University of Mississippi

eGrove

Electronic Theses and Dissertations

Graduate School

2011

Comorbid Depression and Anxiety as Predictors of Adolescent Substance Use in a Rural and Ethnically Diverse Community Sample

Michael James Mcdermott

Follow this and additional works at: https://egrove.olemiss.edu/etd

Part of the Psychology Commons

COMORBID DEPRESSION AND ANXIETY AS PREDICTORS OF ADOLESCENT

SUBSTANCE USE IN A RURAL AND ETHNICALLY DIVERSE COMMUNITY SAMPLE

A Thesis

Presented in partial fulfillment of requirements

For the degree of Master of Arts

in the Department of Psychology

The University of Mississippi

by

MICHAEL J. MCDERMOTT

December 2011

ABSTRACT

Drug use among adolescents is one of the nation's most significant public health concerns, with an estimated 47% to 56% of adolescents engaging in illicit substance use before completing high school. Negative consequences often associated with adolescent substance use frequently result in severe emotional and physical problems and serve to illustrate the growing importance of identifying associated risk factors. It is likely that psychological risk factors play an important role in the initiation and continued use of drugs among adolescents. In particular, mood and anxiety disorders have emerged as two such psychological risk factors. Unfortunately, studies examining this relationship have almost exclusively focused on clinical populations. Additionally, the few studies examining this relationship among community samples tend to be limited in minority representation, especially with regard to minority youth residing in a rural geographical location. As such, the current study aimed to elucidate the relationship between depression and anxiety and adolescent substance use among a sample of diverse adolescents residing in a predominantly rural geographical location. Findings demonstrate the significant role of depression and anxiety above and beyond relevant sociodemographic variables (SES, gender, ethnicity, and grade level) in predicting lifetime substance use among this unique population. Findings extend previous research and suggest the need for early prevention initiatives aimed at both adolescent substance use and psychological correlates such as depression and anxiety.

LIST OF ABBREVIATIONS AND SYMBOLS

SAMHSA   Substance Abuse and Mental Health Services Administration

NIDA   National Institute on Drug Abuse

NSDUH   National Survey on Drug Use and Health

DSM-IV   Diagnostic and Statistical Manual of Mental Disorders, 4th edition

MDD   major depressive disorder

THC   tetrahydrocannabinol

SUD   substance use disorder

GAD   generalized anxiety disorder

PD   panic disorder

PTSD   post traumatic stress disorder

CASA   National Center on Addiction and Substance Abuse

RCADS   Revised Child Anxiety and Depression Scale

YRBS   Youth Risk Behavior Survey

BVS   Behavioral Vital Signs Screening

MANOVA   multivariate analysis of variance

CDC   Center for Disease Control and Prevention

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Comorbid Depression and Anxiety as Predictors of Adolescent Substance Use in a Rural and

Ethnically Diverse Community Sample

Prevalence and Impact of Adolescent Substance Use

Alcohol and drug use among adolescents is one of the nation's most significant public

health concerns. It is estimated that between 47% and 56% of adolescents have engaged in illicit

substance use before completing high school (Johnston, O'Malley, Bachman, & Schulenberg

2009; Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). Findings

from the Monitoring the Future Project, an annual national investigation of adolescent drug use

conducted by the National Institute on Drug Abuse (NIDA), provide specific information

regarding prevalence rates of both licit and illicit substances from roughly 35,000 8th, 10th, and

12th graders across the United States (Johnston et al., 2009). This study demonstrated that by 8th

grade, 19.6% of youths have engaged in the use of at least one illicit drug. This lifetime

prevalence of illicit substance use increases to 34.1% by 10th grade and 47.4% by 12th grade

(Johnston et al., 2009). Equally striking are the rates of illicit substance use when excluding

marijuana. That is, 11.2% of 8th graders, 15.9% of 10th graders, and 24.9% of 12th graders have

engaged in the use of an illicit substance other than marijuana at least one time (Johnston et al.,

2009). Rates are even higher with regard to licit substances such as tobacco and alcohol. For

example, 20.5% of adolescents have smoked a cigarette by 8th grade, with 44.7% having smoked

a cigarette by 12th grade. Additionally, 38.9% of 8th graders have engaged in alcohol use at least

once, with 18% endorsing having been drunk. This rate of lifetime alcohol use increases to

71.9% by 12th grade, with 54.7% having been drunk at least once by this time (Johnston et al.,

2009). These rates of lifetime licit and illicit substance use demonstrate a need for increased awareness and continued observations of substance use among a broad range of adolescents.

Regarding current (within the past 30 days) substance use, data from the 2008 National Survey on Drug Use and Health (NSDUH) indicated that an estimated 20.1 million Americans ages 12 or older (8% of the population) have engaged in use of marijuana/hashish, cocaine, crack-cocaine, heroin, hallucinogens, inhalants, or prescription medication misuse within the past month. These rates of current drug use have remained constant over time and are consistent with data from annual reports of past years (SAMHSA, 2009). Specifically, 9.3% of youths between 12 and 17 are current illicit drug users (SAMHSA, 2009). Additionally alarming are findings that indicate the availability of illicit substances for adolescents. Studies have shown that 13% of adolescents aged 12 to 17 reported that it would be "fairly easy" or "very easy" to obtain heroin, with other illicit substances including LSD, cocaine, and marijuana being even more readily available (SAMHSA, 2009). These high rates of substance use, as well as the ease with which they are obtained, may contribute to current high rates of substance-related disorders. Indeed, an estimated 22.2 million Americans (8.9% of the population) aged 12 or older met diagnostic criteria for past year substance abuse or dependence as classified by the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV; American Psychiatric Association, 2004). Of these individuals, 7.0 million abused or were dependent on illicit drugs, with nearly half of these (3.1 million) meeting criteria for abuse or dependence on *both* alcohol and illicit drugs. Strikingly, approximately 7.6 percent of adolescents between 12 and 17 years of age meet criteria for substance abuse or dependence (SAMHSA, 2009).

Given the high rates of illicit substance use among adolescents, as well as the relative availability of illicit drugs, negative consequences associated with adolescent substance use are

especially relevant and frequently result in severe emotional and physical problems. Adolescent substance use has been shown to have both short- and long-term societal consequences. Specifically, adolescent substance use is financially demanding on the health care system, the public education system, and a host of mental health services (e.g. alcohol and drug treatment programs). In fact, in 2009, roughly $14 billion were allocated by the federal government for the prevention and treatment of substance use in the United States (Office of National Drug Control Policy, 2009).

Alcohol and drug problems among adolescents are often associated with more immediate consequences such as increased sexual risk taking behaviors (e.g., high-risk sexual activity), delinquency, and conduct problems at home and school (Feldstein & Miller, 2006). For example, adolescents being treated for substance use problems report earlier onset of sexual activity, a greater number of sexual partners, and lower rates of condom use compared to peers not in treatment for substance use (Tapert, Aarons, Sedlar, & Brown, 2001). Additionally, adolescents identified as high risk for a diagnosis of alcohol and drug abuse/dependence are more likely to engage in sexual contact after using drugs or alcohol or to be with a sexual partner who has engaged in drug or alcohol use (Levy, Sherritt, Gabrielli, Shrier, & Knight, 2009). Further, longitudinal evidence suggests that early onset adolescent alcohol use is associated with earlier age of sexual intercourse as well as a higher number of sexual partners by adulthood (Strachman, Impett, Henson, & Pentz, 2009). Research has also demonstrated an association between drug-related problems and risk for contracting HIV (Ellickson, Colling, Bogart, Klein, & Taylor, 2005). Although essential in a comprehensive understanding of risk factors associated with adolescent substance use, acute sexual risk factors likely comprise only a subset of the risk factors closely tied to adolescent substance use.

In addition to a heightened propensity for sexual risk taking behaviors, adolescents who engage in substance use at an early age are at increased risk for other problem behaviors. For example, associations have been found between early adolescent substance use and increased risk behaviors such as carrying a weapon to school and engaging in physical fights (DuRant, Smith, Kreiter, & Krowchuk, 1999). Studies have shown that individuals who initiate substance use at earlier ages tend to earn poorer grades and have lower academic intentions compared to those who refrain from use until late adolescence (Ellickson, Tucker, Klein, & Saner, 2004). Early onset substance use is also associated with suicide attempts and suicidal ideation. In a study conducted by Cho, Hallfors, and Iritani (2007), onset of substance use was found to be associated with several suicide risk indicators such as suicidal ideation, personal endorsement of suicide, and suicide attempts. Although an abundance of general negative consequences clearly exists among adolescent substance users, substance characteristics and effects vary considerably. As a result, the observed consequences associated with substance use likely differ as a result of the specific substance used. The following text highlights the impact of specific substances among adolescents.

Specific Substances and Their Impact among Adolescents

Tobacco. Cigarette smoking and other tobacco product use (e.g., chewing tobacco, snuff, etc.) is very common. Indeed, in 2001 there were more than 46 million smokers in the United States (U.S. Department of Health and Human Services, 2004). Cigarette smoking is equally common among youths, with an estimated 5,000 adolescents each day smoking for the first time (U.S. Department of Health and Human Services, 2004) and 20.4% of 12th graders smoking at least once within the past 30 days (Johnston et al., 2009). Nicotine dependence as a result of tobacco use can be very addictive and is marked by severe craving as well as withdrawal

symptoms such as dysphoric or depressed mood, insomnia, irritability, frustration, anger, anxiety, difficulty concentrating, restlessness or impatience, decreased heart rate, and increased appetite or weight gain (American Psychiatric Association, 2004). Nicotine craving and withdrawal symptom severity increases considerably prior to a relapse following a quit attempt, suggesting that these factors play a role in the maintenance of smoking and nicotine use (Allen, Bade, Hatsukami, & Center, 2008). Further, as nicotine dependence increases, smoking cessation becomes extremely difficult, with higher levels of nicotine dependence producing stronger craving and more severe withdrawal symptoms (Bailey et al., 2009).

Adolescent smoking is of particular relevance given findings that adolescent smoking increases the risk for adult smoking (Chassin, Presson, Sherman, & Edwards, 1990). Further, adolescent smoking likely plays a significant role in the onset and severity of more illicit substance use (Henningfield, Clayton, & Pollin, 1990). For example, cigarette use often precedes the onset of illicit substance use for individuals who use marijuana, cocaine, or crack-cocaine (Kandel & Yamaguchi, 1993). In addition to being among the leading causes of death in the United States (Mokdad, Marks, Stroup, & Gerberding, 2004) tobacco use occurs at high rates with psychiatric disorders such as major depressive disorder (MDD; Brown, Lewinsohn, Seeley, & Wagner, 1996).

Alcohol. Alcohol use is one of the most commonly used substances among adolescents. By 8th grade, 38.9% of adolescents have engaged in alcohol use. By 12th grade, this rate nearly doubles to 71.9%, with roughly 43% engaging in alcohol use regularly (Johnston et al., 2009). These rates are coupled with evidence demonstrating that alcohol is frequently used in excessive amounts among adolescents. Indeed, binge drinking and high-risk use occur in over 20% of adolescents 12 years of age or older (Patton et al., 2007; SAMHSA, 2009). By 8th grade, 18% of

adolescents report having been drunk, a rate that increases to 54.7% by 12th grade (Johnston et al., 2009). Although prevalent, patterns of alcohol use differ considerably among adolescents. For example, Colder, Campbell, Ruel, Richardson, and Flay (2002) identified several distinct trajectories of adolescent substance use (occasional very light drinkers, escalators, occasional heavy drinkers, rapid escalators, and heavy drinkers with declining frequency), which differentially predicted alcohol related problems; however, relatively few studies have examined the effect of alcohol use progression on treatment or related outcomes (Deas, 2008).

As one of the most frequently and heavily used substances among adolescents, alcohol is associated with increased use of other licit and illicit substances as well as a multitude of negative consequences. For example, adolescent alcohol use is often associated with an increased likelihood of sedative, stimulant, and opiate use. Additionally, studies demonstrate that compared to non-drinkers, adolescents with alcohol dependence are 10 times more likely to experience another drug use disorder and 4.5 times more likely to have an affective disorder (Degenhardt, Hall, & Lynskey, 2001). In addition to risk for use of other substances, adolescent alcohol use has also been associated with violent and delinquent behaviors (Komro, Williams, Forster, Perry, Farbakhsh, & Stigler, 1999), higher risk for automobile crashes (Dunlop & Romer, 2010), and increased suicidal ideation and suicide attempts (Bagge & Sher, 2008; Schilling, Aseltine, Glanovsky, James, & Jacobs, 2009).

Marijuana. Marijuana is quite easy for adolescents to procure; that is, 83%-90% of 12th graders describe marijuana as "fairly easy" or "very easy" to obtain if desired. Additionally, marijuana has a relatively low perceived level of harmfulness among adolescents, with only 25.8% of 12th graders describing occasional marijuana use as a great risk for physical or other harm (Johnston et al., 2009). As a result, marijuana is the most commonly used illicit substance

among adolescents. By 8th grade, 14.6% of adolescents have engaged in marijuana use at least once. This rate increases considerably to 42.6 % by 12th grade, with 19.4% of 12th graders using marijuana within the past month (Johnston et al., 2009). Marijuana, derived from the cannabis plant, contains delta-9-tetrahydrocannabinol (THC), which produces psychoactive effects in the brain and central nervous system (American Psychiatric Association, 2004). Marijuana dependence can occur with and without physiological dependence. Psychological withdrawal symptoms following abstinence from use may include irritability or anxious mood, with the possible experience of physiological effects such as tremors, perspiration, nausea, changes in appetite, and sleep disturbances (American Psychiatric Association, 2004). Additionally, increases in aggression are common following abstinence of use among chronic users (Kouri, Pope, & Lukas, 1999).

Although marijuana use is rarely perceived to be harmful, extended use may have evident negative consequences. Heavy marijuana use is associated with deficits in attention, learning, and memory (Jacobus, Bava, Cohen-Zion, Mahmood, & Tapert, 2009). For example, Medina, Hanson, Schweinsburg, Cohen-Zion, Nagel, and Tapert (2007) found that marijuana users demonstrated slower psychomotor speed and poorer attention, memory, and sequencing ability compared to adolescent non-using controls. In a related vein, adolescent marijuana use has been linked to poorer school performance and heightened risk for school drop-out (Lynskey, Coffey, Degenhardt, Carlin, & Patton, 2003; Lynskey & Hall, 2000). Existing evidence also suggests that marijuana use has emotional effects. Adolescents who engage in marijuana use may differentially respond to and process emotion related stimuli (Gruber, Rogowska, & Yurgelun-Todd, 2009) and experience elevated levels of depression (Medina, Nagel, Park, McQueeny, & Tapert, 2007) compared to non-using controls. Further, in a study conducted by Lynskey et al.

7

(2004), adolescents who meet criteria for cannabis dependence displayed elevated rates of major depressive disorder (MDD), suicidal ideation, and suicide attempts compared to their non-dependent twin counterparts. Although marijuana is used at high rates and is generally characterized by a low level of perceived harmfulness, a growing body of research has emerged identifying a number of negative consequences associated with adolescent marijuana use.

Cocaine/Crack-cocaine. Current cocaine use among adolescents is relatively low (i.e., only 0.4% of youths aged 12 to 17 have engaged in cocaine use within the past month; SAMHSA, 2009) and generally does not progress to more frequent or heavier use (Brower and Douglas, 1987). However, cocaine, both powder and crack-cocaine, has been used at least once by 5% of 8th graders. This rate doubles by 12th grade, with roughly 7.8% of seniors reporting cocaine use and 2.8% reporting crack-cocaine use at least once (Johnston et al., 2009). Although effects vary by level of potency, cocaine is the active ingredient in all forms of use (American Psychiatric Association, 2004). Several risk factors such as preexisting psychiatric disorders, ADHD, and psychosocial development have been indicated in adolescent cocaine use (Brower & Douglas, 1987). Additionally, following fist occurrence of use, adolescents may be at greater risk than adults for cocaine craving, which may facilitate continued use. For example, Kilgus, Pumariega, and Seidel (2009) found that auditory and visual cocaine-related environmental cues increased craving in both adolescents and adults but that adolescents displayed higher craving at baseline and higher peak craving compared to adults.

Cocaine and crack-cocaine use among adolescents has been associated with numerous negative consequences. For example, among adolescents in treatment for cocaine use, 80% reported experiencing at least one negative consequence as a result of cocaine use (Hickey, Brown, Chung, Kolar, & Michaelson, 1991). In a study conducted by Tolou-Shams, Feldstein

Ewing, Tarantino, and Brown, 2010, increased rates of sexual activity and STDs, as well as inconsistent condom use was associated with adolescents with psychiatric disorders who had at least one occurrence of cocaine/crack-cocaine use. Additionally, cocaine/crack-cocaine use was associated with weekly alcohol and marijuana use, having received substance use treatment, and elevated rates of psychiatric disorders (Tolou-Shams et al., 2010). When used at levels such that a change in behavior or memory loss occurs during use, cocaine has been associated with symptoms of depression and somatic and cognitive distress (Castro, Newcomb, & Bentler, 1988).

Inhalants. Inhalants are uniquely different from other classes of drugs because they are legal for all ages and readily available at home and school, yet their use is difficult to assess (Ridenour, Bray, & Cottler, 2007). Inhalants are defined as "volatile substances that produce chemical vapors that can be inhaled to induce a psychoactive, or mind-altering, effect" (pg. 1) and are often classified into four categories (volatile solvents, aerosols, gases, and nitrites; National Institute of Drug Abuse, 2010). Volatile solvents include paint thinner/remover, gasoline, glues, and felt tip markers. Home products such as hair sprays and fabric protector sprays are classified as aerosols, whereas whipped cream dispensers, butane lighters, propane tanks, and refrigerants are classified as gasses (National Institute of Drug Abuse, 2010). Finally, nitrites, a somewhat different class of inhalants, dilate blood vessels and relax muscles rather than affect the central nervous system, and include cyclohexyl nitrite, isoamyl nitrite, and isobutyl nitrite (National Institute of Drug Abuse, 2010). Immediate effects of use include psychological changes such as confusion, belligerence, assaultive behavior, apathy, impaired judgment and functioning, as well as physiological effects such as dizziness or visual disturbances, nystagmus, incoordination, slurred speech, an unsteady gait, and tremors

9

(American Psychiatric Association, 2004). Inhalant use tends to occur frequently among

adolescents. In fact, between 9.9% and 15.7% of adolescents use inhalants before completing

high school (Johnston et al., 2009). Current inhalant use rates among these adolescents, however,

tend to decrease with age (i.e., 4.1% of 8th graders currently use inhalants compared to 1.4% of

12th graders; Johnston et al., 2009). Additionally, inhalant abuse and dependence has been

reliably demonstrated to occur among users (Howard, Cottler, Compton, & Ben-Abdallah, 2001).

