have found success to effectively reduce drinking and alcohol-related consequences (Antti-Poika, Karaharju, Roine, & Salaspuro, 1988). These short brief conversations with adolescents can happen in counselor's offices, teacher's conference periods as well as any "close-friend" influenced intervention.

I was hoping to find answers to the susceptibility of substance use within the data that would aid in creating a model of prevention for middle-schools. The finding regarding perception of safety as a variable of interest, can be a jumping off point for future research. Conversations with focus groups of adolescents in this age group (11 – 16 years of age), could provider clearer answers in their reasoning behind risky behavior in the use of tobacco, alcohol and marijuana use. Along with the content from the focus groups, a new survey could include questions of access to substances. Where are they most able to acquire illegal substances such as marijuana? Why do they consider vaping as an acceptable form of substance use? What is considered risky behavior to them when it comes to substance use? What do you consider being safe at school? What does a safe space look like to you at school? Who do you consider a safe person to talk to regarding substance use? These among other questions would be able identify the why-and-when substance use experimentation occurs, in order to minimize, decrease, and prevent overall substance use among adolescents.

A recent report from the Centers for Disease Control and Prevention found 1 in 5 adults will know someone who has an issue with drugs, alcohol or tobacco use (Substance Abuse and Mental Health Services, 2018). Adolescent substance use may depend on a number of influences,

including parental drug use, view of no-harm experimentation, (Catalano, Haggerty, Hawkins & Elgin, 2011; Guyll, Madon, Spoth & Lannin, 2014), peer influence, depression, trauma and many other risk factors (Center for Disease Control and Prevention, 2017). Instructional programming to discourage alcohol, tobacco, marijuana and other drug use is widely varied, and are falling below the recommended state-mandated standards (Bruckner, Domina, Hwang, Gerlinger, Carpenter & Wakefield, 2015). This may be due to cost, manpower, and/or minimal-to-no experienced instruction on the delivery of a drug prevention curriculum among K-12 educational institutions.

Examination of school differences in substance use prevalence and identification of significant school factors are essential to the development of effective prevention policies and programs (Hawkins et al., 2016). Programs specifically tailored to individual school contexts could be developed and implemented, particularly for high-risk schools, if these schools can be identified by school characteristics (Ennett et al., 1994). Identification of high-risk schools rather than high-risk individuals increases the effectiveness of intervention programs since most adolescent substance use prevention/intervention programs are school-based, and changes in school characteristics may be easier to bring about than modification of individual risk factors. Furthermore, modification of school contexts may have a greater effect than programs targeted to individual adolescents do, because they change the entire school environment, if they are effective. However, the role of individual attributes in substance use should not be overlooked either because contextual association can differ on individuals of different characteristics.

According to the Texas Education Code for student's 6^{th} - 12^{th} grade, school districts are required to offer health education instruction, but health education is not a requirement for Texas high school seniors to ultimately graduate (Texas Education Code, 2018). The code does not

provide a minimum or a maximum number of hours to teach students about the harmful association and negative consequences in the initiation substance misuse. Furthermore, school personnel, including counselors and teachers often face challenges when students are misusing illegal and legal substances (Gershman, 2012). Gorman and Huber (2009) found that school counselor and teachers are inadequately prepared to identify, address, or assist adolescents identified as abusers of illegal or legal substances.

The Center for Disease Control and Prevention and federal mandates have resulted in policy that prohibits the use of tobacco, alcohol and other drugs on almost all school campuses (Lee, Miller, Brener, Michael, Jones, Leroy, & Barrios, 2019). The types of policies vary in degree and enforcement. Each district is incumbent on facilitating prevention efforts based on the state policy, and the value is in influencing the behavior of adolescents particularly when it comes to drug use. Overall school campus policies are initiated by school leadership, yet implemented by school staff with little input from surrounding communities in proximity to the campus. Adolescents become adults that contribute to their community, yet issues of substance use on school campuses are silenced or function in a silo, privy to only those that initiate a policy. There is little to no interaction with student councils, student body advocates, campus counselors, parents or parental figures. The direct consequence of adolescent substance use directly association a community with causal factors such as accidents, truancy, and other negative consequences associated with substance misuse. Policies that focus on counseling, treatment, and peer support versus the current punitive and punishment campus consequences may have more positive and successful outcomes (Gottfredson, 2017), based on research findings (Li et al., 2011).

A policy serves to mediate a construct connecting individuals to the larger social environment, in this study, the school campus. The purpose of the anti-drug policy is to restrict the behavior of a student who may have the opportunity to initiate substance use. There is research evidence across schools in the enforcement of these types of policies, primarily in tobacco use (Evans-Whipp et al., 2004). The bulk of the research focuses on the impact these policies had, and should be inferred to similar policies of consumption of alcohol and drugs (Ross, Einhaus, Hohenemser, Green, Kann, Gold, 1995). The inference can be found in the research, connecting tobacco consumption to the likelihood in the use of other classes of drugs, such as alcohol or marijuana (Leatherdale, Hamon, & Ahmed, 2008). Leatherdale et al. (2008) found students who had consumed alcohol and smoked tobacco, were 190 times more likely to try marijuana. E-cigarettes may be the new gateway drug to combustible cigarettes, as we don't have the science yet to yield the consequences, but early studies from Leventhal et al., (2015) and Chapman et al., (2018) have found adolescents are more likely to use combustible cigarettes later-in-life after vaping during their adolescence.