A number of negative consequences may occur as a result of inhalant use. Chronic and

acute physiological effects associated with inhalant use include cardiovascular effects such as

dysrhythmias, hypoxia-induced heart block, myocardial fibrosis, and sudden sniffing death

syndrome as well as dermatological and gastrointestinal effects such as burns, contact dermatitis,

perioral eczema, hepatotoxicity, and nausea or vomiting (Anderson & Loomis, 2003; Brouette &

Anton, 2001). Additionally, inhalant use is associated with hematologic and neurologic effects

such as aplastic anemia, bone marrow suppression, leukemia, ataxia, cerebellar degeneration,

peripheral neuropathy, sensorimotor polyneuropathy and white matter degeneration, as well as

pulmonary and renal effects (Anderson & Loomis, 2003; Brouette & Anton, 2001).

Neuropsychiatric effects of inhalant use such as apathy, dementia, depression, insomnia, memory

loss, poor attention and psychosis may also occur (Anderson & Loomis, 2003; Brouette &

Anton, 2001).

Of additional concern among adolescent inhalant users are issues regarding perceived

risk of danger or possible harmful effects. When considering that perceived rates of peer inhalant

use are often overestimated by adolescents and that open attitudes toward marijuana and

inhalants are associated with inhalant use (Crano, Gilbert, Alvaro, & Siegel, 2008), perceived

risk may play a particularly important role in an individual's decision to use inhalants. That is,

despite a number of acute and chronic negative effects of inhalant use (Fung & Tran, 2006; National Institute of Drug Abuse, 2010; Soderberg, 1999), few adolescents perceive inhalant use as dangerous. For example, roughly 29% of youth inhalant users believe regular inhalant use to be of medium risk of harm, with 4.7% of these adolescents perceiving regular inhalant use as having no risk at all (Perron & Howard, 2008). These perceptions are coupled with findings demonstrating that only 33.9% of 8th graders and 41.2% of 10th graders consider infrequent use of inhalants (i.e., once or twice) to be dangerous (Johnston et al., 2009). As such, the dangers of adolescent inhalant use are made clear by the ease of accessibility and relatively low level of perceived harmfulness, coupled with an abundance of acute and long-term negative consequences.

Hallucinogens. Many forms of hallucinogens exist and are characterized by a number of unpredictable effects. Most commonly, hallucinogens include LSD (acid), mescaline, peyote, mushrooms, ecstasy (MDMA), and Salvia (NIDA hallucinogen report; Wu, Ringwalt, Weiss, & Blazer, 2009). Both abuse and dependence may result following hallucinogen use (American Psychiatric Association, 2004). Hallucinogens are often taken orally and produce hallucinogenic effects that often begin with stimulant-like experiences and develop into feelings of euphoria, enhanced sensory experiences, and visual, auditory, and tactile hallucinations (American Psychiatric Association, 2004; National Institute of Drug Abuse, 2001). However, due to the diverse array of substances categorized as hallucinogens, specific hallucinogenic effects differ considerably among drugs. For example, LSD often produces vivid emotional and visual sensations whereas psilocybin (i.e., the active drug in psychoactive mushrooms) can cause difficulties in perception of time and reality (National Institute of Drug Abuse – No. 01-4209, 2001). Hallucinogen use is fairly common among adolescents. By 12th grade, roughly 8.7% of

11

adolescents have engaged in hallucinogen use. Additionally, 7.8% have used hallucinogens other than LSD and 4% have used LSD by 12th grade (Johnston et al., 2009). As would be expected, past month inhalant use tends to be lower, with only 0.9% of 8th graders and 2.2% of 12th graders endorsing current hallucinogen use (Johnston et al., 2009).

Hallucinogens are associated with numerous negative psychological consequences and disorders. For example, polysubstance use is more common among adolescents who use hallucinogens than those who use marijuana (Wu et al., 2009). Additionally, hallucinogen users may develop hallucinogen-induced disorders such as hallucinogen persisting perception disorder (i.e., flashbacks), hallucinogen intoxication delirium, hallucinogen-induced psychotic disorder with delusions or hallucinations, and hallucinogen-induced mood or anxiety disorders (American Psychiatric Association, 2004). Differences also have been demonstrated among adolescent hallucinogen users compared to marijuana users in MMPI-A Schizophrenia (Sc) and Hypochondriasis (Hs) scales (Palmer & Daiss, 2005). In addition to psychological consequences, prolonged or permanent changes in cognition may occur following hallucinogen use. For instance, cognitive impairments often associated with ecstasy (MDMA) use include deficits in recall and working memory, central executive functioning and reasoning, and semantic recognition (Montoya, Sorrentino, Lukas, & Price, 2002). Further, salvia use has been implicated to cause long-term effects of déjà vu, blunted affect, thought blocking, and slow speech (Singh, 2007). The wide array of negative consequences associated with hallucinogen use demonstrates the importance of developing a strong understanding of this substance among adolescents and further serves as rational for identifying additional factors associated with use.

Methamphetamine. Roughly five million Americans have used methamphetamine at least one time (Anglin, Burke, Perrochet, Stamper, & Dawud-Noursi, 2000). Among adolescents,

6.8% of 8th graders and 10.5% of 12th graders report using amphetamines (e.g., speed, crystal meth, and methamphetamine) before leaving high school. Of these adolescents who endorse amphetamine use, 2.8% have used methamphetamine and 2.8% have used crystal meth (Johnston et al., 2009). Methamphetamine, classified as a stimulant, increases stimulation of both dopamine and norepinephrine receptors in the brain and has a relatively slow rate of metabolization compared to cocaine and other stimulants (Anglin et al., 2000). As a result, methamphetamine intoxication can last up to 12 hours, often depending on method of administration (e.g., smoked, used intravenously, snorted, or ingested orally; Sheridan, Bennett, Coggan, Wheeler, & McMillian, 2006). The acute physical effects often associated with methamphetamine include decreased appetite; elevated heart rate, blood pressure, and pulse; and increased physical activity, respiration, and body temperature (National Institute of Drug Abuse – No. 06-4210, 2006). Methamphetamine tends to have an earlier age of first use compared to alcohol, marijuana, tobacco, inhalants, hallucinogens, depressants, PCP, and cocaine with a slightly earlier age of first use compared to ecstasy, opiates, or crack-cocaine (Brecht, Greenwell, & Anglin, 2007). Traditionally concentrated in rural, western and southwestern regions of the U.S., methamphetamine use recently has increased nationally, resulting in a growing economic burden and increased negative effects on public health (Freese, Obert, Dickow, Cohen, & Russell, 2000; Meredith, Jaffe, Ang-Lee, & Saxon, 2005).

As with other substances, methamphetamine use is often associated with the use of other illicit substances (e.g., cocaine, heroin, ecstasy, LSD) and with increased problem behaviors such as antisocial behavior, having friends who engage in deviant behaviors, risky sexual behavior, being arrested, and selling drugs (Embry, Hankins, Biglan, & Boles, 2009; Herman-Stahl, Krebs, Kroutil, & Heller, 2006, 2007). Additionally, adolescents who endorse using methamphetamine

at least one time are more likely to participate in high-risk behaviors such as having sexual intercourse before age 13, having an increased number of sexual partners, failing to use a condom during last intercourse, and using alcohol or drugs before engaging in intercourse compared to those who have not used methamphetamine (Springer, Peters, Shegog, White, & Kelder, 2007). As a result, methamphetamine use increases risk for contracting hepatitis B and HIV and is associated with poorer health conditions (Gorman & Carroll, 2000; Greenwell & Brecht, 2003; Vogt et al., 2006). Continued methamphetamine use can have serious long-term effects such as anxiety, confusion, insomnia, mood disturbances, paranoia, hallucinations and delusions, reduced motor speed, cognitive impairment, and significant structural and functional changes in the brain (Kalechstein, Newton, Longshore, Anglin, vanGorp, & Gawin, 2000; National Institute of Drug Abuse, 2006).

Factors Associated with Adolescent Substance Use

The extensive array of negative consequences associated with adolescent substance use highlights the importance of early identification of factors that may play a role in adolescent substance use. Elucidating factors commonly associated with adolescent substance use may provide valuable information regarding treatment and prevention implications. Traditionally, research has focused on non-psychiatric dispositional and environmental factors that may be associated with adolescent substance use or the development of a substance use disorder (SUD). For example, non-psychiatric dispositional risk factors such as attitudes toward antisocial behavior; attitudes toward alcohol, tobacco, and other drugs; low perceived risk of drug use; sensation seeking; rebelliousness; and social skill deficits are all associated with adolescent substance use (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Cleveland, Feinberg, Bontempo, & Greenberg, 2008).

Several environmental and contextual risk factors often associated with negative substance use outcomes also have been identified. For example, Durlak (1998) found that drug use is commonly associated with community and school variables such as living in an impoverished neighborhood, ineffective social policies, and poor quality of schools. Additionally, peer- and family-related factors such as negative peer pressure/modeling, peer rejection, low socioeconomic status, parental psychopathology, and punitive childrearing have been associated with substance use (Durlak, 1998). In a review of research examining risk factors that contribute to adolescent substance use, Hawkins, Catalano, and Miller (1992) divided risk factors into two categories: broad societal and cultural (contextual) factors and individual and interpersonal environments (e.g., family, school, classrooms, and peer groups). Among the broad societal and cultural factors, findings indicate that availability of substances, extreme economic deprivation, and neighborhood disorganization are associated with adolescent alcohol and substance use. Additionally, associations were demonstrated between alcohol and substance use and interpersonal factors such as family drug behavior, family management practices, and family conflict. Early and persistent problem behaviors, academic failure, peer rejection in elementary grades, association with drug-using peers, and favorable attitudes toward drugs were also found to be associated with adolescent alcohol and substance use. These non-psychiatric and environmental risk factors provide valuable insight into the initiation and maintenance of adolescent substance use; however, co-occurring psychopathology likely plays an additional role in substance use among youth (Saban & Flisher, 2010).

Comorbid Psychiatric Disorders and Substance Use

Psychiatric disorders are common among adolescents, with epidemiological studies suggesting that roughly 15-20% of adolescents have a current psychiatric disorder at any given

15

time (Costello et al., 1996; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Roberts, Roberts, & Xing, 2007). As such, co-occurring (comorbid) psychiatric disorders may play a particularly important role in adolescent substance use. That is, comorbid psychiatric disorders may differentially contribute the development and maintenance of adolescent substance use compared to non-psychiatric dispositional or environmental risk factors (Tate, Brown, Unrod, & Ramo, 2004). Indeed, psychiatric disorders co-occur with adolescent substance use at high rates. Studies have shown that more than 80% of adolescent high school students with an alcohol use disorder exhibit a comorbid psychiatric disorder (Rhode, Lewinsohn, & Seeley, 1996). Further, adolescents who display a current SUD are at threefold greater risk for comorbid psychiatric disorders such as anxiety, mood, or disruptive behavior disorders compared to adolescents without a current SUD (Kandel, et al., 1999).

Among adolescent substance users, psychiatric disorders have been associated with more frequent and severe substance use. For example, in a sample of both addiction treatment outpatients and nonclinical adolescents, heavy alcohol use was associated with higher rates of mental disorders and psychotic, depression, and anxiety symptoms (Fidalgo, da Silveira, & da Silveira, 2008). In a review of studies examining comorbid psychiatric disorders among adolescents and youths being treated for SUDs, Couwenbergh et al. (2006) found that between 61% and 88% experienced comorbid internalizing and externalizing disorders. Further, this study found that adolescents and youths with a comorbid psychiatric disorder and SUD exhibited higher rates of substance use compared to noncomorbid adolescents (Couwenbergh et al., 2006). Given these observed high rates of psychiatric comorbidity among adolescent substance use, an examination of underlying psychiatric variables apart from environmental characteristics may contribute to our understanding of substance use among adolescents.

Comorbid mood and anxiety disorders and substance use. Comorbid mood and anxiety disorders may be particularly relevant to examine among adolescent substance use. Specifically, early-onset major depression or anxiety disorders may play an important and prominent role in the development of adolescent substance use. Evidence suggests that both depression and anxiety disorders often begin in the preadolescent and adolescent years of development (Burke, Burke, Regier, & Rae, 1990) and thus may serve as risk factors for later SUD onset. Additionally, the NIMH Epidemiologic Catchment Area Program study found that young adults who had experienced an earlier depressive or anxiety disorder were at twice the risk for a subsequent drug use disorder (Christie et al., 1988).

In a retrospective design examining the onset of depression and its relation to drug abuse, drug-dependent patients had an onset of depression as much as 7.2 years earlier than non-drug-dependent individuals (Abraham & Fava, 1999). In a study conducted by Burke, Burke, and Rae (1994) epidemiological data were used to examine the prevalence of co-occurring mood and anxiety disorders in relation to onset of drug abuse and dependence. Findings from this study suggested that drug use disorders occur at higher rates among individuals who experienced either mood or anxiety disorders. This was particularly true when the mood or anxiety disorder had an onset during adolescence. Additionally, the onset of a substance use disorder was most likely to occur between 15 to 19 years of age if a pre-existing mood or anxiety disorder had occurred. These studies suggest that a history of a comorbid psychiatric disorder places one at greater risk for subsequent development of a substance use disorder.

Adolescent substance use and major depressive disorder. Studies have demonstrated a relationship between the progression of a SUD and depression symptom severity. In a study conducted by Chinet et al. (2006), 102 adolescents between the ages of 14 and 19 years old who

17

met DSM-IV criteria for regular illicit drug or alcohol use were assessed for comorbid depression. In examining the progression between depression and substance use over a 3.5-year period, a decrease in substance use severity was associated with a decrease in depression and depressive symptoms. Groups that remained stable in substance use severity (i.e., high or low severity of use) tended to display a constant level of depression (i.e., high or low levels of depression). In a longitudinal study examining the relationship between the existence of a major depressive disorder (MDD) and SUD, Rao, Hammen, and Poland (2009) assessed the development of SUD among adolescents with and without MDD at a two to five year follow-up. They found that adolescents with MDD displayed higher rates of SUD development compared to their non-depressed counterparts. This study also suggested the existence of a reciprocal relationship between MDD and SUD, with substance use preceding the onset of MDD and potentially increasing vulnerability to depressive episodes (Rao et al., 2009).

Adolescent substance use and anxiety disorders. Several studies have demonstrated an association between anxiety and adolescent substance use. In a longitudinal study examining cigarette smoking and anxiety disorders among adolescents over a period of roughly 8 years, cigarette smoking was found to increase risk for the development of several anxiety disorders. Specifically, cigarette smoking during adolescence was associated with an increased risk for the development of agoraphobia, generalized anxiety disorder (GAD), and panic disorder (PD; Johnson, Cohen, Pine, Klein, Kasen, & Brook, 2000). Similar findings among young adults suggest that daily cigarette smoking is associated with an increased risk of panic attacks (Breslau & Klein, 1999). Further, reviews of current literature examining the co-occurrence of alcohol problems and anxiety disorders demonstrate that studies find a close association between anxiety-related disorders and problems related to alcohol use (Kushner, Sher, & Beitman, 1990;

Kushner, Sher, & Erickson, 1999). Similarly, studies demonstrate that posttraumatic stress disorder (PTSD) is associated with an increased risk for alcohol abuse or dependence (Breslau, Davis, Peterson, & Schultz, 1997).

Associations between substance use and anxiety disorders are found also when examining simultaneous use of multiple substances. For example, tobacco use and alcohol dependence remain significant predictors of anxiety and affective disorders after controlling for other drug use (Degenhardt et al., 2001). Although alcohol dependence was associated with anxiety, alcohol use or abuse was not associated with increased rates of anxiety disorders. Interestingly, alcohol use in the absence of abuse or dependence was associated with lower rates of anxiety and affective disorders. In the case of multiple substance use (i.e., tobacco, alcohol, and cannabis use in conjunction with sedative, stimulant, or opiate use), cannabis was not associated with increased anxiety and affective disorders while the use of tobacco and alcohol were associated with these disorders (Degenhardt et al., 2001). Although findings demonstrate clear associations between substance use and depression and anxiety, most research has tended to focus on the nature of these relationships among clinical samples.

Mood and anxiety disorders and substance use in clinical samples. As a result of these observed high rates of comorbid SU and depression and anxiety, numerous studies have examined this relationship exclusively among clinical populations receiving treatment primarily for either SU or other psychiatric disorder. For example, Buckstein, Glancy, and Kaminer (1992) examined patterns of comorbidity among a sample of 156 adolescent psychiatric inpatients between the ages of 13 and 18 years old with a dual diagnosis of SUD and another Axis I or II psychiatric diagnosis. They found that 51.3% of adolescent inpatients were diagnosed as having a current affective disorder and that 30.7 % were diagnosed with major depression. In order to

assess the comorbidity between substance use disorders and anxiety disorders in adolescents, Deas-Nesmith, Brady, and Campbell (1998) examined adolescents presenting for comorbid substance abuse and psychiatric disorders in an inpatient substance abuse treatment facility, an inpatient psychiatric treatment facility, and an outpatient community-based psychiatric treatment facility. Thirty-three percent of adolescents in the inpatient adolescent psychiatric unit and the community mental health facility, and 67% of those in the substance abuse treatment facility, had a co-occurring anxiety disorder and SUD. Additionally, all adolescents who had a co-occurring anxiety disorder and SUD reported that the onset of anxiety symptoms preceded the SUD (Deas-Nesmith et al., 1998).

Hovens, Cantwell, and Kiriakos (1994) examined comorbid psychiatric disorders among 52 adolescent inpatient substance abusers and 23 non-substance-abusing adolescent inpatients with conduct and/or oppositional defiant disorders. Among the substance-abusing sample, 83% had used alcohol, 85% had used cannabis, 40% had used cocaine, 16% had engaged in inhalant use, 48% had used hallucinogens, 23% had used amphetamines, and 9% had engaged in opiate use. Higher rates of dysthymia, major depression, and social phobia were found among substance abusers compared to the non-substance abusers. Further, 85% of adolescent substance abusers evidenced co-occurring psychiatric disorders, whereas 65% of non-substance abusers were found to display psychiatric disorders (Hovens et al., 1994). As such, a clear relationship exists among adolescent substance use and mood and anxiety disorders within clinical populations; however, the nature of this relationship among community samples remains equivocal and relatively understudied.

Mechanisms of comorbidity. Though not a focus of the present study, hypotheses regarding the mechanisms that underpin relationships between SUDs and depression/anxiety

deserve brief mention. High rates of comorbidity between psychopathology (i.e., mood and anxiety disorders) and substance use are well established, though the nature of the temporal and causal pathways that underlie this relationship remain unclear. Several explanations have been proposed. The self-medication hypothesis, initially based on clinical observation, suggests that substance use is initiated and maintained in an attempt to assuage or relieve distressing psychological symptoms. Specifically, this hypothesis posits that an individual who experiences psychopathology is motivated to use substances as an attempt to reduce psychological suffering (Khantzian, 1997). A number of studies indirectly support this hypothesis (e.g., Christie et al., 1988; Rao et al., 2009) by demonstrating that psychopathology often precedes the onset of substance use among adolescents.