Findings on policies enforcing adolescent substance use on campus is quite diverse and inconclusive (Agabio, Trincas, Floris, Mura, Sancassianai & Agermeyer, 2015; Evans-Whipp et al., 2004; Flynn, Falco & Hocini, 2015; Hennessy & Tanner, 2015). Studies report varying magnitudes of relationships of policy formation and compliance among schools. The majority of policies included punishment and enforcement, to very little/if any enforcement of tobacco use particularly among high school students (Flay et al., 1999; Kann et al., 2007; Noland, Rayens, Riggs, Staten, Hahn & Riker, 2011).

Qualitative Reflection

One of the main goals of this study was to determine an association of the risk-related factors of, "close-friend" substance use (influence), access (acquisition of tobacco, alcohol or marijuana), and environment (perception of safety on campus). Within that goal was to make the data findings, examination, and results accessible to school officials and educators. As with past research, much of adolescent substance use data is quantitative in nature due to the accessibility of students within districts participating in large survey examinations. It is difficult to acquire the type of data necessary to make inferences of adolescents across grade levels, across districts and across regions. The need for further mixed-method studies suggests the lack of definitive information on adolescent substance use, other than the use of tobacco, alcohol and marijuana continues in this age group based on the findings in this study. It remains unclear which preventive measures would be positive for adolescents (11-16 years of age) to refuse substance use.

Predictors of risk are identified in the literature such as parental use, history of mental illness, trauma, lack of school participation among many others (Bruns, Duong, Lyon, Pullmann, Cook, Cheney & McCauley, 2016; Catalano, Haggerty, Hawkins & Elgin, 2011). The positive indicators for adolescents not using substances are strong family connections, higher-than-average grades, and positive self-image (Haas, Zamobanga, Bersamin & Hyke, 2018; Flay, Petraitis & Hu, 1999; Hawkins, Catalano & Miller, 1992). Armed with the historical findings of adolescent substance use, school officials, such as superintendents and principals can aid their school personnel with insightful information on positive prevention measures for their classrooms. Resources are abundant across online platforms, and many community non-profit organizations receive state-wide funding to provide training and education sessions free of

charge to audiences that include students, parents, teachers, counselors and coaches. It is well documented that early initiation of alcohol or drug use is associated with increased risks of developing a substance use disorder (Luthar, Small & Ciciolla, 2018; Leventhal, Strong, Kirkpatrick, Unger, Sussman, Riggs & Audrain-McGover, 2015). Providing informational tools to school personnel is a preventive measure that could produce a positive influence, particularly with the types of devices that are easily concealed on school grounds, such as vaping products. Recognizing the signs and symptoms of substance use is easily attainable with informational tools.

Some of the more insightful online resources include:

- Substance Abuse Health and Human Services Administration

  Alcohol, Tobacco, and Other Drugs

  https://www.samhsa.gov/find-help/atod
- Substance Abuse Health and Human Services Administration

  Medication-Assisted Treatment for Substance Use Disorders

  https://dpt2.samhsa.gov/treatment/
- Centers for Disease Control and Prevention

  Teen Substance Use and Risks

  https://www.cdc.gov/features/teen-substance-use/index.html
- Centers for Disease Control and Prevention

  Adolescent and School Health

  https://www.cdc.gov/healthyyouth/data/topics/index.htm
- U.S. Department of Health

  Adolescent and Substance Use Resources and Publications

https://www.hhs.gov/ash/oah/resources-and-training/adolescent-health-library/substance-use-resources-and-publications/index.html

- National Institute on Drug Abuse

  Monitoring the Future – Measures drug and alcohol use among adolescents nationwide

  https://www.drugabuse.gov/related-topics/trends-statistics/monitoring-future?utm_source=google&utm_medium=cpc&utm_campaign=MTF-2019

All of these online sites provide reliable information on adolescent substance use, facts, figures and publications. The whole idea is to moderate the influence of the risk factors that are currently increasing the likelihood of substance use. The persistence of adolescent problem behaviors may be more related to the likelihood of substance use. Unable to determine who is at risk increases the odds of substance use among adolescents who engage in risky, rebellious behavior. Designing preventive efforts based on this understanding could be the first step in reducing substance use, and its negative consequences. School-based prevention efforts should also work in combination with family prevention programs. The efforts would mutually educate caregivers on parental monitoring techniques, while also limiting the likelihood of adolescents forming associations with deviant peer groups. Previous research has shown that highly monitored adolescents are at a decreased likelihood of forming connections with substance using peers (Schinke, Schwinn, Hopkins, & Wahlstrom, 2016; Schinke, Fang, & Cole, 2008).

Limitations of Study

This study was limited in that the design was based on secondary data analysis. Analysis of existing data, limits what information can be analyzed based on the fact that one can only look at data, and variables that the original study included. Another limitation of this study was the

exclusion of factors that could be possible confounders for the variables found to influence drug use (i.e., education, parental drug use). The excluded variables were not included in the original study therefore they could not be included in the secondary data analysis.

Additionally, due to the age of the students, responses to survey questions can be misreported, underestimated, or overestimated. A study by Murphy and Rosenman (2019) identified areas of concern with adolescent survey reporting, i.e. stigmatization, peer-pressure or fear of being identified as a substance user. But their findings suggest adolescents may have a prevalence of substance use, higher than reflected in the overall statistical analysis. Their findings suggest a 6% underestimation of marijuana use by adolescents in a State Healthy Youth Survey. Additional research on adolescent survey responses in the prevalence of substance use is recommended.

Future Research

Future research should include more studies focused on the antecedents of drug use specifically for younger adolescents ages 11 - 16. This is necessary for determining what factors are contributing to the recent increase in substance use among this age group. As mentioned previously, future research should include more factors related to close-friend substance use and why they are more influential than parents. It is also important for future research to not only look at racial/ethnic differences but to look at cultural and environmental differences that exist among the racial/ethnic groups. Another area important for future research is substance dependence in the adolescent population. Research is warranted in this area to further determine the risk of dependence among younger adolescents as well as the appropriateness of the use of the DSM V for identifying substance dependency among adolescents.

This study answers several important questions about the influence of school contexts on adolescent substance use. One is the overall significance of school contexts in reference to peer influence and continued use of legal and illegal substance by younger adolescents. Although the majority of variation in tobacco, alcohol and marijuana use across schools stems from individuals who comprised the schools, this analysis confirmed again the notion that "school matters", along with parent and adolescent inclusion in the development of school prevention policies. These results suggest that modification of school prevention efforts may have broad and stable impacts in the prevention of adolescent substance use, if we correctly identify and address related school components. Such components include, providing a safe campus wherein adolescents feel protected and able to resist substance use. School personnel knowledge of substance use trends, and their ability in recognizing signs of substance use in the classroom, are steps that lead to impactful preventive measures. The impact lies in questioning those adolescents and distinguishing positive factors, which make a difference when met with making a choice to use tobacco, alcohol or marijuana at such a young age.

The predictive models in this study indicated that substance use occurs at this age (11-16 years old). The majority of adolescents did not indicate a positive response to using either tobacco, alcohol or marijuana. The adolescents whom did respond positively to substance use, on average approximately 7-8% of the surveyed respondents, should be the focus of attention. Imploring school officials to heed the warnings, and prepare appropriately in their prevention efforts was a goal of this study, particularly as the nation learns of the dangers with new novel drugs on the market (i.e. vaping products, CBD, THC and wax pens), making their way quickly and unannounced to an adolescent's curious hands.

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Appendix A

Receiver Operator Characteristic (ROC) Curve Analysis

ROC Curve. The ROC (Receiving Operating Characteristic) curve, plots the sensitivity against one minus the specificity (false-positive) to show how well the model discriminates when using our chosen independent variables. As the probability of correctly detecting a non-match (state desired for analysis, i.e. substance use) decreases (specificity), which also increases the likelihood of a false positive (1-specificity). Our interest is the area under the curve, which illustrates the likelihood that the proposed model will determine which 7^{th}, 8^{th}, or 9^{th} grade adolescent will have a higher probability of substance use, than an adolescent who does not match under substance use by the independent variables. The analysis was run for all three models of tobacco, alcohol and marijuana. Below the ROC curve for the marijuana use model had a specificity set at 1 and had an outcome value of .848 for "close-friend" use variable, .804 for marijuana access variable, age variable of .661, and grade level of .623. According to Archer and Lemeshow (2006), our model would fall into the category of good discrimination. The area that is measured is discriminating its ability to correctly classify those with a likelihood of substance use, in this case use of marijuana. Note the diagonal nature of this particular overall outcome is no worse or better with the chosen independent variables. Overall, the percent of the data that was correctly classified under just the ""close-friend" use" variable was 85.6%. The variables with little to no effect were age (.661 area under the curve) and grade (.623 area under the curve) for this model.

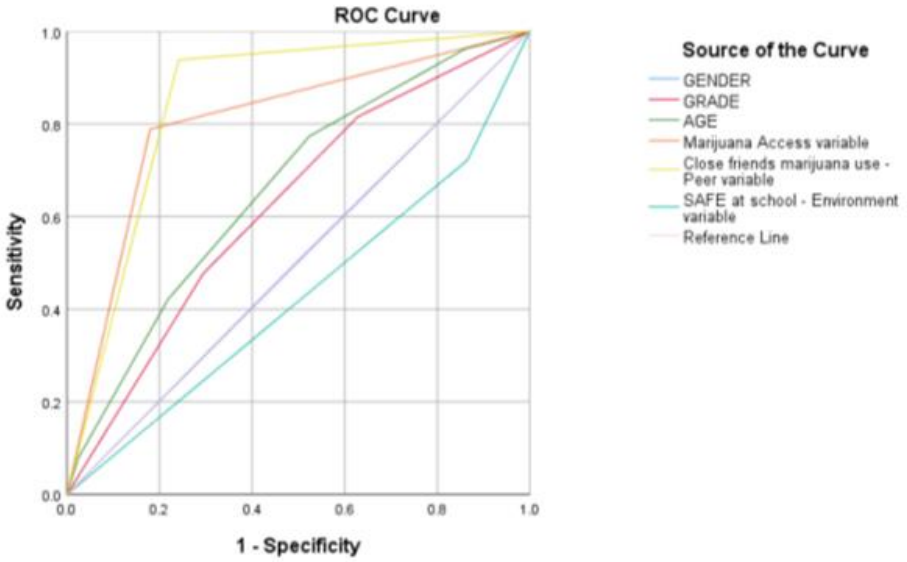

Figure 5 Receiver Operation Characteristic (ROC) analysis for Marijuana use Model

Below the ROC curve for the alcohol use model had a specificity set at 1 and had an outcome value of .802 for "close-friend" use variable, .729 for the alcohol access variable, age variable of .627, and grade level of .613. Based on Archer and Lemeshow (2006), the model falls into the category of good discrimination. The area that is measured is discriminating its ability to correctly classify those with a likelihood of alcohol substance use. Overall, the percent of the data that was correctly classified under just the ""close-friend" use" variable was 80.9%. The variables with little to no effect were age (.627 area under the curve) and grade (.613 area under the curve) for this model. Note for this analysis, the gender variable and environment fall below the reference line, meaning no effect on the impact on the likelihood of alcohol use by an adolescent who answered yes to 30-day alcohol use.