Another hypothesis asserting a directional relationship between psychopathology and substance use among adolescents holds that substance use precedes the development of psychopathology. This hypothesis suggests that substance use increases the risk for the subsequent development of a psychiatric disorder. This notion is supported indirectly by arguments that neuroadaptations and neurobiological alterations resulting from prolonged use and withdrawal contribute to the development of psychiatric symptoms (McEwen, 2000).

Because neither directionality hypothesis alone is sufficient to account for all comorbid cases, psychopathology and substance use may not be causally related but instead accounted for by a third variable. For example, a biological trait or environmental factor such as emotional lability or the experience of childhood trauma may increase the risk for the development of psychopathology and the onset of substance use. The evidence for a clear relationship between psychopathology and substance use is largely equivocal. Possibly these hypothesized mechanisms are not mutually exclusive and exist concurrently (Khantzian, 1997). In fact, it is

21

likely that these pathways account for differential contributions toward the development and maintenance of both psychopathology and substance use and that a bidirectional relationship exists between the occurrence of substance use and comorbid psychiatric disorders. Though this project does not focus on elucidating such pathways directly, it does attempt to describe these relationships within a population that has historically received very little consideration.

Limitations of Current Research

      Community based samples. A prominent issue in current research examining comorbid psychiatric disorders and adolescent substance use resides in the lack of research examining this relationship within community-based samples. That is, studies that have examined the association between depression and anxiety and adolescent substance use have been performed largely in clinical outpatient or inpatient settings (e.g. Buckstein, et al., 1992; Chinet et al., 2006; Deas-Nesmith et al., 1998; Hovens et al., 1994; Libby, Orton, Stover, & Riggs, 2005; Swadi & Bobier, 2003). The major existing studies that have examined these comorbidities among community samples have been large nationally based surveys (e.g., Johnston et al., 2009; SAMHSA, 2009). As a result, two prominent limitations are evident. First, the apparent dearth of research exploring this relationship outside of clinical settings limits the generalizability of these findings to non-clinical samples (Armstrong & Costello, 2002). Armstrong and Costello (2002) underscored the need for research examining this relationship among community populations. They noted specific concerns when generalizing findings among clinical samples to representative community populations. In particular, adolescents with two or more psychiatric disorders are more likely to seek treatment compared to adolescents with only a single psychiatric disorder. As a result, an inpatient or clinical sample may display higher rates of comorbidity compared to the general population (Armstrong & Costello, 2002). Additionally,

22

some disorders, or combinations of disorders, are more likely to be referred to treatment compared to others. For example, an externalizing disorder such as conduct disorder is more likely to elicit a referral to treatment compared to internalizing disorders such as anxiety or depression. Generalizability may also be limited because temporal ordering and observed risk factors may differ between adolescents in a clinical versus community setting (Armstrong & Costello, 2002).

The second limitation pertains to the allocation of community resources and development of policies that are not community-specific. National epidemiological studies of adolescent substance are those that inform government, education, and health related public policy (Johnston et al., 2009), but national data samples may inaccurately reflect local community needs for treatment and prevention programs, especially those services intended for minority youth (Kip, Peters, & Morrison-Rodriquez, 2002). It has been noted that methods for estimating specific community needs for services from national samples, such as synthetic estimation, carry certain assumptions that are often violated in actual practice with community samples. In these cases, it is more appropriate to directly survey the population in question (Dewit & Rush, 1996). As such, this lack of research examining adolescent substance use among community-based samples may fail to elucidate unique risk factors that are present (and amenable to intervention) in specific communities.

In an attempt to address these limitations, Costello, Erkanli, Federman, and Angold (1999), examined the association between psychiatric disorders and substance use among a community sample within a single region of the United States (i.e., southeastern U.S.). In one of the few and most widely-cited large-scale community studies on this topic, Costello and colleagues found that girls and boys with depression displayed significantly higher rates of

lifetime use of any substance compared to those without a psychiatric disorder (88.6% and 52.2% respectively for girls and 86.5% vs. 50.0% for boys). A similar trend was found in boys for smoking (64.5% vs. 11.5%), alcohol use (84.5% vs. 43.0%), cannabis use (57.6% vs. 9.6%), and other drug use (48.3% vs. 0.4%) as well as substance abuse or dependence (29.9% vs. 1.5%), but not in girls. Interestingly, anxiety was not associated with any type of substance use or abuse in either girls or boys (Costello et al., 1999). Although results obtained in the Costello et al. (1999) "Great Smoky Mountains Study" provide valuable information into the association between psychiatric disorders and adolescent substance use among a specific community samples, the lack of a representative minority sample is a significant limitation. The study employed a predominantly Caucasian sample with less than 10% African American adolescents (Costello et al., 1999). This underrepresentation is significant when considering southern states such as Mississippi, a predominantly rural region in which African Americans comprise roughly 37% of the population (US Census Bureau, 2010). This limitation provides opportunity for future research in which patterns of comorbidity between affective disorders and SUDs can be explored within a sample more representative of the adolescent population in the southeast.

  Minority samples. Examining variations between adolescent subgroups is an integral part in developing a comprehensive understanding of substance use etiology and implementing prevention efforts (Johnston et al., 2009). As demonstrated by De La Rosa, Adrados, Kennedy, and Millburn (1997) current research remains limited in its understanding of substance use and substance using behavior among minority youth. This deficit in understanding is made relevant when considering that patterns of drug use likely differ as a function or ethnicity (James & More, 1997). Additionally, psychological factors may differentially contribute to adolescent substance use across race/ethnicity. That is, factors such as sensation seeking, peer substance use, and peer

pressure resistance may differentially influence substance use among African American adolescents compared to Caucasian adolescents (Brown, Miller, & Clayton et al., 2004). As such, research findings examining co-occurring depression and anxiety in adolescent substance use among a nonminority sample may not generalize to ethnic minority youth populations.

To date, several studies have examined the impact of race/ethnicity on adolescent substance use (e.g., Fothergill, & Ensminger, 2006; Johnson, 2004; Wang, Matthew, Bellamy, & James, 2005); however, these findings remain equivocal. Indeed, disparities are often found between minority groups, with mixed findings of substance use rates in minority youth compared to White youth (Jackson & LeCroy, 2009; Johnston et al., 2009; SAMHSA, 2009; Wallace & Muroff, 2002; Watt, 2004;). With regard to national rates, most data suggest that African Americans demonstrate considerably lower rates of current and lifetime licit and illicit drug use compared to those of Caucasian and Hispanic ethnicity (Johnston, O'Malley, Bachman, & Schulenberg, 2010). For example, national studies suggest that White youth tend to engage in twice the rate of current cigarette use and greater than three and a half times the rate of heavy alcohol use compared to Black or African American youth (SAMHSA, 2009). Although fairly consistent across studies, these rates sometimes differ with regard to age. For instance, African American middle school students have shown slightly higher rates of alcohol use compared to Caucasians in some samples (45% compared to 37.7%; Jackson & LeCroy, 2009). These differences point to the increased need for continued examination of substance use trends among both minority and non-minority youth.

Findings tend to be equally mixed with regard to the contribution of psychosocial correlates of substance use across minority youth. A growing body of work has shown that psychosocial factors differentially contribute to substance use among minority youth compared

25

to Caucasian youth (e. g., Howard, Walker, Walker, Cottler, & Compton, 1999; Jackson & LeCroy, 2009; Watt, 2008). Specifically, African American adolescents may be at elevated risk for influence by contextual risk factors such as economic deprivation and higher rates of academic difficulties, while Caucasian adolescents may be at increased risk for influence by peer use and individual risk factors such as sensation seeking (Wallace & Muroff, 2002). Additionally, findings demonstrate that individual, social, and treatment factors differentially contribute to substance use treatment attrition among racial subgroups, while cultural factors such as perceived discrimination, racial or ethnic identity, or acculturation may not play a significant role in treatment attrition (Austin & Wagner, 2010). Specifically, parental alcohol and crack-cocaine use is significantly predictive of treatment attrition among African American adolescents but not among foreign or native born Hispanic adolescents (Austin & Wagner, 2010). Conversely, a number of studies have found similarities in risk and protective factors across minority and nonminority youth (e.g. peer and family protective factors, coping styles, self-esteem, and self-efficacy; Brook, Brook, Arencibia-Mireles, Richter, & Whiteman, 2001; Clinton-Sherrod et al., 2005; Roberts & Roberts, 2007). These inconsistent findings highlight the need for the continued investigation of risk factors associated with drug-using behavior among both minority and nonminority populations, including comparisons of substance use rates and psychological correlates of substance use across ethnic groups.

Rural minority samples. Examining adolescent substance use among a rural sample is of additional importance, as underscored by geographical group differences in adolescent substance use. Specifically, adolescents in rural areas exhibit substance use rates that consistently exceed those found among urban dwelling counterparts. Among 8th graders, those living in southern states have consistently demonstrated higher rates of current and lifetime illicit

substance use compared to other geographical locations (Johnston et al., 2010). Interestingly, these differences do not seem to be as pronounced in older adolescent cohorts (Johnston et al., 2010). Further, in a secondary examination of the 1999 Monitoring the Future Study, conducted by the National Institute on Drug Abuse (NIDA), significantly higher rates of adolescent licit and illicit substance use were observed in rural areas compared to other locations in the country (National Center on Addiction and Substance Abuse [CASA], 2000). Findings from this study showed that 8th graders residing in rural locations were more than twice as likely to smoke cigarettes, 29 percent more likely to drink alcohol, 34 percent more likely to use marijuana, 53 percent more likely to use cocaine, 83 percent more likely to use crack cocaine, and 104 percent more likely to use amphetamines than those living in urban areas (CASA, 2000). Rates of use continue to be higher among rural 10th graders compared to urban 10th graders in all substance categories except Ecstasy and marijuana. Among 12th graders, rural adolescents demonstrated higher rates of cigarette, alcohol, cocaine, crack-cocaine, amphetamine, and inhalant use than those in urban environments (CASA, 2000). These data confirm that elevated rates of substance use (across most substances) are consistently observed among adolescents in rural geographical locations.

Extant studies investigating adolescent substance use among minority populations have largely been conducted using urban samples (e.g., Clinton-Sherrod, Sobeck, Abbey, Agius, & Terry, 2005; Jackson & LeCroy, 2009). Conversely, studies focusing on adolescent substance use among rural populations often utilize a predominantly White sample (e.g., Dunn et al., 2008; Hanson et al., 2009; Shears, Edwards, & Stanley, 2006) or have a relatively small sample size (Strong, Del Grosso, Burwick, Jethwani, & Ponza, 2005). Consequently, there is a shortage of research examining substance use among ethnic minorities in rural settings. This is equally true

with regard to associated psychological correlates such as depression and anxiety. As a result, a large scale, ethnically diverse and rural-based examination of adolescent substance use and co-occurring depression and anxiety would contribute considerably to existing literature.

Aims of Present Study

Substance use among adolescents is prevalent and associated with an abundance of negative consequences. Findings demonstrate a strong relationship between depression and anxiety and adolescent substance use in clinical samples. Emerging evidence suggests that a similar relationship exists among adolescents in non-clinical populations as well, but few studies have examined the relationship between comorbid psychiatric symptoms and substance use among ethnically diverse and rural adolescents, the latter of whom appear to be at highest risk of SUDs. The following goals and hypotheses are proposed:

Exploratory Study Goal: Examine epidemiological rates of lifetime adolescent tobacco, alcohol, marijuana, cocaine, inhalant, hallucinogen, and methamphetamine use among an ethnically diverse community sample in Mississippi.

Hypothesis: Given limited extant research examining substance use among community-based ethnically diverse rural samples, no a priori hypotheses were developed for this study goal.

Primary Study Goal: Explore the relationship between depression/anxiety and lifetime licit and illicit substance use (i.e., tobacco, alcohol, marijuana, cocaine, inhalant, hallucinogen, and methamphetamine) among a diverse, rural-based, community sample of adolescents.

Hypothesis: Depression and anxiety will predict lifetime substance use above and beyond relevant demographic and environmental variables (e.g., socio-economic status, grade level, race/ethnicity, gender).

<center>**Method**</center>

Participants

Participants were 5,735 pre-adolescents and adolescents in grades 6 – 12 from several

counties in Mississippi representing diverse demographic areas. This large number of ethnically

diverse participants from multiple rural counties in Mississippi provided sufficient power for all

analyses conducted in the present study. Participants were distributed equally across gender

(51.4% female). In terms of racial/ethnic background, participants were diverse with a majority

identifying as either White/Caucasian ($n = 3,120$, 54.4%) or Black/African American ($n = 2,026$,

35.3%). The remaining participants identified as Asian ($n = 132$, 2.3%), Hispanic ($n = 149$,

2.6%), or Other ($n = 280$, 4.9%). Given the small representation of racial/ethnic backgrounds

other than White/Caucasian or Black/African American, participants were classified in

subsequent analyses as White/Caucasian or Other. Given the nature of the study it was not

feasible to assess annual household income or other socio-economic status (SES) related

information from adolescents who may not have the ability or knowledge to answer accurately.

Instead, 2010 U.S. Census data were used as a proxy to provide a general description of annual

income. Specifically, dummy variables were assigned to county-based median annual income

and matched to each student by school zone (see Table 1 for description of median annual

income and population density for counties assessed).

Measures

Revised Child Anxiety and Depression Scale (RCADS). The RCADS (Chorpita,

Moffitt, & Gray, 2005; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) is a 47-item self-

<center>29</center>

report questionnaire designed to measure childhood anxiety disorders and depression in a community, clinical, or research setting. Participants rate how often each item applies to them based on a 4-point Likert-type scale (0 = *never*, 1 = *sometimes*, 2 = *often*, 3 = *always*). Scores from the RCADS yield total anxiety and depression scores, a major depressive disorder subscale, and 5 anxiety subscale scores: separation anxiety disorder, panic disorder, generalized anxiety disorder, social phobia, and obsessive-compulsive disorder. Internal consistency for the RCADS scales has been shown to be good (major depressive disorder α = .87, separation anxiety disorder α = .78, panic disorder α = .88, generalized anxiety disorder α = .84, social phobia α = .87, and obsessive-compulsive disorder α = .82; Chorpita et al., 2005). Confirmatory factor analyses yield adequate model fit for the depression factor and all anxiety factors. Factor loadings were statistically significant for all RCADS factors with loadings ranging from .53 to .70 for the depression factor, .52 to .69 for the separation anxiety disorder factor, .55 to .76 for the panic disorder factor, .59 to .79 for the generalized anxiety disorder factor, .51 to .78 for the social phobia factor, and .55 to .74 for the obsessive-compulsive disorder factor (Chorpita et al., 2005). The RCADS scores demonstrate good convergent validity, with all depression and anxiety scales correlated positively and significantly with related and validated assessment measures. Specifically, the RCADS major depression scale is significantly and positively correlated with the Child Depression Inventory (.70) and the RCADS anxiety scales are each significantly and positively correlated with similar scales measured with the Revised Children's Manifest Anxiety Scale (separation anxiety disorder = .60; panic disorder = .64; generalized anxiety disorder = .65; social phobia = .72; obsessive-compulsive disorder = .59; Chorpita et al., 2005).

Modified Youth Risk Behavior Survey (YRBS). The YRBS (Brener et al., 2004) is a widely used self-report measure designed to determine the prevalence of health-risk behaviors

among young adolescents and high school students. It can be used to assess change over time in these behaviors as well as the co-occurrence of health-risk behaviors in six risk areas: 1. Behaviors that result in unintentional injuries and violence; 2. Tobacco use; 3. Alcohol and drug use; 4. Behaviors that contribute to unintended pregnancy and sexually transmitted diseases; 5. Physical inactivity; and 6. Problematic dietary behaviors. Differential response formats and scoring techniques are implemented throughout the YRBS in order to address specific study aims. Response options vary from a yes/no format to mutually exclusive response choices. Scores may be summed or assessed independently for each response. Studies have demonstrated test-retest reliability for this measure to be fair, with Kappa values ranging from .24 to .91, with a mean of .61 and 93.1% of items demonstrating at least "moderate" reliability (Kappas ≥ .41; Brener, Kann, McManus, Kinchen, Sundberg, & Ross, 2002).

A slightly modified version of the YRBS was used for this study in order to examine substance use variables above and beyond those available in the current YRBS. Specifically, additional questions were added to assess use of substances not covered in the original YRBS (i.e., inhalants other than glue and hallucinogens other than Ecstasy). All additional drug use questions were modeled in the same format with regard to question style and response options as those currently found in the YRBS. The final version used in this study assessed for the occurrence and frequency of both self-reported current (past 30 days) and lifetime use of tobacco, alcohol, marijuana, cocaine, inhalants, hallucinogens, and methamphetamine. For current use, response choices (i.e., 0 days, 1-9 days, 10-19 days, 20-29 days, and 30 days) denote the number of days of use within the past 30 days. Lifetime substance use for each substance employed a yes/no response format and was assessed dichotomously (e.g., "Have you ever used alcohol?"). Responses included in results for the current study used only those examining

lifetime use and employed a dichotomous yes/no format. Items used in the current study have previously demonstrated good Kappa reliability: 85.7% for lifetime tobacco use, 81.9% for lifetime alcohol use, 89.8% for lifetime marijuana use, 73.4% for lifetime cocaine use, 67.0% for lifetime inhalant use, and 70.7% for lifetime methamphetamine use (note, Kappa reliability was not observed for hallucinogen use; Brener et al., 2002).

Demographic Questionnaire. Participants also completed a demographic questionnaire inquiring about their age, gender, and racial/ethnic identity.

Procedure

Procedures for this study were approved by the University of Mississippi's Institutional Review Board. Participants were recruited as part of the Behavioral Vital Signs Screening (BVS) project, which is an ongoing mental health screening program administered to public schools in Mississippi. It was offered free of charge to every public school in the state of Mississippi from August 2008 to present. Following the provision of passive informed consent (i.e., all adolescents in this study were provided with informed parental assent documents that were returned only upon declining participation), participants completed a questionnaire packet including the measures described above. Participants were instructed that their involvement in the study was voluntary, that their responses were anonymous and confidential, and that participation would in no way influence their academic standing or educational status.

Data from questionnaires were collected from each school in a single administration, with collection dates and logistic preparations coordinated with school personnel prior to administration. Students were administered the RCADS, YRBS, and demographic questionnaire in packet form during normal class time. They recorded their answers on computer-scored response sheets (SCANTRON®). Students completed questionnaires during class time; teachers

aided in administration. Both teachers and research staff were available throughout the administration process to read questions aloud and help in proper responding for participants who had trouble reading or understanding questions.