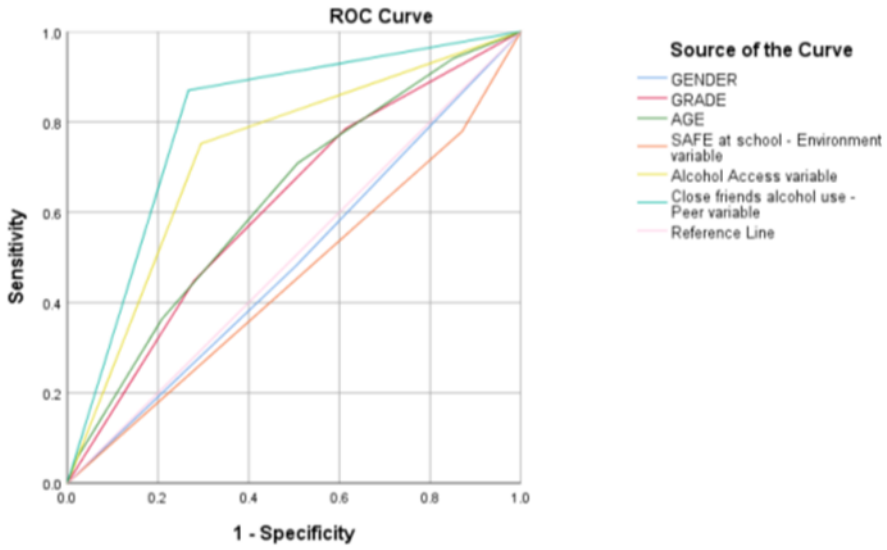

Figure 6 Receiver Operation Characteristic (ROC) analysis for Alcohol use Model

Below the ROC curve for the tobacco use model had a specificity set at 1 and had an outcome value of .845 for the "close-friend" use variable, .775 for tobacco access variable, age variable of .654, and grade level of .623. This model also falls under good discrimination for analysis (Archer and Lemeshow (2006). Overall, the percent of the data that was correctly classified under just the "close-friend" use variable was 85.6% and access variable of 81.6%, meaning, those two variables have the highest influence on the likelihood of use for tobacco. The variables with little to no effect were age (.661 area under the curve) and grade (.623 area under the curve) for this model. Again, not the variable below the reference line for environment has no effect on the likelihood of tobacco use. For this ROC analysis, gender has some interactional force for likelihood of use along with the additional variables.

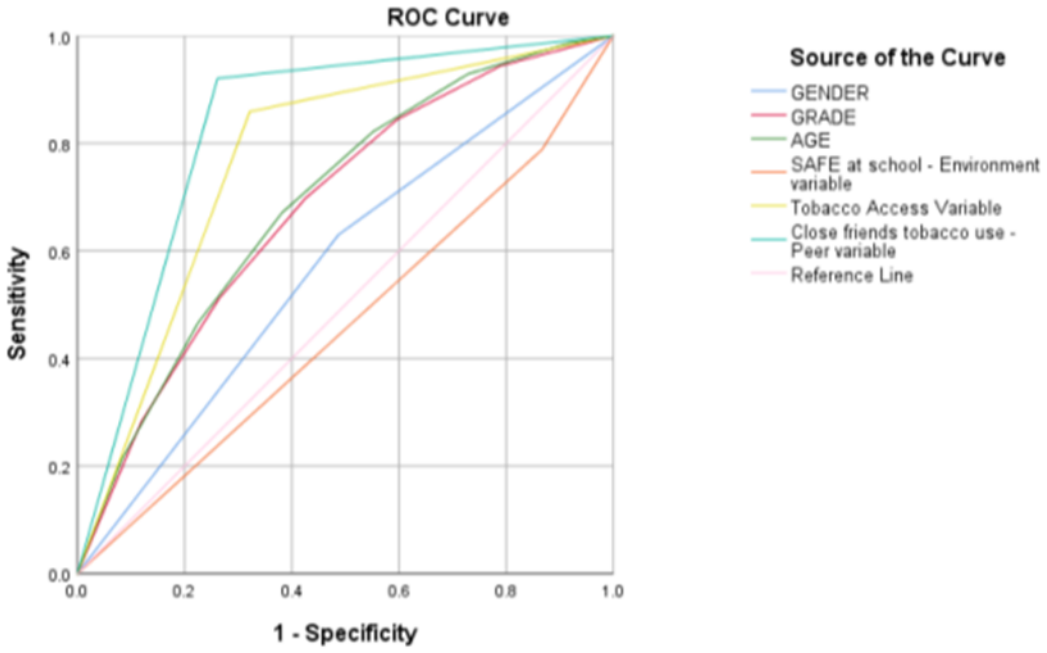

Figure 7 Receiver Operation Characteristic (ROC) analysis for Tobacco use Model

The environment a negative significant analysis and scored below the reference- line in all models. This may be in part due to the question chosen for representation of a students' view of their environment, and on how "safe" they feel at school. The term safe is a relative term and can have different meanings, and have no relationship to substance use. The adolescent may view the safety questions in terms of violence over the norms of school substance use. For future analysis, the measure of environment should focus on responses dealing with school prevention efforts surrounding substance use among adolescents. However, while the chosen environment level did not have significance in the ROC analysis models, the variable was not eliminated in the Logistic Regression Models, as to not potentially eliminate a relationship in the presence of other variables in answering the research questions, since the questions do not focus on creating a fragmented model, but rather focus on variable changes across grade levels.