Statistical Analyses

Consistent with the exploratory goal of the study, descriptive statistics were calculated to examine lifetime substance use rates by grade. Next, in order to address the primary study goal, a preliminary multivariate analysis of variance (MANOVA) was conducted to identify demographic variables to be entered as covariates for subsequent analyses. In order to determine the extent to which relevant sociodemographic variables, depression, and anxiety reliably predicted lifetime use of tobacco, alcohol, marijuana, cocaine, inhalants, hallucinogens, and methamphetamine, a multivariate logistic regression analysis was conducted in which all predictor variables were entered simultaneously. Follow-up univariate hierarchical logistic regressions were conducted in order to examine the extent to which depression and anxiety predicted lifetime use for individual substances above and beyond relevant sociodemographic covariates. Specifically, relevant sociodemographic variables, identified from the preliminary MANOVA, were entered as covariates in the first step of the model, followed by depression and subscale scores of anxiety in the second step; this format was repeated for each substance of interest. In all analyses, depression was expressed as a single variable, while anxiety was expressed as five separate subscale variables (separation anxiety disorder, panic disorder, generalized anxiety disorder, social phobia, and obsessive-compulsive disorder). Data were analyzed using PASW by SPSS version 17.0.

Results

Preliminary Analyses

Prior to conducting analyses, predictor (demographic variables, depression, anxiety) and criterion (lifetime use of tobacco, alcohol, marijuana, cocaine, inhalants, hallucinogens, and methamphetamine) variables were screened for accuracy of data entry and violations of assumptions). Histograms and scatter plots were used to examine assumptions of normal distribution, linearity, homoscedasticity and homogeneity. In order to assess for multivariate outliers, a Mahalanobis test was conducted and scores that exceeded a predetermined chi-square cutoff ($p < .001$) were excluded from analyses. As a result, 104 participants were identified as multivariate outliers (1.8 % of entire sample) and thus excluded from further analyses.

Exploratory Analyses: Rates of Lifetime Substance Use

Consistent with the exploratory study goal, prevalence of lifetime substance use across grade levels and substances are presented in Figure 1 and Table 2. Overall use of any illicit substance by 8th grade was 22.7%. This rate increased to 50.1% by 12th grade. Of particular interest are findings that suggest a differential trend in lifetime use from 6th to 12th grade with reference to specific substance of use. For example, lifetime smoking and alcohol use rates from 6th to 12th grade displayed an increasing linear trend from 10.2% to 44.5% and from 23.2% to 72.0% respectively. As a result, lifetime tobacco use for 12th graders was 4.4 times greater than for 6th graders; lifetime alcohol use was 3.1 times greater among high school seniors compared to 6th graders. Marijuana use displayed a similar yet slightly steeper increasing linear trend from 7.8% in 6th grade to 39.2% in 12th grade. This trend represents an overall increase in which

34

roughly 5 times the number of 12th graders report having engaged in marijuana use compared to 6th graders.

Cocaine and inhalant use displayed a considerably flatter linear trend compared to those observed in tobacco, alcohol, and marijuana lifetime use. Specifically, rates of lifetime cocaine use were endorsed at a much more consistent rate when comparing 6th graders to 12th graders (6.7% to 11.1%). As such, rates of lifetime cocaine use among 12th graders were only 1.7 times greater than those observed among 6th graders. Further, lifetime inhalant use increased from 12.2% in 6th graders to 17.9% in 12th graders, demonstrating 12th grade lifetime use to be only 1.5 times higher than lifetime use endorsed by 6th graders.

Increase in hallucinogen and methamphetamine lifetime use tended to be more moderate. Specifically, hallucinogen use among 12th graders was 2.7 times greater than 6th graders (12.1% compared to 4.4% respectively). Similarly, lifetime methamphetamine use increased from 3.0% in 6th graders to 6.3% in 12th graders, a trend representing a moderate increase in which 12th grade lifetime methamphetamine use was 2.7 times greater than 6th grade.

Primary Analyses: Relationships between Depression/Anxiety and Substance Use

Preliminary associations. In order to identify relevant sociodemographic variables to be use in subsequent regression analyses, a MANOVA was conducted with seven dependent variables (lifetime use of tobacco, alcohol, marijuana, cocaine, inhalants, hallucinogens, and methamphetamine). Demographic variables of interest representing independent variables were SES, grade level, ethnicity, and gender. Using Wilks' criteria, the combined DVs were significantly affected by SES, F (35, 22789) = 1.598, p = .014, gender, F (7, 5417) = 6.543, $p <$ .001, and grade level, F (42, 25411) = 6.908, $p <$ .001, but not by race/ethnicity, F (7, 5417) = 1.371, p = .213. Although race/ethnicity was not identified as a significant potential covariate, it

was retained in subsequent analyses in order to remain consistent with study aims and theoretical rationale.

In the initial multivariate logistic regression analysis, sociodemographic variables (SES, grade level, ethnicity, and gender) and primary predictor variables (depression, separation anxiety disorder, panic disorder, generalized anxiety disorder, social phobia, and obsessive-compulsive disorder) were entered simultaneously to predict lifetime tobacco, alcohol, marijuana, cocaine, inhalant, hallucinogen, and methamphetamine use. Using Wilks' criteria, the overall model examining the combined criterion variables was significant, F (70, 32054) = 22.793, $p < .001$. Further, the model was significant in predicting lifetime tobacco, F (10, 5502) = 65.182, $p < .001$, alcohol, F (10, 5502) = 88.363, $p < .001$, marijuana, F (10, 5502) = 60.122, $p < .001$, cocaine, F (10, 5502) = 11.228, $p < .001$, inhalant, F (10, 5502) = 27.439, $p < .001$, hallucinogen, F (10, 5502) = 22.901, $p < .001$, and methamphetamine use, F (10, 5502) = 15.648, $p < .001$. These findings provided support for subsequent examination of each substance individually.

Depression and anxiety as incremental predictors of alcohol and tobacco use. To identify the unique contributions of the sociodemographic variables versus affective variables for each substance, a series of hierarchical logistic regressions were performed as articulated above. That is, seven separate hierarchical logistic regression analyses were conducted, each examining lifetime use of a single substance as the criterion variable. In the first step of the regression examining lifetime tobacco use, sociodemographic variables significantly predicted lifetime tobacco use, χ^2 (4, $n = 5,666$) = 331.57, $p < .001$, and correctly classified 98.5% of non-lifetime users and 3.8% of users. In the second step, depression and anxiety dimensions significantly improved the model, χ^2 (6, $n = 5,666$) = 260.16, $p < .001$, and correctly classified an additional

11.2% of lifetime tobacco users. The overall model was significant, χ^2 (10, $n = 5,666) = 591.73$, $p < .001$, and correctly classified 95.9% of non-lifetime tobacco users and 15% of lifetime tobacco users, for an overall correct classification of 64.8% (Table 4).

For alcohol use, in the first step of the model, sociodemographic variables significantly predicted lifetime alcohol use, χ^2 (4, $n = 5,626) = 608.11$, $p < .001$, and correctly classified 82.0% of non-users and 44.2% lifetime users. The second step of the model was significant, χ^2 (6, $n = 5,626) = 209.23$, $p < .001$, and the inclusion of depression and anxiety dimensions correctly classified an additional 9.6% of lifetime alcohol users. The overall model significantly predicted lifetime alcohol use, χ^2 (10, $n = 5,626) = 817.34$, $p < .001$, and correctly classified 77.3% of non-users and 53.8% of lifetime users for an overall correct classification of 66.6% (Table 5).

Depression and anxiety as incremental predictors of illicit substance use. With regard to marijuana use, sociodemographic variables were significant in predicting lifetime marijuana use, χ^2 (4, $n = 5,609) = 386.20$, $p < .001$, and correctly classified 99.6% of non-users and 2% of lifetime users. In the second step, depression and anxiety dimensions significantly improved the model, χ^2 (6, $n = 5,609) = 162.16$, $p < .001$, and classified an additional 5.8% of lifetime marijuana users. The overall model was significant, χ^2 (10, $n = 5,609) = 548.36$, $p < .001$, and correctly classified 98.4% of non-users and 7.8% of lifetime marijuana users for an overall correct classification of 80.5%. It should be noted that although statistically significant, the model tended to over-classify individuals as non-users and under-classify lifetime marijuana users (Table 6).

For cocaine use, sociodemographic variables significantly predicted lifetime cocaine use, χ^2 (4, $n = 5,599) = 34.11$, $p < .001$. However, this step failed to correctly classify any individuals

who reported lifetime cocaine use. Rather, a significant model was achieved by classifying all individuals as non-users. The addition of depression and anxiety dimensions was significant as well, χ^2 (6, n = 5,599) = 73.28, p < .001, but equally failed to correctly classify any lifetime cocaine users. As such, the overall model, although significant, χ^2 (10, n = 5,599) = 107.38, p < .001, classified all individuals as non-users and failed to correctly classify any individuals who reported lifetime cocaine use (Table 7).

Similar results to those demonstrated for lifetime cocaine use, were observed in inhalant, hallucinogen, and methamphetamine use (see Tables 8 though 10). In all cases, the overall models were significant in predicting inhalant use, χ^2 (10, n = 5,579) = 244.52, p < .001, hallucinogen use, χ^2 (10, n = 5,568) = 211.81, p < .001, and methamphetamine use, χ^2 (10, n = 5,556) = 141.55, p < .001. However, the overall model for inhalant use was only able to correctly classify 1.7% of lifetime inhalant users, the overall model for hallucinogen use was limited to a correct classification of only .5% of lifetime users, and the overall model for methamphetamine use was unsuccessful in classifying any lifetime methamphetamine users. As such, these cases demonstrate statistical significance but fail to achieve models that adequately differentiate individuals with no history of use from those who report lifetime use.

Discussion

Utilizing a large representative sample, the present study obtained epidemiological rates of adolescent tobacco, alcohol, marijuana, cocaine, inhalant, hallucinogen, and methamphetamine use across grade levels among a diverse, rural-based, community sample of adolescents. The present study additionally, and primarily, explored the relationship between depression and anxiety and licit (i.e., tobacco and alcohol) and illicit substance use (i.e., marijuana, cocaine, inhalant, hallucinogen, and methamphetamine) among these adolescents. Specifically, this study examined the role of depression and anxiety in predicting licit and illicit substance use above and beyond relevant sociodemographic covariates within this unique community sample.

Prevalence Rates of Substance Use Compared to Extant Findings

Overall, lifetime substance use among Mississippi adolescents tended to vary considerably across substances when compared to national rates of use. When considering licit substance use, Mississippi adolescents tended to report lower rates of tobacco and alcohol use across almost all grade levels than those observed in two national surveys conducted by the Center for Disease Control and Prevention (CDC; CDC, 2010; Shanklin, Brener, McManus, Kinchen, & Kann, 2007). For example, while roughly 45% of Mississippi youth reported engaging in lifetime tobacco use by 12th grade, the CDC found that 55.5% reported lifetime use nationally. Similarly, Mississippi youth reported lower rates of lifetime alcohol use compared to those observed nationally, with roughly 72% of 12th graders reporting lifetime use in Mississippi compared to 79.7% nationally (CDC, 2010). These trends are interesting considering that rural

adolescents at all age groups are more likely to smoke cigarettes and use alcohol than adolescents residing in large urban areas (CASA, 2000). It is possible that Mississippi, in contrast to other similar rural states, has devoted particular resources to tobacco and alcohol prevention that helps account for this discrepancy. For example, in the 2011 fiscal year, Mississippi spent $9.9 million on tobacco prevention. Although this amount was only 25.3% of the CDC's recommendation for spending, it was considerably higher than neighboring states such as Alabama, which met only 1.5% of CDC's recommended spending (i.e., $860,000) and Tennessee, which allocated finances totaling 0.3% of the CDC's recommended spending ($200,000; Campaign for tobacco free kids, 2011). As a result, it is possible that initial prevention efforts in Mississippi have helped to lower licit substance use rates among adolescents in this sample.

When compared to national rates, lifetime marijuana use tended to demonstrate somewhat different results to those observed for licit substances. That is, lifetime marijuana use among Mississippi adolescents was higher in early middle school youth but lower among late high school adolescents when compared to nationally reported rates. For example, while 3.7%-5.5% of 6th graders nationally reported lifetime use of marijuana, 7.9% of 6th graders in Mississippi reported lifetime marijuana use (Shanklin et al., 2007). These trends were reversed among high school youth with 45.6% reporting lifetime marijuana use nationally and only 39.2% of 12th graders reporting lifetime marijuana use in Mississippi (CDC, 2010).

In a manner quite different to that observed for tobacco and alcohol use, Mississippi youth reported generally higher rates of lifetime, cocaine, inhalant, hallucinogen, and methamphetamine use compared to those observed in comparative national surveys (i.e., CDC, 2010; Johnston et al., 2009; Shanklin et al., 2007). With regard to cocaine and inhalant use, both

Mississippi middle school and high school youth reported lifetime rates equal to or greater than national rates at every grade level. For example, by 12th grade, Mississippi youth demonstrated considerably higher rates of lifetime cocaine and inhalant use (11.1% compared to 7.9% nationally for cocaine and 17.9% compared to 9.1% nationally for inhalants). Mississippi adolescents reported higher rates of hallucinogen use in both 8th and 12th grade (8.7% and 12.1% respectively) compared to national rates (3.3% and 8.7%). Similar trends were observed in methamphetamine use with roughly 8% of 8th graders and 6.3% of 12th graders using methamphetamine in Mississippi compared to only 2.3% of 8th graders and 2.8% of 12th graders nationally (Johnston et al., 2009).

Of additional interest are the differential linear trends of increasing use observed among this sample. Specifically, changes in rates of use tended to vary considerably by substance. This is particularly true with regard to cocaine and inhalant use compared to tobacco, alcohol, and marijuana use. Specifically, the linear trends for cocaine and inhalant use were considerably flatter than those for tobacco, alcohol, and marijuana use. Further, as mentioned previously, Mississippi youth demonstrated considerably higher rates of lifetime cocaine and inhalant use compared to those nationally at all grade levels. Such trends suggest that fewer Mississippi youth initiate use of these substances later on in adolescence as compared to later initiation of tobacco, alcohol, and marijuana. These findings call attention to the particularly problematic nature of early initiation of cocaine and inhalant use and highlight the need for early intervention and prevention efforts.

Overall, findings from the present study indicate that Mississippi youth generally engage in lower rates of lifetime tobacco and alcohol use compared to those observed nationally; however, these trends do not extend to illicit drug use. By 12th grade, Mississippi youth report

41

higher rates of lifetime use across all illicit substances other than marijuana in comparison to youth nationally.

Depression and Anxiety as Predictors of Adolescent Substance Use

The primary goal of the current study was to examine the role of depression and anxiety among a diverse, rural-based, community sample of adolescents, a population at heightened risk for adolescent substance use. As predicted, lifetime licit and illicit substance use was significantly associated with current symptoms of depression and anxiety. Further, relevant demographic and environmental variables (SES, gender, ethnicity, and grade level), depression, and anxiety were statistically significant in differentiating those who had engaged in lifetime substance use from those who had not. This was particularly true of tobacco and alcohol use. It should be noted, that although statistically significant, overall models were not particularly accurate in classifying lifetime users of most illicit substances.

When considering the distinct role of sociodemographic variables in predicting lifetime use for specific substances, the findings tended to vary considerably across variables. As was expected, grade significantly predicted lifetime use across all substances. That is, youth in higher grade levels were significantly more likely to have used both licit and illicit substances compared to younger adolescents. Conversely, race did not significantly predict lifetime use for any substance other than methamphetamine, in which non-White individuals were more likely to use than White adolescents. With regard to SES and gender, findings varied considerably across substances. For instance, although neither SES nor gender were significant predictors of lifetime tobacco use, both significantly predicted lifetime alcohol and marijuana use. Specifically, being male predicted higher rates of both alcohol and marijuana use while low SES was associated with lifetime alcohol use and high SES was associated with marijuana use.

42

With regard to the role of depression and specific anxiety dimensions predicting substance use beyond sociodemographic variables, findings were generally mixed. Further, although statistically significant, the observed odds ratios for all depression and anxiety variables suggest generally modest influences on lifetime substance use. The presence of depression incrementally predicted lifetime use for all substances examined; however, findings suggest that individuals who display depression symptoms are only at a moderately higher risk to have engaged in lifetime substance use compared to non-depressed counterparts. When considering specific anxiety dimensions, findings tended to be mixed and vary considerably across disorders. For example, panic disorder emerged as the only consistent and most influential predictor of adolescent substance use. Generalized anxiety disorder symptoms were indicative of an increased likelihood of lifetime tobacco and alcohol use. Interestingly, in contrast to panic disorder and generalized anxiety disorder, several anxiety dimensions emerged as factors associated with a lower likelihood of substance use. For example, adolescents who reported elevated social phobia symptoms demonstrated a lower likelihood of use for all substances examined. Although both subclinical and clinical social phobia is commonly associated with a higher likelihood of substance use among adults (e.g., Crum & Pratt, 2001), it is possible that the experience of social phobia among adolescents in this sample may limit exposure to substance use and substance-using peers and ultimately decrease likelihood of use.

In contrast to those variables that demonstrated a consistent trend across substances, separation anxiety disorder displayed an oscillating influence. For example, the experience of separation anxiety disorder symptoms was associated with a lower likelihood of lifetime use for tobacco, alcohol, and inhalants; however, it was alternatively associated with a higher likelihood of use for lifetime use of cocaine, hallucinogens, and methamphetamine. Again, for all anxiety

43

disorder dimensions, corresponding odds ratios suggest a limited and modest role. As such, findings must be interpreted cautiously.

It should be noted however, that although modest odds ratios were obtained for each individual disorder, it is likely that both the experience of depression and anxiety dimensions, specifically panic disorder and generalized anxiety disorder, play at least a small role in the experience of lifetime substance use among adolescents in this diverse community sample. Further, the mixed findings between anxiety dimensions on particular substances may call attention to the differential role of specific anxiety subtypes among different substances. When considering the performance of the overall models, depression and anxiety added most to the incremental prediction of lifetime tobacco and alcohol use. Conversely, although statistically significant, models including depressive and anxiety symptoms were generally unsuccessful in differentiating users from non-users for illicit substances, primarily because they assisted little in the identification of users. Specifically, the overall model predicting lifetime marijuana use demonstrated minimal success, while models for cocaine, inhalants, hallucinogens, and methamphetamine were able to predict only an inconsequential percent of lifetime users. It is possible however, that the models were unsuccessful in predicting lifetime use for the illicit substances examined in this study due to low base rates in which best fit models and statistical significance were achieved by classifying all adolescents as non-users. Overall, models were moderately successful in predicting lifetime tobacco and alcohol use, yet unsuccessful in predicting lifetime illicit substance use.

In total, findings demonstrate the statistically significant role of comorbid depression and anxiety in predicting adolescent licit substance use (i.e., tobacco and alcohol) with some limited evidence for the modest role of comorbid depression and anxiety in illicit substance use.

Depression and anxiety dimensions were generally statistically significant in predicting lifetime use but differed slightly from findings observed by Costello et al., (1999). Specifically, similar to Costello et al., (1999), depression emerged as a generally consistent predictor of adolescent use, a relationship that was particularly true among males. In contrast, while anxiety dimensions (i.e., panic disorder and generalized anxiety disorder in particular) predicted lifetime use among the current sample, Costello et al., (1999) found no relationship. It should be noted that although similar (i.e., community-based), the sample included in the current study was considerably more ethnically diverse than the sample examined by Costello et al. (1999). As such, findings demonstrate the potentially differential impact of depression and anxiety among this diverse sample compared to other community samples and suggests a modest role in the likelihood of use for most licit and illicit substances.

Extension of Findings to Mississippi Adolescents

The present findings contribute to current research in a number or ways. First, although a fairly consistent relationship exists between psychological variables such as depression and anxiety and substance use within clinical settings, limited research has been conducted to extend these findings to community populations. As noted by Armstrong and Costello (2002), it is inappropriate to generalize findings from clinical samples to community populations. As such, this study provides support for the role of depression and anxiety in adolescent substance use among this non-clinical community sample. In doing so, findings highlight community needs in a manner that may help to inform local policy, treatment, and prevention programs. It should be noted, however, that the small effect sizes observed in the current study suggest a relatively modest impact of depression and anxiety among this community sample compared to more clinical populations. Indeed, Costello et al., (1999) found adolescent substance use to be

45

associated with depression but not anxiety among a similar community sample. As such, it is likely that these psychological factors, although important within this community sample, contribute to a greater extent to adolescent substance use among clinical populations. As a result, it is possible that environmental and contextual factors such as family, peer, school, and community influences play a stronger role in substance use within this population than do depression and anxiety.

Second, geographical group differences are often observed in adolescent substance use. Indeed, results from several national studies indicate that rates of adolescent licit and illicit substance use often differ by geographical location and are generally highest in rural areas (National Center on Addiction and Substance Abuse [CASA], 2000; Lambert et al., 2008; Strong et al., 2005). Further, studies have suggested higher rates of illicit substance use among adolescents residing in southern states (Johnston, O'Malley, Bachman, & Schulenberg 2010). To date, no studies have examined comorbid depression and anxiety among adolescents residing in Mississippi, both a predominantly rural and southern state. Given this, the current study extends the association between depression and anxiety and adolescent substance use to an understudied population at risk for elevated rates of substance use.

Third, there is a shortage of research examining adolescent substance use among ethnic minorities residing in rural settings (De La Rosa et al., 1997). This is particularly true with regard to research examining associated psychological factors that may contribute to adolescent substance use, such as comorbid depression and anxiety. Although the current study did not specifically examine racial/ethnic group differences in depression and anxiety, this study employed a large minority sample in which roughly half of the participants were African American or another minority. Findings thus provide indirect support for the roles of comorbid

depression and anxiety and adolescent substance use among a historically underrepresented population (i.e., ethnically diverse participants of predominantly low SES and residing primarily in rural geographical locations).

Implications for Current Prevention Programs in Rural Communities

Although depression and anxiety differ in magnitude and by disorder in their role in adolescent licit and illicit substance use, this study and others (e.g., Burke et al., 1994; Chinet et al., 2006; Christie et al., 1988) consistently highlight associations between adolescent substance use and depression and anxiety. By its extension to an understudied population, this study highlights the need for psychologically-based mental health and substance use prevention efforts in rural and impoverished areas. This may be particularly true for rural areas that consist of an ethnically diverse population. Indeed, racial/ethnic differences in perceived harmfulness of licit and illicit substances may exist in rural settings (Stern, & Wiens, 2009) and have the potential to differentially influence rural prevention programs.

The rural environment may present additional challenges to adolescent health in which rural youth are at an increased risk for an array of negative health outcomes (Cherry, Huggins, & Gilmore, 2007). Rural adolescents additionally demonstrate a number of negative health behaviors and may be at particular risk for mental health problems and substance use (Curtis, Waters, & Brinds, 2011). Unfortunately, rural and ethnically diverse communities present a set of unique challenges to implementing prevention research and programs. That is, the rural environment may not have the resources necessary for effective delivery of substance abuse prevention or treatment programs. Additionally, rural areas may provide fewer opportunities for adolescents to minimize substance use risk such as changing schools or avoiding disruptive environments (Scaramella & Keyes, 2001). As a result, rural-based prevention efforts should

address the environmental characteristics unique to rural settings. Equally, evidence-based substance use prevention programs that have been tested in non-rural settings should be evaluated for their adaptability to rural areas (Smith & Caldwell, 2007).

To date, a number of substance use prevention programs have been designed specifically for implementation in rural communities. These programs have sought to address both early risk factors as well as preventative intervention strategies. For example, an early intervention program targeted toward the prevention of substance use risk factors in preschool children demonstrated efficacy in improving caregiver involvement and social competence among rural children and families (Kaminski, Stormshak, Good, & Goodman, 2002). Substance use prevention strategies among rural school age youth have also demonstrated some effectiveness. For example, Trudeau, Spoth, Lillehoj, Redmond, and Wickrama (2003) demonstrated that a school-based intervention significantly slowed the rate of increase in alcohol, tobacco, and marijuana initiation. Additionally, this program slowed the rate of decrease in refusal intentions and negative outcome expectancies among a sample of rural seventh graders. Further, in a prevention approach aimed at school-based comprehensive education and case-management, Zavela et al. (1997) demonstrated effectiveness in improving academic achievement and reducing current use of alcohol and other drugs in a rural, at-risk population.

Although several prevention efforts have been established specifically for youth in rural-based communities, few have addressed psychological risk factors that may contribute to the development and maintenance of adolescent substance use among these populations. Indeed, an effective prevention program should minimize both maladjustment and clinical dysfunction (e.g., depression and anxiety) in adolescents (Kazdin, 1993). Further, prevention and treatment efforts may be enhanced by addressing comorbid psychological disorders (Merikangas & Avenevoli,

48

2000). For example, in a randomized clinical trial of adolescents with comorbid bipolar disorder and alcohol abuse or dependence, Geller et al. (1998) demonstrated that lithium was effective in reducing symptoms of both depression and alcoholism. Further research on prevention and treatment efforts among this adolescent population should focus on regular screening for depression and anxiety symptoms, prevention efforts for at-risk youth, evaluation and incorporation of interventions targeting these symptoms, and assessment of feasibility and accessibility of delivery of such services. This may be particularly true for tobacco and alcohol prevention and treatment efforts within these communities. In doing so, it may be possible to enhance adolescent substance use prevention and treatment in diverse rural communities such as Mississippi.

Conclusion: Strengths, Limitations and Future Directions

Several noteworthy strengths exist within the current study. Namely, this study utilized a very large sample of adolescents, representative of a number of geographic areas across Mississippi. As noted earlier, the sample included in this study was ethnically diverse and unique in a number of sociodemographic variables, particularly those related to low SES and rural geographical regions. Further, this study employed a passive consent format in which over 99% of potentially eligible individuals participated in the study, allowing for an accurate representation of sampled locations.

Despite considerable strengths within this study, a number of limitations should be highlighted. First and foremost, data were cross-sectional and thus we are unable to infer directionality of findings. We are unable to conclude whether depression and anxiety contribute to the onset or maintenance of adolescent substance use, whether adolescent substance use contributes to the experience of depression and anxiety, or if a third variable exists that may

account for both depression and anxiety and adolescent substance use. Second, data included in

this study were self-report and may not be as reliable as interview-based methods. However, the

RCADS has demonstrated both convergent and discriminant validity consistent with well

validated interview-based assessment measures (Chorpita et al., 2005). Nevertheless, future

studies should utilize longitudinal and interview-based methods to examine the role of

depression and anxiety in substance use over time among similar populations. Third, the current

study did not examine possible interactions between variables of interest and adolescent

substance use. For example, it is possible that an interaction between SES and gender

significantly contributed to adolescent substance use in which low SES played a significant role

in substance use for males but not females. Statistical analyses conducted in this study did not

examine moderating variables and may have failed to identify contributing interactions to

lifetime use. Further, this study did not include population density variables in statistical analyses

and are thus unable to make definitive statements about the relative role of rural/low SES versus

urban/higher SES living conditions. However, as a whole, Mississippi has a predominantly rural

geographic landscape and is the poorest state in the country with roughly 21.3% of individuals

living in poverty, a rate that is significantly higher than any other state in the country and nearly

two times higher than the national poverty rate (US Census Bureau, 2010). Indeed, more than

half (53.8%) of participants in the current study were drawn from counties with fewer than

50,000 residents, and over 40% of participants resided in counties with a median income less

than $30,000 annually. Finally, it should be noted that this study utilized current rates of

depression and anxiety to predict lifetime rates of substance use. Given that the experience of

lifetime substance use may be temporally removed from the experience of current depression and

anxiety, findings may not accurately reflect a direct relationship between variables. Future

studies should extend findings by examining current depression and anxiety disorders in the prediction of current substance use.

Overall, findings demonstrate the significant role of depression and anxiety disorders, specifically panic disorder and generalized anxiety disorder, above and beyond relevant sociodemographic variables (SES, gender, ethnicity, and grade level) in predicting lifetime substance use among this unique population. Although the magnitude of impact tended to vary depending on type of substance and in many cases was associated with relatively small increases in risk, findings provide evidence for the important role of psychological correlates such as depression and anxiety in substance use among Mississippi adolescents. This is particularly true with regard to tobacco and alcohol use. Findings extend previous research and suggest the need to explore early substance use prevention initiatives that incorporate components aimed at preventing and treating depression and anxiety.

LIST OF REFERENCES

Abraham, H. D. & Fava, M. (1999). Order of onset of substance abuse and depression in a

sample of depressed outpatients. Comprehensive Psychiatry, 40, 44-50.

Allen, S. S., Bade, T., Hatsukami, D., & Center, B. (2008). Craving, withdrawal, and smoking

urges on days immediately prior to smoking relapse. *Nicotine & Tobacco Research, 10,*

35-45.

American Psychiatric Association (2004). *Diagnostic and statistical manual of mental disorders*

(4ᵗʰ ed.). Washington, DC: Author.

Anderson, C. E. & Loomis, G. A. (2003). Recognition and prevention of inhalant abuse.

American Family Physician, 68, 869-874.

Anglin, M. D., Burke, C., Perrochet, B., Stamper, E., & wud-Noursi, S. (2000). History of the

methamphetamine problem. *Journal of Psychoactive Drugs, 32,* 137-141.

Armstrong, T. D. & Costello, E. J. (2002). Community studies on adolescent substance use,

abuse, or dependence and psychiatric comorbidity. *Journal of Consulting and Clinical*

Psychology, 70, 1224-1239.

Arthur, M. W., Hawkins, J. D., Pollard, J. A., Catalano, R. F., & Baglioni, A. J., Jr. (2002).

Measuring risk and protective factors for substance use, delinquency, and other

adolescent problem behaviors: The Communities That Care Youth Survey. *Evaluation*

Review, 26, 575-601.

Austin, A., Wagner, E. F. (2010). Treatment attrition among racial and ethnic minority youth.

Journal of Social Work Practice in the Addictions, 10, 63-80.

Bagge, C. & Sher, K. J. (2008). Adolescent alcohol involvement and suicide attempts: Toward

the development of a conceptual framework. *Clinical Psychology Review, 28,* 1283-1296.

Bailey, S. R., Harrison, C. T., Jeffery, C. J., Ammerman, S., Bryson, S. W., Killen, D. T., . . .

    Killen, J. D. (2009). Withdrawal symptoms over time among adolescents in a smoking

    cessation intervention: Do symptoms vary by level of nicotine dependence? *Addictive*

    Behaviors, 34, 1017-1022.

Brecht, M. L., Greenwell, L., & Anglin, M. D. (2007). Substance use pathways to

    methamphetamine use among treated users. *Addictive Behaviors, 32,* 24-38.

Brener, N. D., Kann, L., Kinchen, S. A., Grunbaum, J. A., Whalen, L., Eaton, D., . . . Ross, J. G.

    (2004). Methodology of the Youth Risk Behavior Surveillance System. *Morbidity and*

    Mortality Weekly Report, 53, 1-13.

Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002).

    Reliability of the 1999 youth risk behavior survey questionnaire. *Journal of Adolescent*

    Health, 31, 336-342.

Breslau, N., Davis, G. C., Peterson, E. L., & Schultz, L. (1997). Psychiatric sequelae of

    posttraumatic stress disorder in women. *Archives of General Psychiatry, 54,* 81-87.

Breslau, N. & Klein, D. F. (1999). Smoking and panic attacks: An epidemiologic investigation.

    Archives of General Psychiatry, 56, 1141-1147.

Brook, J. S., Brook, D. W., rencibia-Mireles, O., Richter, L., & Whiteman, M. (2001). Risk

    factors for adolescent marijuana use across cultures and across time. *The Journal of*

    Genetic Psychology: Research and Theory on Human Development, 162, 357-374.

Brouette, T. & Anton, R. (2001). Clinical review of inhalants. *The American Journal on*

    Addictions, 10, 79-94.

Brower, K. J. & Anglin, M. D. (1987). Adolescent cocaine use: Epidemiology, risk factors, and

    prevention. *Journal of Drug Education, 17,* 163-180.

Brown, R. A., Lewinsohn, P. M., Seeley, J. R., & Wagner, E. F. (1996). Cigarette smoking, major depression, and other psychiatric disorders among adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 35,* 1602-1610.

Brown, T. L., Miller, J. D., & Clayton, R. R. (2004). The Generalizability of Substance Use Predictors Across Racial Groups. *The Journal of Early Adolescence, 24,* 274-302.

Bukstein, O. G., Glancy, L. J., & Kaminer, Y. (1992). Patterns of affective comorbidity in a clinical population of dually diagnosed adolescent substance abusers. *Journal of the American Academy of Child & Adolescent Psychiatry, 31,* 1041-1045.

Burke, J. D., Burke, K. C., & Rae, D. S. (1994). Increased rates of drug abuse and dependence after onset of mood or anxiety disorders in adolescence. *Hospital & Community Psychiatry, 45,* 451-455.

Burke, K. C., Burke, J. D., Regier, D. A., & Rae, D. S. (1990). Age at onset of selected mental disorders in five community populations. *Archives of General Psychiatry, 47,* 511-518.

Castro, F. G., Newcomb, M. D., & Bentler, P. M. (1988). Depression and poor health as antecedents and consequences of cocaine use. *Psychology & Health, 2,* 157-186.

Centers for Disease Control and Prevention. (2010). Youth Risk Behavior Surveillance – United States, 2009. *Surveillance Summaries, MMWR, 59, SS-5.*

Chassin, L., Presson, C. C., Sherman, S. J., & Edwards, D. A. (1990). The natural history of cigarette smoking: Predicting young-adult smoking outcomes from adolescent smoking patterns. *Health Psychology, 9,* 701-716.

Cherry, D. C., Huggins, B., & Gilmore, K. (2007). Children's health in the rural environment. *Pediatric Clinics of North America, 54,* 121-133.

Chinet, L., Plancherel, B., Bolognini, M., Bernard, M., Laget, J., Daniele, G., & Halfon, O. (2006). Substance use and depression. Comparative course in adolescents. *European Child & Adolescent Psychiatry, 15,* 149-155.

Cho, H., Hallfors, D. D., & Iritani, B. J. (2007). Early initiation of substance use and subsequent risk factors related to suicide among urban high school students. *Addictive Behaviors, 32,* 1628-1639.

Chorpita, B. F., Moffitt, C. E., & Gray, J. (2005). Psychometric properties of the Revised Child Anxiety and Depression Scale in a clinical sample. *Behaviour Research and Therapy, 43,* 309-322.

Chorpita, B. F., Yim, L., Moffitt, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale. *Behaviour Research and Therapy, 38,* 835-855.

Christie, K. A., Burke, J. D., Regier, D. A., & Rae, D. S. (1988). Epidemiologic evidence for early onset of mental disorders and higher risk of drug abuse in young adults. *The American Journal of Psychiatry, 145,* 971-975.

Cleveland, M. J., Feinberg, M. E., Bontempo, D. E., & Greenberg, M. T. (2008). The role of risk and protective factors in substance use across adolescence. *Journal of Adolescent Health, 43,* 157-164.

Clinton-Sherrod, M., Sobeck, J., Abbey, A., Agius, E., & Terry, K. (2005). The Role of Psychosocial Factors in the Transition to Substance Use: Are They Protective among Urban Minority Adolescents? *The Journal of Primary Prevention, 26,* 511-528.

Colder, C. R., Campbell, R. T., Ruel, E., Richardson, J. L., & Flay, B. R. (2002). A finite
    mixture model of growth trajectories of adolescent alcohol use: Predictors and
    consequences. *Journal of Consulting and Clinical Psychology, 70,* 976-985.

Costello, E. J., Angold, A., Burns, B. J., Stangl, D. K., Tweed, D. L., Erkanli, A., & Worthman,
    M. (1996). The Great Smoky Mountains Study of youth: Goals, design, methods, and the
    prevalence of DSM-III-R disorders. *Archives of General Psychiatry, 53,* 1129-1136.

Costello, E. J., Erkanli, A., Federman, E., & Angold, A. (1999). Development of psychiatric
    comorbidity with substance abuse in adolescents: Effects of timing and sex. *Journal of
    Clinical Child Psychology, 28,* 298-311.

Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and
    Development of Psychiatric Disorders in Childhood and Adolescence. *Archives of
    General Psychiatry, 60,* 837-844.

Couwenbergh, C., van den Brink, W., Zwart, K., Vreugdenhil, C., van Wijngaarden-Cremers, P.,
    & van der Gaag, R. J. (2006). Comorbid psychopathology in adolescents and young
    adults treated for substance use disorders: A review. *European Child & Adolescent
    Psychiatry, 15,* 319-328.

Crano, W. D., Gilbert, C., Alvaro, E. M., & Siegel, J. T. (2008). Enhancing prediction of inhalant
    abuse risk in samples of early adolescents: A secondary analysis. *Addictive Behaviors,
    33,* 895-905.

Crum, R, M., & Pratt, L. A. (2001). Risk of heavy drinking and alcohol use disorders in social
    phobia: A prospective analysis. *American Journal of Psychiatry, 158,* 1693-1700.

Curtis, A. C., Waters, C. M., & Brindis, C. (2011). Rural adolescent health: The importance of
    prevention services in the rural community. *The Journal of Rural Health, 27,* 60-71.

Deas, D. (2008). Evidence-based treatments for alcohol use disorders in adolescents. *Pediatrics, 121,* S348-S354.

Deas-Nesmith, D., Brady, K. T., & Campbell, S. (1998). Comorbid substance use and anxiety disorders in adolescents. *Journal of Psychopathology and Behavioral Assessment, 20,* 139-148.

Degenhardt, L., Hall, W., & Lynskey, M. (2001). Alcohol, cannabis and tobacco use among Australians: A comparison of their associations with other drug use and use disorders, affective and anxiety disorders, and psychosis. *Addiction, 96,* 1603-1614.

De La Rosa, M. R., Adrados, J. R., Kennedy, N. J., & Millburn, N. (1997). Current gaps and new directions for studying drug use and abuse behavior in minority youth. *Substance Use and Misuse, 32,* 1985-1990.