Table 18

Tobacco, Alcohol, Marijuana use models – ROC area under the curve outcome

Test Variable	Area under the curve	Asymptotic significance	95% Confidence Interval Upper/Lower
Marijuana Access	.804	.000	.793/.816
Peer Use	.848	.000	.840/.856
Age	.661	.000	.648/.673
Grade	.623	.000	.610/.636

Test Variable	Area under the curve	Asymptotic significance	95% Confidence Interval Upper/Lower
Alcohol Access	.729	.000	.720/.737
Peer Use	.802	.000	.795/.809
Age	.627	.000	.618/.636
Grade	.613	.000	.604/.622

Test Variable	Area under the curve	Asymptotic significance	95% Confidence Interval Upper/Lower
Tobacco Access	.775	.000	.761/.888
Peer Use	.845	.000	.834/.856
Age	.654	.000	.639/.669
Grade	.623	.000	.608/.638

Appendix B

Texas Survey Questionnaire

TEXAS SCHOOL SURVEY OF SUBSTANCE USE

SURVEY INSTRUMENT

2016 VERSION

INTRODUCTION

Before answering the survey questions in this booklet, please read the following:

- I am aware that the survey questions I am answering are designed to measure drug and alcohol use, that I will be asked questions about student attitudes and behaviors that relate to substance abuse issues, and that over 200,000 students all over Texas will be taking this survey;
- I know that I do not have to take this survey and that I can skip any question that I do not choose to answer for any reason without any consequences;
- I know that there is no way for anyone to find out which survey that I answered, that the numbers on the questionnaire books are used only to identify which pages go together after the booklets are cut and cannot be used to tell who answered the questions; and
- I am voluntarily participating in the *Texas School Survey of Drug and Alcohol Use.*

We will do everything we can to keep others from knowing about your participation in this study and how you answered the survey. The researchers will use a Certificate of Confidentiality to prevent anyone from finding out which survey students answered. The Certificate does not keep you or your family members from deciding to release information about yourself, or your participation in this study.

If you feel you need to talk with someone about problems with tobacco, inhalants, alcohol or drugs, please call, toll free, 1-877-9-NO-DRUG (1-877-966-3784) for immediate and confidential help, 24 hours a day, seven days a week.

This research study has been reviewed and approved by the Institutional Review Board --- Human Subjects in Research, Texas A&M University. For research-related questions regarding subjects' rights, the Institutional Review Board may be contacted at (979) 458-4067 or irb@tamu.edu.

FOR OFFICE USE ONLY

DIRECTIONS

- DO NOT write your name anywhere on this booklet.
- Use a NUMBER 2 PENCIL only.
- Fill in only ONE BUBBLE for each part of a question.
- Be sure to read each question carefully.

EXAMPLE QUESTION

IN THE PAST WEEK, on how many DAYS have you used:

	Never heard of it	Not used it	1-2 days	3-4 days	5-7 days
a. Cigarettes	○	○	○	○	●
b. Smokeless Tobacco	○	○	●	○	○
c. Beer	○	●	○	○	○

CORRECT MARK ● INCORRECT MARKS ⊘ ⊗ ⊙ ◒

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SERIAL #

SCANTRON. Mark Reflex® EM-96596-16:654321

1. **Are you:**
   Male ○ Female ○

2. **What grade are you in?**
   7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 ○

3. **Do you live with both of your parents?**
   Yes ○ No ○

4. **How old are you?**
   11 or younger ○ 12 ○ 13 ○ 14 ○ 15 ○ 16 ○ 17 ○ 18 ○ 19+ ○

5a. **Are you Hispanic or Latino?**
   Yes ○ No ○

5b. **What is your race?** (DARKEN ONE BUBBLE ONLY)
- ○ American Indian or Alaska Native
- ○ Asian
- ○ Black or African American
- ○ Native Hawaiian or Other Pacific Islander
- ○ White
- ○ Some other race
- ○ More than one race

6. **On average, what grades do you get?** (DARKEN ONE BUBBLE ONLY)
   Mostly A's ○ Mostly B's ○ Mostly C's ○ Mostly D's ○ Mostly F's ○

7. **Do you have a job?**
   Yes ○ No ○

8. **During the current school year, do you qualify for a free or reduced price school lunch?**
- ○ Yes
- ○ No
- ○ Don't Know

9. **Do you regularly participate in any of the following extra-curricular activities?** (DARKEN ONE BUBBLE FOR EACH LINE: a-i.)

	Yes	No	
a.	○	○	School athletics (UIL, Varsity, Junior Varsity)
b.	○	○	School band/orchestra
c.	○	○	School choir
d.	○	○	Drill team or cheerleading squad
e.	○	○	Student government, newspaper, or yearbook
f.	○	○	Academic clubs, societies, or competition groups (UIL, Language Club, Math Club, etc.)
g.	○	○	Other school clubs or student groups
h.	○	○	Athletic teams OUTSIDE of school
i.	○	○	Other clubs or groups OUTSIDE of school

10. **How safe do you feel when you are:** (DARKEN ONE BUBBLE FOR EACH LINE: a-c.)

	Very Safe	Somewhat Safe	Not Very Safe	Not Safe At All	Don't Know
a. in your home?	○	○	○	○	○
b. out in your neighborhood?	○	○	○	○	○
c. at school?	○	○	○	○	○

The next two questions ask about your parents. If you were raised by a foster parent, step-parent, grandparent, or someone else - please answer for those who have been the most involved in raising you.