Dewit, D. J. & Rush, B. (1996). Assessing the need for substance abuse services: A critical review of needs assessment models. *Evaluation and Program Planning, 19,* 41-64.

Dunlop, S. M. & Romer, D. (2010). Adolescent and young adult crash risk: Sensation seeking, substance use propensity and substance use behaviors. *Journal of Adolescent Health, 46,* 90-92.

Dunn, M. S., Ilapogu, V., Taylor, L., Naney, C., Roger, B., Wilder, R., & Givens, C. (2008). Self-reported substance use and sexual behaviors among adolescents in a rural state. *Journal of School Health, 78,* 587-593.

Durant, R. H., Smith, J. A., Kreiter, S. R., & Krowchuk, D. P. (1999). The relationship between early age of onset of initial substance use and engaging in multiple health risk behaviors among young adolescents. *Archives of Pediatrics and Adolescent Medicine, 153,* 286-291.

Durlak, J. A. (1998). Common risk and protective factors in successful prevention programs. *American Journal of Orthopsychiatry, 68,* 512-520.

Ellickson, P. L., Collins, R. L., Bogart, L. M., Klein, D. J., & Taylor, S. L. (2005). Scope of HIV risk and co-occurring psychosocial health problems among young adults: Violence, victimization, and substance use. *Journal of Adolescent Health, 36,* 401-409.

Ellickson, P. L., Tucker, J. S., Klein, D. J., & Saner, H. (2004). Antecedents and outcomes of marijuana use initiation during adolescence. *Preventive Medicine: An International Journal Devoted to Practice and Theory, 39,* 976-984.

Embry, D., Hankins, M., Biglan, A., & Boles, S. (2009). Behavioral and social correlates of methamphetamine use in a population-based sample of early and later adolescents. *Addictive Behaviors, 34,* 343-351.

Feldstein, S. W. & Miller, W. R. (2006). Substance use and risk-taking among adolescents. *Journal of Mental Health, 15,* 633-643.

Fidalgo, T. M., da Silveira, E. D., & da Silveira, D. X. (2008). Psychiatric comorbidity related to alcohol use among adolescents. *The American Journal of Drug and Alcohol Abuse, 34,* 83-89.

Fothergill, K. E. & Ensminger, M. E. (2006). Childhood and adolescent antecedents of drug and alcohol problems: A longitudinal study. *Drug and Alcohol Dependence, 82,* 61-76.

Freese, T. E., Obert, J., Dickow, A., Cohen, J., & Lord, R. H. (2000). Methamphetamine abuse: Issues for special populations. *Journal of Psychoactive Drugs, 32,* 177-182.

Fung, H. L. & Tran, D. C. (2006). Effects of inhalant nitrites on VEGF expression: A feasible link to Kaposi's sarcoma? *Journal of Neuroimmune Pharmacology, 1,* 317-322.

Geller, B., Cooper, T. B., Sun, K., Zimmerman, B., Frazier, J., Williams, M., & Heath, J. (1998). Double-blind and placebo-controlled study of lithium for adolescent bipolar disorders with secondary substance dependency. *Journal of the American Academy of Child and Adolescent Psychiatry, 37,* 171-178.

Gorman, E. M. & Carroll, R. T. (2000). Substance abuse and HIV: Considerations with regard to methamphetamines and other recreational drugs for nursing practice and research. *JANAC: Journal of the Association of Nurses in AIDS Care, 11,* 51-62.

Greenwell, L. & Brecht, M. L. (2003). Self-reported health status among treated methamphetamine users. *The American Journal of Drug and Alcohol Abuse, 29,* 75-104.

Gruber, S. A., Rogowska, J., & Yurgelun-Todd, D. A. (2009). Altered affective response in marijuana smokers: An FMRI study. *Drug and Alcohol Dependence, 105,* 139-153.

Hanson, C. L., Novilla, M. L., Barnes, M. D., Eggett, D., McKell, C., Reichman, P., & Havens, M. (2009). Using the rural-urban continuum to explore adolescent alcohol, tobacco, and other drug use in Montana. *Journal of Child & Adolescent Substance Abuse, 18,* 93-105.

Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin, 112,* 64-105.

Henningfield, J. E., Clayton, R., & Pollin, W. (1990). Involvement of tobacco in alcoholism and illicit drug use. *British Journal of Addiction, 85,* 279-291.

Herman-Stahl, M. A., Krebs, C. P., Kroutil, L. A., & Heller, D. C. (2006). Risk and Protective Factors for Nonmedical Use of Prescription Stimulants and Methamphetamine among Adolescents. *Journal of Adolescent Health, 39,* 374-380.

Herman-Stahl, M. A., Krebs, C. P., Kroutil, L. A., & Heller, D. C. (2007). Risk and protective factors for methamphetamine use and nonmedical use of prescription stimulants among young adults aged 18 to 25. *Addictive Behaviors, 32,* 1003-1015.

Hickey, J. E., Brown, B. S., Chung, A. S., & Kolar, A. F. (1991). Perceived risk and sources of information regarding cocaine. *International Journal of the Addictions, 26,* 757-767.

Hovens, J. G. F. M., Cantwell, D. P., & Kiriakos, R. (1994). Psychiatric comorbidity in hospitalized adolescent substance abusers. *Journal of the American Academy of Child & Adolescent Psychiatry, 33,* 476-483.

Howard, M. O., Cottler, L. B., Compton, W. M., & Ben-Abdallah, A. (2001). Diagnostic concordance of DSM-III-R, DSM-IV and ICD-10 inhalant use disorders. *Drug and Alcohol Dependence, 61,* 223-228.

Howard, M. O., Walker, R. D., Walker, P. S., Cottler, L. B., & Compton, W. M. (1999). Inhalant use among urban American Indian youth. *Addiction, 94,* 83-95.

Jacobus, J., Bava, S., Cohen-Zion, M., Mahmood, O., & Tapert, S. F. (2009). Functional consequences of marijuana use in adolescents. *Pharmacology, Biochemistry and Behavior, 92,* 559-565.

Jackson, K. F. & LeCroy, C. W. (2009). The influence of race and ethnicity on substance use and negative activity involvement among monoracial and multiracial adolescents of the southwest. *Journal of Drug Education, 39,* 195-210.

James, W. H. & Moore, D. D. (1997). Screening for substance use among ethnic minority adolescents: Patterns and prevention approaches. *Substance Abuse, 18,* 57-66.

Johnson, J. G., Cohen, P., Pine, D. S., Klein, D. F., Kasen, S., & Brook, J. S. (2000). Association between cigarette smoking and anxiety disorders during adolescence and early adulthood. *JAMA: Journal of the American Medical Association, 284,* 2348-2351.

Johnson, M. K. (2004). Further Evidence on Adolescent Employment and Substance Use: Differences by Race and Ethnicity. *Journal of Health and Social Behavior, 45,* 187-197.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2010). *Demographic subgroup trends for various licit and illicit drugs, 1975-2009* (Monitoring the Future Occasional Paper No. 73). Ann Arbor, MI: Institute for Social Research, 417 pp.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2009). *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2008* (NIH Publication No. 09-7401). Bethesda, MD: National Institute on Drug Abuse.

Kalechstein, A. D., Newton, T. F., Longshore, D., Anglin, M. D., van Gorp, W. G., & Gawin, F. H. (2000). Psychiatric comorbidity of methamphetamine dependence in a forensic sample. *The Journal of Neuropsychiatry and Clinical Neurosciences, 12,* 480-484.

Kaminski, R. A., Stormshak, E. A., Good, R. H., & Goodman, M. R. (2002). Prevention of substance abuse with rural Head Start children and families: Results of Project STAR. *Psychology of Additive Behaviors, 16,* S11-S26.

Kandel, D. & Yamaguchi, K. (1993). From beer to crack: Developmental patterns of drug involvement. *American Journal of Public Health, 83,* 851-855.

Kandel, D. B., Johnson, J. G., Bird, H. R., Weissman, M. M., Goodman, S. H., Lahey, B. B., . . . Schwab-Stone, M. E. (1999). Psychiatric comorbidity among adolescents with substance use disorders: Findings from the MECA study. *Journal of the American Academy of Child & Adolescent Psychiatry, 38,* 693-699.

Kazdin, A.E. (1993). Adolescent mental health: Prevention and treatment programs. *American Psychologist, 48,* 127-141.

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A recosideration and recent applications. *Harvard Review of Psychiatry, 4,* 231-244.

Kilgus, M. D., Pumariega, A. J., & Seidel, R. W. (2009). Experimental manipulation of cocaine craving in adolescents by videotaped environmental cues. *Addictive Disorders & Their Treatment, 8,* 80-87.

Kip, K. E., Peters, R. H., & Morrison-Rodriguez, B. (2002). Commentary on why national epidemiological estimates of substance abuse by race should not be used to estimate prevalence and need for substance abuse services at community and local levels. *The American Journal of Drug and Alcohol Abuse, 28,* 545-556.

Komro, K. A., Williams, C. L., Forster, J. L., Perry, C. L., Farbakhsh, K., & Stigler, M. H. (1999). The relationship between adolescent alcohol use and delinquent and violent behaviors. *Journal of Child & Adolescent Substance Abuse, 9,* 13-28.

Kouri, E. M., Pope, H. G., Jr., & Lukas, S. E. (1999). Changes in aggressive behavior during withdrawal from long-term marijuana use. *Psychopharmacology, 143,* 302-308.

Kushner, M. G., Sher, K. J., & Beitman, B. D. (1990). The relation between alcohol problems and the anxiety disorders. *The American Journal of Psychiatry, 147,* 685-695.

Kushner, M. G., Sher, K. J., & Erickson, D. J. (1999). Prospective analysis of the relation between DSM-III anxiety disorders and alcohol use disorders. *The American Journal of Psychiatry, 156,* 723-732.

Lambert, D., Gale, J. A., & Hartley, D. (2008). Substance abuse by youth and young adults in rural America. *The Journal of Rural Health, 24,* 221-228.

Levy, S., Sherritt, L., Gabrielli, J., Shrier, L. A., & Knight, J. R. (2009). Screening adolescents

for substance useGÇôrelated high-risk sexual behaviors. *Journal of Adolescent Health,*

45, 473-477.

Libby, A. M., Orton, H. D., Stover, S. K., & Riggs, P. D. (2005). What came first, major

depression or substance use disorder? Clinical characteristics and substance use

comparing teens in a treatment cohort. *Addictive Behaviors, 30,* 1649-1662.

Lynskey, M. & Hall, W. (2000). The effects of adolescent cannabis use on educational

attainment: A review. *Addiction, 95,* 1621-1630.

Lynskey, M. T., Coffey, C., Degenhardt, L., Carlin, J. B., & Patton, G. (2003). A longitudinal

study of the effects of adolescent cannabis use on high school completion. *Addiction, 98,*

685-692.

Lynskey, M. T., Glowinski, A. L., Todorov, A. A., Bucholz, K. K., Madden, P. A. F., Nelson, E.

C., . . . Heath, A. C. (2004). Major depressive disorder, suicidal ideation, and suicide

attempt in twins discordant for cannabis dependence and early-onset cannabis use.

Archives of General Psychiatry, 61, 1026-1032.

Medina, K. L., Hanson, K. L., Schweinsburg, A. D., Cohen-Zion, M., Nagel, B. J., & Tapert, S.

F. (2007a). Neuropsychological functioning in adolescent marijuana users: Subtle deficits

detectable after a month of abstinence. *Journal of the International Neuropsychological*

Society, 13, 807-820.

McEwen, B. (2000). Allostasis and allostatic load: Implications for neuropsychopharmacology.

Neuropsychopharmacology, 22, 108-124.

Medina, K. L., Nagel, B. J., Park, A., McQueeny, T., & Tapert, S. F. (2007b). Depressive symptoms in adolescents: Associations with white matter volume and marijuana use. *Journal of Child Psychology and Psychiatry, 48,* 592-600.

Meredith, C. W., Jaffe, C., ng-Lee, K., & Saxon, A. J. (2005). Implications of Chronic Methamphetamine Use: A Literature Review. *Harvard Review of Psychiatry, 13,* 141-154.

Merikangas, K. R., & Avenevoli, S. (2000). Implications of genetic epidemiology for the prevention of substance use disorders. *Addictive Behaviors, 25,* 807-820.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual Causes of Death in the United States, 2000. *JAMA: Journal of the American Medical Association, 291,* 1238-1245.

Montoya, A. G., Sorrentino, R. e., Lukas, S. E., & Price, B. H. (2002). Long-term neuropsychiatric consequences of 'Ecstasy' (MDMA): A review. *Harvard Review of Psychiatry, 10,* 212-220.

National Center on Addiction and Substance Abuse (CASA) at Columbia University (2000). *No place to hide: Substance abuse in mid-size cities and rural America.* New York, NY: The National Center on Addiciton and Substance Abuse (CASA) at Columbia University.

National Institute of Drug Abuse. (2001). *Hallucinoens and Dissociative Drugs: Including LSD, PCP, Ketamine, Dextromethorphan* (NIH Publication No. 01-4209).

National Institute of Drug Abuse. (2006). *Methamphetamine: Abuse and Addiction* (NIH Publication No. 06-4210).

National Institute of Drug Abuse. (2010). *Inhalants: Abuse and Addiction* (NIH Publication No. 10-3818).

Office of National Drug Control Policy. (2009). *The national drug control strategy: 2009, budget summary.* Washington, DC: U.S. Government Printing Office.

Palmer, G. A. & Daiss, D. D. (2005). Personality characteristics of adolescents with hallucinogen, methamphetamine, and cannabis dependence: A comparative study. *Journal of Child & Adolescent Substance Abuse, 15,* 37-49.

Patton, G. C., Coffey, C., Lynskey, M. T., Reid, S., Hemphill, S., Carlin, J. B., & Hall, W. (2007). Trajectories of adolescent alcohol and cannabis use into young adulthood. *Addiction, 102,* 607-615.

Perron, B. E. & Howard, M. O. (2008). Perceived risk of harm and intentions of future inhalant use among adolescent inhalant users. *Drug and Alcohol Dependence, 97,* 185-189.

Rao, U., Hammen, C. L., & Poland, R. E. (2009). Mechanisms underlying the comorbidity between depressive and addictive disorders in adolescents: Interactions between stress and HPA activity. *The American Journal of Psychiatry, 166,* 361-369.

Ridenour, T. A., Bray, B. C., & Cottler, L. B. (2007). Reliability of use, abuse, and dependence of four types of inhalants in adolescents and young adults. *Drug and Alcohol Dependence, 91,* 40-49.

Roberts, R. E. & Roberts, C. R. (2007). Ethnicity and risk of psychiatric disorder among adolescents. *Research in Human Development, 4,* 89-117.

Roberts, R. E., Roberts, C. R., & Xing, Y. (2007). Rates of DSM-IV psychiatric disorders among adolescents in a large metropolitan area. *Journal of Psychiatric Research, 41,* 959-967.

Rohde, P., Lewinsohn, P. M., & Seeley, J. R. (1996). Psychiatric comorbidity with problematic alcohol use in high school students. *Journal of the American Academy of Child & Adolescent Psychiatry, 35,* 101-109.

Saban, A. & Flisher, A. J. (2010). The association between psychopathology and substance use in young people: A review of the literature. *Journal of Psychoactive Drugs, 42,* 37-47.

Scaramella, L. V., & Keyes, A. W. (2001). The social contextual approach and rural adolescent substance use: Implications for prevention in rural settings. *Clinical Child and Family Psychology Review, 4,* 231-251.

Schilling, E. A., Aseltine, R. H., Jr., Glanovsky, J. L., James, A., & Jacobs, D. (2009). Adolescent alcohol use, suicidal ideation, and suicide attempts. *Journal of Adolescent Health, 44,* 335-341.

Shanklin, S. L., Brener, N., McManus, T., Kinchen, S., & Kann, L. (2007). 2005 Middle School Youth Risk Behavior Survey. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Shears, J., Edwards, R. W., & Stanley, L. R. (2006). School bonding and substance use in rural communities. *Social Work Research, 30,* 6-18.

Sheridan, J., Bennett, S., Coggan, C., Wheeler, A., & McMillan, K. (2006). Injury associated with methamphetamine use: A review of the literature. *Harm Reduction Journal, 14.*

Singh, S. (2007). Adolescent salvia substance abuse. *Addiction, 102,* 823-824.

Smith, E. & Caldwell, L. (2007). Adapting evidence-based programs to new contexts: What needs to be changed?. *Journal of Rural Health, 23,* S37-S41.

Soderberg, L. S. (1999). Increased tumor growth in mice exposed to inhaled isobutyl nitirte. *Toxicology Letters, 101,* 35-41.

Springer, A. E., Peters, R. J., Shegog, R., White, D. L., & Kelder, S. H. (2007). Methamphetamine use and sexual risk behaviors in U.S. High school students: Findings from a National Risk Behavior Survey. *Prevention Science, 8,* 103-113.

Stern, M. K., & Wiens, B. A. (2009). Ethnic differences in adolescent perceptions of and
attitudes toward substance use. *Journal of Ethnicity in Substance Abuse, 8,* 54-69.

Strachman, A., Impett, E. A., Henson, J. M., & Pentz, M. A. (2009). Early adolescent alcohol use
and sexual experience by emerging adulthood: A 10-year longitudinal investigation.
Journal of Adolescent Health, 45, 478-482.

Strong, D. A., Del Grosso, P., Burwick, A., Jethwani, V., & Ponza, M. (2005). *Rural research
needs and data sources for selected human services topics: Research needs.* Princeton,
NJ: Mathematica Policy Research Inc.

Substance Abuse and Mental Health Services Administration. (2009). *Results from the 2008
National Survey on Drug Use and Health: National Findings* (Office of Applied Studies,
NSDUH Series H-36, HHS Publication No. SMA 09-4434). Rockville, MD.

Swadi, H. & Bobier, C. (2003). Substance use disorder comorbidity among inpatient youths with
psychiatric disorder. *Australian and New Zealand Journal of Psychiatry, 37,* 294-298.

Tapert, S. F., Aarons, G. A., Sedlar, G. R., & Brown, S. A. (2001). Adolescent substance use and
sexual risk-taking behavior. *Journal of Adolescent Health, 28,* 181-189.

Tate, S. R., Brown, S. A., Unrod, M., & Ramo, D. E. (2004). Context of relapse for substance-
dependent adults with and without comorbid psychiatric disorders. *Addictive Behaviors,
29,* 1707-1724.

Tolou-Shams, M., Ewing, S. W. F., Tarantino, N., & Brown, L. K. (2010). Crack and cocaine
use among adolescents in psychiatric treatment: Associations with HIV risk. *Journal of
Child & Adolescent Substance Abuse, 19,* 122-134.

Trudeau, L., Spoth, R., Lillehoj, C., Redmond, C., & Wickrama, K. A. S. (2003). Effects of a

    preventive intervention on adolescent substance use initiation, expectancies, and refusal

    intentions. *Prevention Science, 4,* 109-122.