11. **What is the highest level of schooling completed by...** (DARKEN ONE BUBBLE FOR EACH LINE: a-b.)

	Completed grade school or less	Some high school	Completed high school	Some college	Completed college	Graduate or professional school after college	Don't know or doesn't apply
a. ...your FATHER?	○	○	○	○	○	○	○
b. ...your MOTHER?	○	○	○	○	○	○	○

12. **Do one or both of your parents usually attend school-sponsored open houses or PTA meetings?** ○ Yes ○ No

13. **How many of your FRIENDS would you say:** (DARKEN ONE BUBBLE FOR EACH LINE: a-e.)

	None	A Few	Some	Most	All
a. Feel close to their parents?	○	○	○	○	○
b. Care about making good grades?	○	○	○	○	○
c. Wish they could drop out of school?	○	○	○	○	○
d. Sometimes carry weapons like a knife or gun?	○	○	○	○	○
e. Belong to a gang or are interested in becoming a gang member?	○	○	○	○	○

Below is a list of things some people sniff to get high. They are called INHALANTS.

14. **How recently, if ever, have you sniffed, huffed, or inhaled the following INHALANTS for "kicks" or to get "high":** (DARKEN ONE BUBBLE FOR EACH LINE: a-h.)

	Never heard of/Never used it	Used at least once in the Past Month	Used at least once Since School Began in the Fall	Used at least once In Your Lifetime
a. Spray paint to get high?	○	○	○	○
b. Whiteout, correction fluid, magic markers to get high?	○	○	○	○
c. Computer dusting sprays to get high?	○	○	○	○
d. Helium, butane, propane, whippets (nitrous oxide), refrigerants/Freon gas to get high?	○	○	○	○
e. Glue to get high?	○	○	○	○
f. Toluene/tolly, paint thinner, other solvents to get high?	○	○	○	○
g. Gasoline, octane booster, carburetor cleaner to get high?	○	○	○	○
h. Other aerosols/sprays (deodorant spray, Pam, hair spray, room spray, etc.) to get high?	○	○	○	○

15. **How recently, if ever, have you used the following TOBACCO, ALCOHOL, and INHALANT products even one time:** (DARKEN ONE BUBBLE FOR EACH LINE: a-h.)

	Never heard of/ Never used it	Used at least once in the Past Month	Used at least once Since School Began in the Fall	Used at least once In Your Lifetime
a. Cigarettes?	○	○	○	○
b. Smokeless Tobacco?	○	○	○	○
c. Beer?	○	○	○	○
d. Wine Coolers (hard lemonade, hard sodas, hard cider, etc.)?	○	○	○	○
e. Wine?	○	○	○	○
f. Liquor (vodka, rum, whiskey, etc.)?	○	○	○	○
g. Inhalants (Whiteout, spray paint, glue, gas, etc.) to get high?	○	○	○	○
h. Electronic Vapor Products (E-Cigarettes, E-Cigars, Vaping pens, Vape pipes, etc.)?	○	○	○	○

16. **How recently, if ever, have you used the following DRUGS even one time:** (DARKEN ONE BUBBLE FOR EACH LINE: a-k.)

	Never heard of/ Never used it	Used at least once in the Past Month	Used at least once Since School Began in the Fall	Used at least once In Your Lifetime
a. Marijuana?	○	○	○	○
b. Cocaine (not crack)?	○	○	○	○
c. Crack?	○	○	○	○
d. Blamaril?	○	○	○	○
e. Hallucinogens (LSD, Mushrooms, etc.)?	○	○	○	○
f. Synthetic Cathinones (Bath Salts, MDPV, etc.)?	○	○	○	○
g. Steroids?	○	○	○	○
h. Ecstasy?	○	○	○	○
i. Heroin (black tar, cheese, chiva, brown heroin)?	○	○	○	○
j. Methamphetamine (speed, crystal meth, ice, or crank)?	○	○	○	○
k. Synthetic Marijuana (spice, K2)?	○	○	○	○

SERIAL # ○○○○○○○○○○○○○○○○○○○○○○○○○○

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17. How recently, if ever, have you taken the following PRESCRIPTION DRUGS not prescribed to you or only for the experience or feeling it caused even one time: (DARKEN ONE BUBBLE FOR EACH LINE: a-e.)

	Never heard of/Never used it	Used at least once in the Past Month	Used at least once Since School Began in the Fall	Used at least once In Your Lifetime
a. Codeine cough syrup (Leans, Nods, AC/DC)?	○	○	○	○
b. OxyContin, Percodan, Percocet, Oxycodone, Vicodin, Lortab, Lorcet, or Hydrocodone?	○	○	○	○
c. Valium, Diazepam, Xanax, or other benzodiazepines?	○	○	○	○
d. Adderall, Ritalin, Dexedrine, Concerta, or Focalin?	○	○	○	○
e. Any other prescription drug not listed above?	○	○	○	○

18. How recently, if ever, have you taken the following OVER-THE-COUNTER DRUGS only for the experience or feeling it caused even one time:

	Never heard of/Never used it	Used at least once in the Past Month	Used at least once Since School Began in the Fall	Used at least once In Your Lifetime
a. DXM, Triple C's, Skittles, or Coricidin?	○	○	○	○

19. IN THE PAST 30 DAYS, how many times, if any, have you used: (DARKEN ONE BUBBLE FOR EACH LINE: a-f.)

	Never heard of/ Not used it	1 - 2 Times	3 - 10 Times	11+ Times
a. Tobacco?	○	○	○	○
b. Alcohol?	○	○	○	○
c. Inhalants (Whiteout, spray paint, glue, gas, etc.) to get high?	○	○	○	○
d. Marijuana?	○	○	○	○
e. Cocaine (not crack)?	○	○	○	○
f. Crack?	○	○	○	○

20. About how many of your close friends use: (DARKEN ONE BUBBLE FOR EACH LINE: a-d.)

	Never heard of/ None	A few	Some	Most	All
a. Tobacco?	○	○	○	○	○
b. Alcohol?	○	○	○	○	○
c. Inhalants (Whiteout, spray paint, glue, gas, etc.)?	○	○	○	○	○
d. Marijuana?	○	○	○	○	○

21. If you wanted some, how difficult would it be to get: (DARKEN ONE BUBBLE FOR EACH LINE: a-l.)

	Never heard of it	Impossible	Very difficult	Somewhat difficult	Somewhat easy	Very easy
a. Tobacco?	○	○	○	○	○	○
b. Alcohol?	○	○	○	○	○	○
c. Inhalants (Whiteout, spray paint, glue, gas, etc.)?	○	○	○	○	○	○
d. Marijuana?	○	○	○	○	○	○
e. Cocaine (not crack)?	○	○	○	○	○	○
f. Crack?	○	○	○	○	○	○
g. Blamaril?	○	○	○	○	○	○
h. Steroids?	○	○	○	○	○	○
i. Ecstasy?	○	○	○	○	○	○
j. Heroin (black tar, cheese, chiva, brown heroin)?	○	○	○	○	○	○
k. Methamphetamine (speed, crystal meth, ice, or crank)?	○	○	○	○	○	○
l. Synthetic Marijuana (spice, K2)?	○	○	○	○	○	○

SERIAL # ○○○○○○○○○○○○○○○○○○○○○○○○

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22. How often do you normally use: (DARKEN ONE BUBBLE FOR EACH LINE: a-l.)

	Never used it	Every day	Several times a week	Several times a month	About once a month	About once a year	Less than once a year
a. Tobacco?	○	○	○	○	○	○	○
b. Alcohol?	○	○	○	○	○	○	○
c. Inhalants (Whiteout, spray paint, glue, gas, etc.)?	○	○	○	○	○	○	○
d. Marijuana?	○	○	○	○	○	○	○
e. Cocaine (not crack)?	○	○	○	○	○	○	○
f. Crack?	○	○	○	○	○	○	○
g. Blamaril?	○	○	○	○	○	○	○
h. Steroids?	○	○	○	○	○	○	○
i. Ecstasy?	○	○	○	○	○	○	○
j. Heroin (black tar, cheese, chiva, brown heroin)?	○	○	○	○	○	○	○
k. Methamphetamine (speed, crystal meth, ice, or crank)?	○	○	○	○	○	○	○
l. Synthetic Marijuana (spice, K2)?	○	○	○	○	○	○	○

23. When you drink alcoholic beverages, how many drinks do you usually have AT ONE TIME, on average: (DARKEN ONE BUBBLE FOR EACH LINE: a-d.)

	Never drink this beverage	12 or more drinks	9 - 11 drinks	5 - 8 drinks	3 - 4 drinks	2 drinks	1 drink	Less than 1 drink
a. Beer?	○	○	○	○	○	○	○	○
b. Wine Coolers (hard lemonade, hard sodas, hard cider etc.)?	○	○	○	○	○	○	○	○
c. Wine?	○	○	○	○	○	○	○	○
d. Liquor (vodka, rum, whiskey, etc.)?	○	○	○	○	○	○	○	○

24. IN THE PAST 30 DAYS, on how many days have you had 5 or more drinks of alcohol in a two-hour period?

	Never had 5 or more drinks in a two-hour period	Zero days	1 day	2 days	3 to 5 days	6 to 9 days	10 or more days
a. Alcohol	○	○	○	○	○	○	○

25. How often do you get alcoholic beverages from the following sources? (DARKEN ONE BUBBLE FOR EACH LINE: a-e.)

	Do Not Drink	Never	Seldom	Most of the time	Always
a. At home	○	○	○	○	○
b. From friends	○	○	○	○	○
c. From a store	○	○	○	○	○
d. At parties	○	○	○	○	○
e. Other source	○	○	○	○	○

26. How dangerous do you think it is for kids your age to use: (DARKEN ONE BUBBLE FOR EACH LINE: a-m.)

	Very Dangerous	Somewhat Dangerous	Not Very Dangerous	Not Dangerous At All	Don't Know
a. Tobacco?	○	○	○	○	○
b. Alcohol?	○	○	○	○	○
c. Inhalants (Whiteout, spray paint, glue, gas, etc.)?	○	○	○	○	○
d. Marijuana?	○	○	○	○	○
e. Cocaine (not crack)?	○	○	○	○	○
f. Crack?	○	○	○	○	○
g. Ecstasy?	○	○	○	○	○
h. Steroids?	○	○	○	○	○
i. Heroin (black tar, cheese, chiva, brown heroin)?	○	○	○	○	○
j. Methamphetamine (speed, crystal meth, ice, or crank)?	○	○	○	○	○
k. Synthetic Marijuana (spice, K2)?	○	○	○	○	○
l. Any prescription drug not prescribed to you?	○	○	○	○	○
m. Electronic Vapor Products (E-Cigarettes, E-Cigars, Vaping pens, Vape pipes, etc.)?	○	○	○	○	○