U.S. Census Bureau. (2010). *Profile of General Demographic Characteristics: 2010.*

    Washington, DC: U.S. Census Bureau. Available at:

    http://factfinder.census.gov/home/saff/main.html?_lang=en. Accessed June 10, 2010.

U.S. Department of Health and Human Services. (2004). *The Health Consequences of Smoking.*

    A Report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human

    Services, Public Health Service, Office on Smoking and Health.

Vogt, T. M., Perz, J. F., Van Houten, C. K., Jr., Harrington, R., Hansuld, T., Bialek, S. R., . . .

    Williams, I. T. (2006). An outbreak of hepatitis B virus infection among

    methamphetamine injectors: The role of sharing injection drug equipment. *Addiction,*

    101, 726-730.

Zavela, K. J., Battistich, V., Dean, B. J., Flores, R., Barton, R., & Delaney, R. J. (1997). Say yes

    first: A longitudinal, school-based alcohol and drug prevention project for rural youth and

    families. *Journal of Early Adolescence, 17,* 67-96.

Appendix

Table 1.

Median annual income and population density for counties assessed

County	n	Income	Population
Bolivar	1,547	$28,779	34,145
Coahoma	558	$28,320	26,151
Hancock	859	$43,491	43,929
Hinds	391	$38,826	245,285
Jackson	2,393	$51,034	139,668
Jefferson	723	$24,352	7,726
Madison	384	$62,129	95,203

Note. Income and population density data were retrieved from the 2010 U.S Census.

Table 2

Lifetime Substance Use for Adolescents in Grades 6 through 12

Grade (n)	6 (1172)	7 (1485)	8 (1244)	9 (874)	10 (532)	11 (521)	12 (521)
				Percent of Use			
Licit Substances							
Tobacco	10.24	19.66	25.16	30.78	36.28	35.12	44.53
Alcohol	23.21	37.24	43.49	52.86	62.97	64.68	71.98
Illicit Substances							
Marijuana	7.85	12.66	19.69	23.91	29.32	33.78	39.16
Cocaine	6.66	8.01	11.66	8.70	10.71	12.86	11.13
Inhalants	12.20	15.35	18.97	18.88	17.67	19.39	17.85
Hallucinogens	4.44	5.25	8.68	9.38	10.90	12.09	12.09
Methamphetamine	2.99	3.91	8.04	4.58	5.83	8.25	6.72
Any illicit substance	22.70	28.82	35.77	38.67	41.92	46.64	50.11

Table 3.

*Logistic Regression Analysis Predicting **Lifetime Tobacco Use***

	B	*Wald*	*OR*	*95% CI*
Step 1				
SES	-0.00	0.01	1.00	0.96-1.04
Grade**	**0.30**	**307.19**	**1.35**	**1.31-1.40**
Race/Ethnicity	-0.12	2.74	0.09	0.77-1.02
Gender	0.06	0.77	0.38	0.93-1.20
Step 2				
SES	0.01	0.18	1.01	0.97-1.06
Grade**	**0.31**	**300.67**	**1.36**	**1.32-1.41**
Race/Ethnicity*	**-0.22**	**8.24**	**0.80**	**0.95-1.23**
Gender	0.08	1.42	1.08	0.95-1.23
Major Depressive Disorder**	**0.03**	**61.92**	**1.03**	**1.02-1.04**
Separation Anxiety Disorder*	**-0.01**	**6.33**	**0.99**	**0.98-1.00**
Panic Disorder**	**0.02**	**37.20**	**1.02**	**1.02-1.03**
Generalized Anxiety Disorder*	**0.01**	**9.69**	**1.01**	**1.01-1.02**
Social Phobia Disorder**	**-0.04**	**78.80**	**0.96**	**0.95-0.97**
Obsessive-Compulsive Disorder	-0.00	0.20	1.00	0.99-1.01

Note. OR = Odds Ratio; CI = Confidence Interval.

* $p < .05$; ** $p < .001$.

Table 4.

Logistic Regression Analysis Predicting **Lifetime Alcohol Use**

	B	Wald	OR	95% CI
Step 1				
SES**	**-0.09**	**20.42**	**0.91**	**0.88-0.95**
Grade**	**0.38**	**525.45**	**1.47**	**1.42-1.52**
Race/Ethnicity	-0.03	0.17	0.97	0.86-1.10
Gender*	**0.14**	**6.06**	**1.15**	**1.03-1.29**
Step 2				
SES**	**-0.09**	**17.91**	**0.92**	**0.88-0.95**
Grade**	**0.39**	**521.46**	**1.48**	**1.43-1.53**
Race/Ethnicity	-0.11	2.79	0.90	0.79-1.02
Gender*	**0.15**	**6.84**	**1.16**	**1.04-1.31**
Major Depressive Disorder**	**0.02**	**38.49**	**1.02**	**1.01-1.03**
Separation Anxiety Disorder**	**-0.02**	**34.68**	**0.98**	**0.97-0.99**
Panic Disorder**	**0.02**	**23.53**	**1.02**	**1.01-1.03**
Generalized Anxiety Disorder**	**0.02**	**30.22**	**1.02**	**1.01-1.03**
Social Phobia Disorder**	**-0.03**	**64.91**	**0.97**	**0.96-0.98**
Obsessive-Compulsive Disorder	-0.00	0.31	1.00	0.99-1.01

Note. OR = Odds Ratio; CI = Confidence Interval.

* $p < .05$; ** $p < .001$.

Table 5.

*Logistic Regression Analysis Predicting **Lifetime Marijuana Use***

	B	Wald	OR	95% CI
Step 1				
SES*	**0.06**	**6.95**	**1.07**	**1.02-1.12**
Grade**	**0.32**	**297.58**	**1.38**	**1.33-1.43**
Race/Ethnicity	0.15	3.56	1.16	0.99-1.36
Gender**	**0.48**	**46.43**	**1.61**	**1.41-1.85**
Step 2				
SES**	**0.08**	**10.30**	**1.08**	**1.03-1.14**
Grade**	**0.32**	**281.97**	**1.38**	**1.33-1.43**
Race/Ethnicity	0.11	1.73	1.11	0.95-1.31
Gender**	**0.47**	**42.77**	**1.60**	**1.39-1.84**
Major Depressive Disorder**	**0.03**	**53.76**	**1.03**	**1.02-1.04**
Separation Anxiety Disorder	-0.00	0.54	1.00	0.99-1.01
Panic Disorder**	**0.02**	**24.64**	**1.02**	**1.01-1.03**
Generalized Anxiety Disorder	0.00	0.41	1.00	0.99-1.01
Social Phobia Disorder**	**-0.04**	**74.03**	**0.96**	**0.95-0.97**
Obsessive-Compulsive Disorder*	**-0.01**	**3.95**	**0.99**	**0.98-1.00**

Note. OR = Odds Ratio; CI = Confidence Interval.

* $p < .05$; ** $p < .001$.

Table 6.

Logistic Regression Analysis Predicting **Lifetime Cocaine Use**

	B	*Wald*	*OR*	*95% CI*
Step 1				
SES	0.01	0.06	1.01	0.95-1.07
Grade**	**0.09**	**13.95**	**1.10**	**1.05-1.15**
Race/Ethnicity	0.04	0.16	1.04	0.85-1.28
Gender**	**0.41**	**19.44**	**1.51**	**1.26-1.81**
Step 2				
SES	0.03	0.57	1.03	0.96-1.09
Grade*	**0.08**	**10.04**	**1.08**	**1.03-1.14**
Race/Ethnicity	-0.03	0.08	0.97	0.79-1.20
Gender**	**0.41**	**18.46**	**1.50**	**1.25-1.81**
Major Depressive Disorder**	**0.02**	**11.39**	**1.02**	**1.01-1.03**
Separation Anxiety Disorder*	**0.01**	**6.83**	**1.01**	**1.00-1.02**
Panic Disorder**	**0.02**	**10.75**	**1.02**	**1.01-1.03**
Generalized Anxiety Disorder	-0.00	0.07	1.00	0.99-1.01
Social Phobia Disorder**	**-0.04**	**33.52**	**0.96**	**0.95-0.98**
Obsessive-Compulsive Disorder	-0.00	0.23	1.00	0.99-1.01

Note. OR = Odds Ratio; CI = Confidence Interval.

* $p < .05$; ** $p < .001$.

Table 7.

Logistic Regression Analysis Predicting **Lifetime Inhalant Use**

	B	Wald	OR	95% CI
Step 1				
SES	-0.03	1.26	0.97	0.93-1.02
Grade**	**0.08**	**15.92**	**1.08**	**1.04-1.12**
Race/Ethnicity	0.06	0.50	1.06	0.90-1.24
Gender	0.08	1.14	1.08	0.94-1.24
Step 2				
SES	-0.02	0.68	0.98	0.93-1.03
Grade**	**0.08**	**13.90**	**1.08**	**1.04-1.12**
Race/Ethnicity	-0.05	0.28	0.96	0.81-1.13
Gender	0.11	2.30	1.12	0.97-1.30
Major Depressive Disorder**	**0.03**	**59.50**	**1.03**	**1.02-1.04**
Separation Anxiety Disorder*	**-0.01**	**5.16**	**0.99**	**0.98-1.00**
Panic Disorder**	**0.02**	**27.62**	**1.02**	**1.01-1.03**
Generalized Anxiety Disorder	0.01	1.75	1.01	1.00-1.02
Social Phobia Disorder**	**-0.03**	**46.61**	**.97**	**0.96-0.98**
Obsessive-Compulsive Disorder	0.01	1.20	1.01	1.00-1.02

Note. OR = Odds Ratio; CI = Confidence Interval.

* $p < .05$; ** $p < .001$.

Table 8.

*Logistic Regression Analysis Predicting **Lifetime Hallucinogen Use***

	B	Wald	OR	95% CI
Step 1				
SES	-0.00	0.01	1.00	0.93-1.07
Grade**	**0.22**	**65.88**	**1.25**	**1.18-1.31**
Race/Ethnicity	-0.23	3.70	0.79	0.63-1.00
Gender**	**0.60**	**32.17**	**1.81**	**1.48-2.23**
Step 2				
SES	0.02	0.38	1.02	0.95-1.10
Grade**	**0.21**	**54.67**	**1.23**	**1.16-1.30**
Race/Ethnicity*	**-0.33**	**6.93**	**0.72**	**0.56-0.92**
Gender**	**0.59**	**30.19**	**1.81**	**1.46-2.23**
Major Depressive Disorder**	**0.02**	**10.74**	**1.02**	**1.01-1.03**
Separation Anxiety Disorder*	**0.01**	**3.84**	**1.01**	**1.00-1.02**
Panic Disorder**	**0.04**	**35.96**	**1.04**	**1.02-1.05**
Generalized Anxiety Disorder*	**-0.02**	**5.72**	**0.98**	**0.97-1.00**
Social Phobia Disorder**	**-0.05**	**42.57**	**0.95**	**0.94-0.97**
Obsessive-Compulsive Disorder	0.00	0.02	1.00	0.99-1.02

Note. OR = Odds Ratio; CI = Confidence Interval.

* *p* < .05; ** *p* < .001.

Table 9.

*Logistic Regression Analysis Predicting **Lifetime Methamphetamine Use***

	B	Wald	OR	95% CI
Step 1				
SES	-0.02	0.25	0.98	0.90-1.06
Grade**	**0.14**	**17.86**	**1.15**	**1.08-1.23**
Race/Ethnicity*	**0.39**	**7.44**	**1.48**	**1.12-1.95**
Gender**	**0.62**	**23.39**	**1.86**	**1.45-2.40**
Step 2				
SES	0.01	0.04	1.01	0.93-1.10
Grade**	**0.12**	**11.55**	**1.12**	**1.05-1.20**
Race/Ethnicity*	**0.30**	**4.27**	**1.36**	**1.02-1.81**
Gender**	**0.61**	**21.46**	**1.84**	**1.42-2.38**
Major Depressive Disorder*	**0.01**	**4.22**	**1.01**	**1.00-1.03**
Separation Anxiety Disorder*	**0.02**	**8.46**	**1.02**	**1.01-1.03**
Panic Disorder**	**0.04**	**29.37**	**1.04**	**1.03-1.05**
Generalized Anxiety Disorder*	**-0.02**	**3.06**	**0.99**	**0.97-1.00**
Social Phobia Disorder**	**-0.05**	**32.10**	**0.95**	**0.94-.0.97**
Obsessive-Compulsive Disorder	-0.00	0.21	1.00	0.98-1.01

Note. OR = Odds Ratio; CI = Confidence Interval.

* *p* < .05; ** *p* < .001.

Figure 1

Overall Trends in Lifetime Use by Grade and Substance
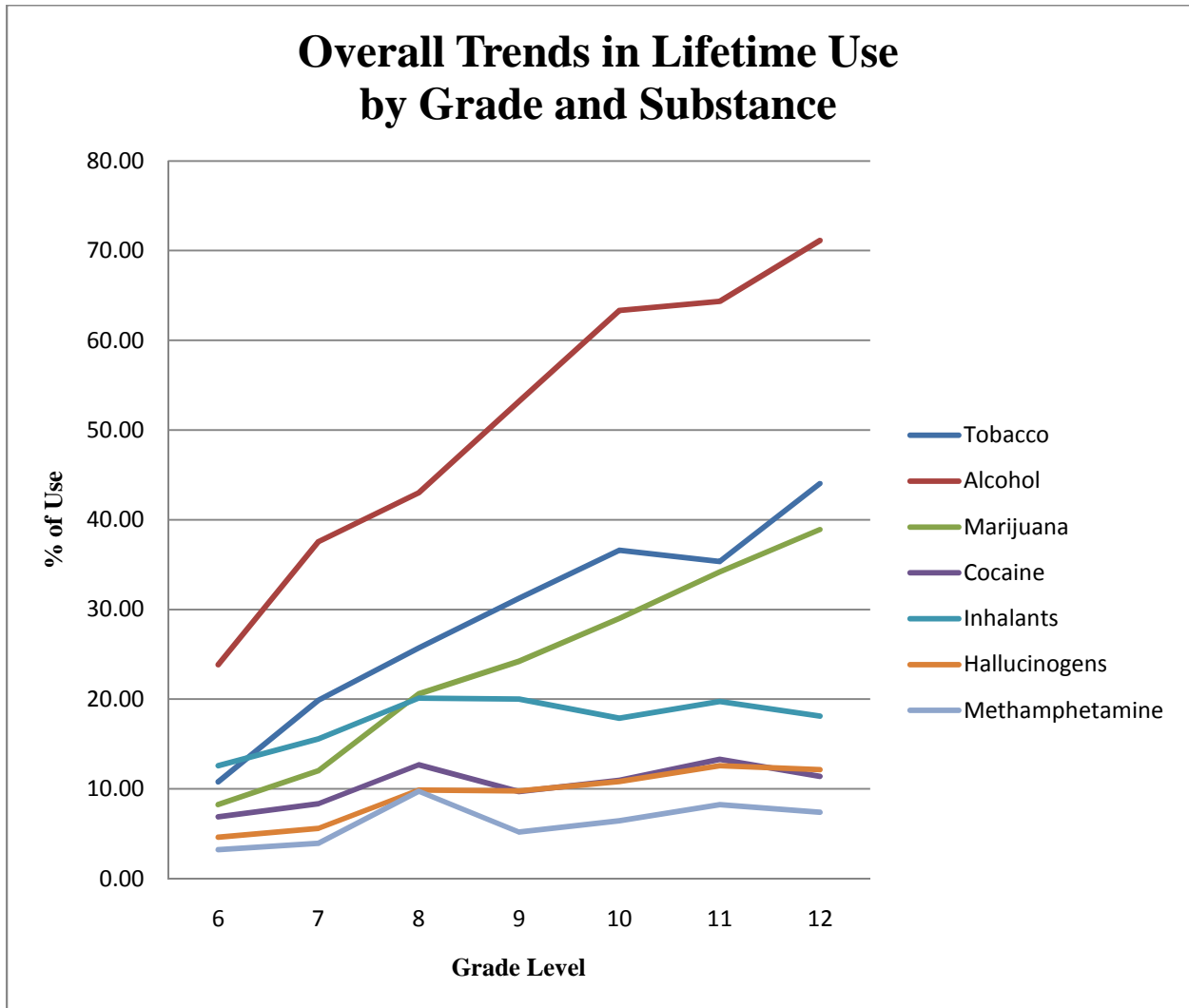
Revised Child Anxiety and Depression Scale (RCADS)

Please put a circle around the word that shows how often each of these things happen to you. There are no right or wrong answers.

		Never	**Sometimes**	**Often**	**Always**
1.	I worry about things	Never	Sometimes	Often	Always
2.	I feel sad or empty	Never	Sometimes	Often	Always
3.	When I have a problem, I get a funny feeling in my stomach	Never	Sometimes	Often	Always
4.	I worry when I think I have done poorly at something	Never	Sometimes	Often	Always
5.	I would feel afraid of being on my own at home	Never	Sometimes	Often	Always
6.	Nothing is much fun anymore	Never	Sometimes	Often	Always
7.	I feel scared when I have to take a test	Never	Sometimes	Often	Always
8.	I feel worried when I think someone is angry with me	Never	Sometimes	Often	Always
9.	I worry about being away from my parents	Never	Sometimes	Often	Always
10.	I get bothered by bad or silly thoughts or pictures in my mind	Never	Sometimes	Often	Always
11.	I have trouble sleeping	Never	Sometimes	Often	Always
12.	I worry that I will do badly at my school work	Never	Sometimes	Often	Always
13.	I worry that something awful will happen to someone in my family	Never	Sometimes	Often	Always
14.	I suddenly feel as if I can't breathe when there is no reason for this	Never	Sometimes	Often	Always
15.	I have problems with my appetite . . .	Never	Sometimes	Often	Always
16.	I have to keep checking that I have done things right (like the switch is off, or the door is locked)	Never	Sometimes	Often	Always
17.	I feel scared if I have to sleep on my own	Never	Sometimes	Often	Always
18.	I have trouble going to school in the mornings because I feel nervous or afraid	Never	Sometimes	Often	Always

19. I have no energy for things	Never	Sometimes	Often	Always
20. I worry I might look foolish	Never	Sometimes	Often	Always
21. I am tired a lot	Never	Sometimes	Often	Always
22. I worry that bad things will happen to me	Never	Sometimes	Often	Always
23. I can't seem to get bad or silly thoughts out of my head	Never	Sometimes	Often	Always
24. When I have a problem, my heart beats really fast	Never	Sometimes	Often	Always
25. I cannot think clearly	Never	Sometimes	Often	Always
26. I suddenly start to tremble or shake when there is no reason for this	Never	Sometimes	Often	Always
27. I worry that something bad will happen to me	Never	Sometimes	Often	Always
28. When I have a problem, I feel shaky	Never	Sometimes	Often	Always
29. I feel worthless	Never	Sometimes	Often	Always
30. I worry about making mistakes	Never	Sometimes	Often	Always
31. I have to think of special thoughts (like numbers or words) to stop bad things from happening.	Never	Sometimes	Often	Always
32. I worry what other people think of me	Never	Sometimes	Often	Always
33. I am afraid of being in crowded places (like shopping centers, the movies, buses, busy playgrounds)	Never	Sometimes	Often	Always
34. All of a sudden I feel really scared for no reason at all	Never	Sometimes	Often	Always
35. I worry about what is going to happen	Never	Sometimes	Often	Always
36. I suddenly become dizzy or faint when there is no reason for this	Never	Sometimes	Often	Always
37. I think about death	Never	Sometimes	Often	Always
38. I feel afraid if I have to talk in front of my class	Never	Sometimes	Often	Always
39. My heart suddenly starts to beat too quickly for no reason	Never	Sometimes	Often	Always
40. I feel like I don't want to move	Never	Sometimes	Often	Always

41. **I worry that I will suddenly get a scared feeling when there is nothing to be afraid of**	Never	Sometimes	Often	Always
42. **I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order)**	Never	Sometimes	Often	Always
43. **I feel afraid that I will make a fool of myself in front of people**	Never	Sometimes	Often	Always
44. **I have to do some things in just the right way to stop bad things from happening**	Never	Sometimes	Often	Always
45. **I worry when I go to bed at night**	Never	Sometimes	Often	Always
46. **I would feel scared if I had to stay away from home overnight**	Never	Sometimes	Often	Always
47. **I feel restless**	Never	Sometimes	Often	Always

Modified Youth Risk Behavior Survey (YRBS)

Directions: Please bubble in the letter of the answer choice that best describes your response to following questions.