27. SINCE SCHOOL BEGAN IN THE FALL, on how many DAYS have you. . .
(DARKEN ONE BUBBLE FOR EACH LINE: a-e.)

	None	1-3 days	4-9 days	10+ days
a. missed a whole day of school because you "skipped" or "cut"?	○	○	○	○
b. missed a whole day of school because you were ill?	○	○	○	○
c. missed a whole day of school for some other reason?	○	○	○	○
d. been sent by a teacher to someone like the Principal, Dean, or Guidance Counselor because of your conduct or attitude?	○	○	○	○
e. had someone from your home be called to school because of your conduct or attitude?	○	○	○	○

28. DURING THE PAST 12 MONTHS, how many TIMES (if any) have you...
(DARKEN ONE BUBBLE FOR EACH LINE: a-d.)

	None	1-3 times	4-9 times	10+ times
a. gotten into difficulties of any kind with your friends because of your drinking?	○	○	○	○
b. driven a car when you've had a good bit to drink?	○	○	○	○
c. gotten into difficulties of any kind with your friends because of your drug use?	○	○	○	○
d. driven a car when you've felt high from drugs?	○	○	○	○

29. SINCE SCHOOL BEGAN IN THE FALL, on how many DAYS (if any) have you attended at least one class while "high," "drunk" or "stoned" on. . .
(DARKEN ONE BUBBLE FOR EACH LINE: a-d.)

	None	1-3 days	4-9 days	10+ days
a. beer, wine coolers (hard lemonade, hard sodas, hard cider), wine, or hard liquor?	○	○	○	○
b. marijuana?	○	○	○	○
c. inhalants?	○	○	○	○
d. some other drug(s)?	○	○	○	○

30. Alcohol or other drugs are sometimes used at parties. Thinking of the parties you attended this school year. . .
(DARKEN ONE BUBBLE FOR EACH LINE: a-b.)

	Never	Seldom	Half the time	Most of the time	Always	Don't Know	Didn't attend any parties
a. how often was alcohol used?	○	○	○	○	○	○	○
b. how often were marijuana and/or other drugs used?	○	○	○	○	○	○	○

31. SINCE SCHOOL BEGAN IN THE FALL, have you sought help, other than from family or friends, for problems in any way connected with your use (if any) of alcohol, marijuana, or other drugs?

Yes	No
○	○

32. If you had a drug or alcohol problem and needed help, who would you go to?
(DARKEN ONE BUBBLE FOR EACH LINE: a-i.)

	Yes	No
a. A counselor or program in school?	○	○
b. A school nurse?	○	○
c. Another adult in school (such as a teacher or coach)?	○	○
d. Your parents?	○	○
e. A medical doctor?	○	○
f. Your friends?	○	○
g. Another adult (such as a relative, clergyman, or other family friend)?	○	○
h. A counselor or program outside of school?	○	○
i. I wouldn't go to anyone.	○	○

33. SINCE SCHOOL BEGAN IN THE FALL, have you gotten any information on drugs or alcohol from the following SCHOOL sources?
(DARKEN ONE BUBBLE FOR EACH LINE: a-h.)

	Yes	No
a. A school health class?	○	○
b. An assembly program at school?	○	○
c. A school guidance counselor?	○	○
d. A school nurse?	○	○
e. A science or social studies class?	○	○
f. A student group or club meeting at school?	○	○
g. An invited school guest?	○	○
h. Another source at school?	○	○

34. **How do your parents feel about kids your age. . .** (DARKEN ONE BUBBLE FOR EACH LINE: a-c.)

	Strongly Disapprove	Mildly Disapprove	Neither Approve nor Disapprove	Mildly Approve	Strongly Approve	Don't Know
a. using tobacco?	○	○	○	○	○	○
b. drinking alcohol?	○	○	○	○	○	○
c. using marijuana?	○	○	○	○	○	○

Vitae

Susie A. Villalobos was born on May 13, 1967 in El Paso, Texas. She graduated from Eastwood High School in El Paso, Texas in 1985. After graduation she attended El Paso Community College, received her Associates Degree, and moved forward in pursuing her Bachelor's degree by enrolling at The University of Texas at El Paso (UTEP). As an undergraduate student in the Department of Psychology, she excelled in her courses and was intrigued by the classes associated with her minor in Sociology. She received her Bachelor's Degree in Psychology in 2001. After graduation, she enrolled in the College of Education to pursue a Master's of Educational Psychology. While enrolled in the Master's program she worked full-time with non-profit organizations tackling issues of health disparities along the U.S. – Mexico Border. She received her Master's degree in 2006, and since her graduation continued her passion for education, research and practice in El Paso and the surrounding rural communities, as Project Coordinator for the United States Mexico Border Health Association and the Alliance of Border Collaboratives. During her time as a Master's student, she was able to collaborate with principal investigators at Texas Tech Health Sciences Center, in researching alcohol and substance use among Hispanics. She has contributed on several publications related to the topic as well as publications on maternal health along the border. In 2012, seeing a need for more female principal investigators looking at problems unique to border communities, she enrolled in the doctoral program in the College of Health Sciences. After attending for 2 years, she felt her life goals and the specific degree were not aligned and decided to enroll in the doctoral program in the College of Education at UTEP, to receive her doctorate in Educational Leadership and Administration. Her focus continues on paths and patterns of success, in finding answers to health disparities among Hispanics in her community. She continues to serve as a member of several community organizations and is the current Research Director for the Department of Neurology at Texas Tech Health Sciences at El Paso.

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