1. Have you ever carried a weapon, such as a gun, knife, or club?
A. Yes   B. No

2. Have you ever been in a physical fight?
A. Yes   B. No

3. In the past 30 days have you been in a physical fight?
A. Yes   B. No

4. Have you ever been in a physical fight in which you were hurt and had to be treated by a doctor or nurse?
A. Yes   B. No

5. Have you ever been in a physical fight where you tried to use a weapon to hurt someone?
A. Yes   B. No

6. Have you ever been bullied on school property? Bullying is when one or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when two students of about the same strength or power argue or fight or tease each other in a friendly way.
A. Yes   B. No

7. Have you ever seriously thought about killing yourself?
A. Yes   B. No

8. Have you ever made a plan about how you would kill yourself?
A. Yes   B. No

9. Have you ever tried to kill yourself?
A. Yes   B. No

10. Have you ever tried cigarette smoking?
A. Yes   B. No

11. How old were you when you smoked a whole cigarette for the first time?
A. I have never smoked a whole cigarette
B. Younger than 10
C. 10-13
D. 13-15
E. Older than 15

12. During the past 30 days, on how many days did you smoke cigarettes?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

13. During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?
A. I did not smoke cigarettes during the past 30 days.
B. 1-5
C. 6-10
D. 11-15
E. More than 15

14. During the past 30 days, how did you usually get your cigarettes?
A. I did not smoke cigarettes during the past 30 days.
B. I bought them myself.
C. I got someone else to buy them for me.
D. Someone gave them to me E. I took them from a store or family member.

15. Have you ever smoked cigarettes daily, that is, at least one cigarette every day for 30 days?
A. Yes   B. No

16. During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

17. During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

18. Have you ever had a drink of alcohol (more than just a sip)?
A. Yes   B. No

19. How old were you when you had your first drink of alcohol (more than just a sip)?
A. I have never had a drink of alcohol
B. Younger than 10
C. 10-13
D. 13-15

E. Older than 15

20. During the past 30 days, on how many days did you drink alcohol?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

21. Have you ever used marijuana (also called weed, grass, or pot)?
A. Yes   B. No

22. How old were you when you tried marijuana for the first time?
A. I have never tried marijuana
B. Younger than 10
C. 10-13
D. 13-15
E. Older than 15

23. During the past 30 days, on how many days did you use marijuana?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

24. Have you ever used any form of cocaine, including powder, crack, or freebase?
A. Yes   B. No

25. How old were you when you tried cocaine for the first time?
A. I have never tried cocaine
B. Younger than 10
C. 10-13
D. 13-15
E. Older than 15

26. During the past 30 days, on how many days did you use cocaine?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

27. Have you ever sniffed glue, breathed the contents of spray cans, or inhaled other things (like paint, gas, or lighter fluid) to get high?
A. Yes   B. No

28. How old were you when you inhaled something to get high for the first time?
A. I have never inhaled something to get high
B. Younger than 10
C. 10-13
D. 13-15
E. Older than 15

29. During the past 30 days, on how many days did you inhale something to get high?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

30. Have you ever taken drugs to make yourself hallucinate, like LSD (also called acid), mescaline (also called cactus), or Salvia (also called magic mint or diviner's sage)?
A. Yes   B. No

31. Have you ever used methamphetamines (also called crystal meth, meth, crank, ice, or tick tick)?
A. Yes   B. No

32. Have you ever used prescription drugs to get high?
A. Yes   B. No

33. During the past 30 days, on how many days did you use prescription drugs to get high?
A. 0
B. 1-9
C. 10-19
D. 20-29
E. 30 (every day)

34. How do you usually get prescription drugs used to get high?
A. I have never used prescription drugs to get high
B. I use my own
C. I use my friends'
D. I buy them
E. I take them from a family member

35. Have you ever used a prescription stimulant, like Ritalin, Concerta, Focalin, or Dexedrine, to get high?
A. Yes   B. No

36. Have you ever used a prescription antipsychotic, like Seroquel, Abilify, Geodon, or Risperdal, to get high?

A. Yes   B. No

37. Have you ever used a prescription benzodiazepene, like Valium, Xanax, or Klonopin, to get high?
A. Yes   B. No

38. Have you ever used a prescription SSRI, like Prozac, Paxil, Luvox, Lexapro, Celexa, or Zoloft, to get high?
A. Yes   B. No

39. Have you ever used prescription pain pills, like Vicodin, Percocet, OxyContin, Codeine, or Demerol, to get high?
A. Yes   B. No

40. Have you ever taken pills with alcohol to get high?
A. Yes   B. No

VITA

CONTACT INFORMATION

Address: Department of Psychology
University of Mississippi
207 Peabody Building
University, MS 38677

Voice: (443)-956-0524
E-mail: mjmcderm@olemiss.edu

EDUCATION

Master of Arts University of Mississippi
(Expected 2011) Clinical Psychology Ph.D. Program (APA-accredited)
Oxford, Mississippi
Thesis: Comorbid Anxiety and Depression among Adolescent
Substance Use in a Community Sample (Chair: Todd A.
Smitherman, Ph.D.)
Current GPA: 3.76

Bachelor of Arts University of Maryland, College Park
Sept. 2005-May 2007 College Park, Maryland
Major GPA: 3.66
Cumulative GPA: 3.62

RESEARCH EXPERIENCE

August 2009- **Graduate Research Assistant,** *Information-processing biases toward*
Present *pain-relevant stimuli in migraine* **(PI: Todd A. Smitherman, Ph.D.)**
Department of Psychology
University of Mississippi, Oxford, MS
Description: This study examines whether pain-relevant stimuli are
more salient (i.e., increased attentional bias to migraine relevant cues)
among individuals who suffer from chronic migraine compared to those
without migraine.
Responsibilities/Duties: Responsible for the programming of the

attentional bias task, assist in the collection and management of participant data, and supervision of other research assistants involved with this project.

August 2010- Present	**Graduate Research Assistant (NCI-CA R01-85406; PI: Vida L. Tyc, Ph.D.)** Department of Psychology St. Jude Children's Research Hospital, Memphis, TN Description: This project is a randomized, controlled trial to help parents reduce Second-Hand Smoke exposure (SHSe) for a medically compromised sample of pediatric patients with cancer, as measured by urine cotinine assays and parental reports of exposure to cigarettes smoked. Responsibilities/Duties: Involved in analysis and interpretation of data as well as manuscript and presentation development.
August 2010- September 2011	**Graduate Research Assistant, *SBANK10: Sperm Banking among Adolescents Newly Diagnosed with Cancer – Development of a Profiling and Referral Tool* (NICHD R21 HD061296; PI: James L. Klosky, Ph.D.)** Department of Psychology St. Jude Children's Research Hospital, Memphis, TN Description: This study is a multisite investigation of factors predictive of banking/not banking sperm among at-risk adolescents newly diagnosed with cancer and the development of a brief profiling and referral tool designed to increase sperm banking in these individuals. Responsibilities/Duties: Assisted in participant recruitment and assessment of newly diagnosed adolescent cancer patients.
August 2010- September 2011	**Graduate Research Assistant, *Human Papillomavirus (HPV) Vaccination among Survivors of Childhood Cancer* (PI: James L. Klosky, Ph.D.)** Department of Psychology St. Jude Children's Research Hospital, Memphis, TN Description: This study focuses on estimating the prevalence of HPV vaccination and examining HPV vaccination intent among a large cohort of childhood cancer survivors and an acquaintance control group. Responsibilities/Duties: Assisted in participant recruitment and assessment of childhood cancer survivors.
August 2009- May 2010	**Graduate Research Assistant, *Role of Alcohol Use as a Predictor of Migraine among College Students* (PI: Todd A. Smitherman, Ph.D.)** Department of Psychology

University of Mississippi, Oxford, MS
Description: The goal of this study is to examine the unique relationship between alcohol use among college students and the experience of chronic migraine.
Responsibilities/Duties: Oversee and assist in the collection and management of participant data (i.e., interview, self-report), assisted in participant recruitment and the supervision of other research assistants affiliated with this project.

August 2009- **May 2010**	**Graduate Research Assistant,** *Mental Health Screening in Mississippi's Schools: Behavioral Vital Signs* **(PI: John Young, Ph.D.)** Department of Psychology University of Mississippi, Oxford, MS Description: This project provided basic behavioral health screening for conditions of anxiety, mood disturbances, loneliness/social dysfunction, and externalizing behavior in Mississippi's public schools. It involved coordination at multiple levels with state agencies such that procedures can become standard practice in attending schools, and data collected to be utilized to reform/improve mental health services offered to youth in these contexts. Responsibilities/Duties: Assisted in collection, management, analysis, and feedback of data from mental and behavioral health assessments in Mississippi public schools. Assisted in supervision of other research assistants affiliated with this project.
August 2009- **May 2010**	**Graduate Research Assistant,** *Clinical and Program Evaluation Services for Mississippi Children's Home Society* **(PI: John Young, Ph.D.)** Department of Psychology University of Mississippi, Oxford, MS Description: This project examined the effectiveness of home and community based mental health services compared to psychiatric residential treatment facilities (PRTF). This project was conducted in conjunction with the Mississippi Youth Programs Around the Clock (MYPAC), a division of Medicaid Bureau of Mental Health Programs. Responsibilities/Duties: Assisted in administration, assessment, and organization of assessment data for feedback for child mental and behavioral health evaluations conducted with (MYPAC) and Mississippi Children's Home Services.
July 2008- **July 2009**	**Project Director,** *PTSD and Predictors of Drug Use Treatment Drop-Out* **(R21 DA022383; PI: Matthew T. Tull, Ph.D.)** Department of Psychiatry and Human Behavior University of Mississippi Medical Center, Jackson, MS

Description: This study examined emotion-related mechanisms (i.e., emotion dysregulation, experiential avoidance, distress intolerance, HPA axis reactivity) that might underlie early residential substance abuse treatment drop-out among lower SES rural substance dependent patients with and without PTSD.
Responsibilities/Duties: Oversee and assist in the collection and management of participant data (i.e., interview, self-report, behavioral task, and cortisol data), in charge of participant recruitment, responsible for participant payment, assist in the supervision of other research assistants affiliated with this project.
Supervisors: Matthew T. Tull, Ph.D. and Kim L. Gratz, Ph.D.

July 2007- July 2008	**Project Director,** *Predictors of Drug-Related Attentional Bias among Crack/Cocaine Users with PTSD* **(R03 DA023001; PI: Matthew T. Tull, Ph.D.)** Center for Addictions, Personality, and Emotion Research and the Department of Psychology University of Maryland, College Park, MD Description: This study examined whether trauma cue exposure increased attentional bias to crack/cocaine cues among inner-city crack/cocaine dependent patients with PTSD (as compared to those without PTSD) in residential substance abuse treatment. Responsibilities/Duties: Responsible for the programming of the dot-probe attentional bias task, oversaw and assisted in the collection and management of participant data, was in charge of participant recruitment and payment, supervised other research assistants involved with this project. Supervisor: Matthew T. Tull, Ph.D.
October 2007- July 2008	**Research Assistant,** *Depression Treatment for Urban Low Income Minority Substance Users* **(R01 DA026424l; PI: Stacey B. Daughters, Ph.D.)** Center for Addictions, Personality, and Emotion Research and the Department of Psychology University of Maryland, College Park, MD Description: This study conducted a randomized control trial with long term outcome data for the Life Enhancement Treatment for Substance Use (Let's Act). Responsibilities/Duties: Assisted in participant recruitment, assessment, and data collection among crack/cocaine dependent individuals in residential substance abuse treatment. Supervisor: Stacey B. Daughters, Ph.D.
December 2007- July 2008	**Research Assistant,** *Development of a Delayed Discounting Task for Panic Disorder* **(PI: Matthew T. Tull, Ph.D.)** Center for Addictions, Personality, and Emotion Research and the

Department of Psychology
University of Maryland, College Park, MD
Description: The goal of this study was to develop an emotional delayed discounting task relevant to panic disorder, as well as examine its construct and predictive validity among individuals high and low in anxiety sensitivity.
Responsibilities/Duties: Assisted in the development and programming of a panic disorder-relevant delayed discounting task, assisted in the collection and management of participant data.
Supervisor: Matthew T. Tull, Ph.D. and Kim L. Gratz, Ph.D.

September 2006-
May 2007
    Research Assistant, *Decision Attention and Memory (DAM)*
Laboratory **(PI: Michael R. Dougherty, Ph.D.)**
Decision Attention and Memory Laboratory and the
Department of Psychology
University of Maryland, College Park, MD
Responsibilities/Duties: Assisted in data collection and was involved in several studies examining the role of hypothesis generation in human judgment, decision making, and memory.
Supervisor: Michael R. Dougherty, Ph.D.

TEACHING EXPERIENCE

June 2006-
July 2006
    Teaching Assistant
Department of Psychology, University of Maryland, College Park, MD
Course: Statistical Methods in Psychology
Responsibilities/Duties: Assisted in the preparation of course material, the grading of exams, and the compilation of final grades.
Supervisor: Barry Smith, Ph.D.

PUBLICATIONS

Manuscripts:

Tull, M. T., **McDermott, M. J**., Gratz, K. L., Coffey, S. F., & Lejuez, C. W. (In Press). Cocaine-related attentional bias following trauma cue exposure among cocaine dependent inpatients with and without posttraumatic stress disorder. *Addiction*.

Smitherman, T. A., & **McDermott, M. J**., Buchanan, E. M. (2011). Negative impact of episodic migraine on a university population: Quality of life, functional impairment, and comorbid psychiatric symptoms. *Headache, 51,* 581-589.

McDermott, M. J., Tull, M. T., Soenke, M., Jakupcak, M., & Gratz, K. L. (2010). Masculine gender role stress and posttraumatic stress disorder symptom severity among inpatient male crack/cocaine users. *Psychology of Men and Masculinity, 11,* 225-232.

Jakupcak, M., Tull, M. T., **McDermott, M. J**., Kaysen, D., Hunt, S., & Simpson, T. (2010). PTSD symptom clusters in relationship to alcohol misuse among Iraq and Afghanistan war veterans seeking post-deployment VA health care. *Addictive Behaviors, 35,* 840-843.

McDermott, M. J., Tull, M. T., Gratz, K. L., Daughters, S. B., & Lejuez, C. W. (2009). The role of anxiety sensitivity and difficulties in emotion regulation in posttraumatic stress disorder among crack/cocaine dependent patients in residential substance abuse treatment. *Journal of Anxiety Disorders, 23,* 591-599.

Manuscripts in Preparation:

McDermott, M. J., Drescher, C. F., Smitherman, T. A., Tull, M. T., Heiden, L., Damon, J. D., Hight, T. L., & Young, J. *Trends in lifetime adolescent substance use among a rural and ethnically diverse community Sample.* Manuscript in preparation.

McDermott, M. J., Smitherman, T. A., Gratz, K. L., & Tull, M. T. *Migraine among substance dependent individuals in residential substance abuse treatment.* Manuscript in preparation.

Tull, M. T., **McDermott, M. J**., Gratz, K. L., Coffey, S. F., & Lejuez, C. W. *The effect of trauma cue exposure on drug cravings among crack/cocaine dependent patients with and without posttraumatic stress disorder.* Manuscript in preparation.

Tull, M. T., Aklin, W. M., **McDermott, M. J**., Chin, K., & Lejuez, C. W. *Impulsivity, risk-taking propensity, and difficulties in emotion regulation among substance users in residential substance abuse treatment with and without a history of childhood abuse.* Manuscript in preparation.

CONFERENCE SYMPOSIA PRESENTATIONS

McDermott, M. J., Gratz, K. L., Tull, M. T., & Lejuez, C. W. (November, 2009). *The role of cognitive factors in the development and maintenance of deliberate self harm.* In A. L. Chapman and C. Schmahl (Chairs), *The role of universal cognitive and neurobiological factors in deliberate self-harm.* Symposium presented at the 43rd annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

Tull, M. T., **McDermott, M. J**., Gratz, K. L., Coffey, S. F., & Lejuez, C. W. (November, 2009). *The effect of trauma-cue exposure on drug-related attentional bias among crack/cocaine users with PTSD.* In R. C. Smith (Chair), *Treatment of comorbid PTSD and stimulant use disorders: focus on functional relations and maintaining mechanisms.* Symposium

presented at the 43rd annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

McDermott, M. J., Tull. M. T., & Lejuez, C. W. (June, 2008). *Drug cravings following trauma cue exposure among crack/cocaine dependent patients with and without PTSD.* In J. Roache and X. Liu (Chairs), *Extinction/reinstatement: On again, off again.* Symposium presented at the 70th annual conference for the College on Problems of Drug Dependence, San Juan, Puerto Rico.

INVITED PRESENTATIONS

McDermott, M. J., & Young, J. (August, 2010). *Trends in lifetime and current substance use rates among Mississippi adolescents.* Findings presented at the State Epidemiological Outcomes Workgroup, Jackson, MS.

CONFERENCE POSTER PRESENTATIONS

McDermott, M. J., Davis, R., Smitherman, T. A., Gratz, K. L., & Tull, M. T. (Poster to be presented November, 2011). *Migraine among substance dependent individuals in residential substance abuse treatment.* Poster to be presented at the 45th annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, Canada.

McDermott, M. J., Bordieri, M., Smitherman, T. A., Heiden, L., Damon, J. D., Hight, T. L., & Young, J. (Poster to be presented November, 2011). *The role of anxiety and depression in lifetime tobacco and alcohol use among a large rural and ethnically diverse community sample of adolescents.* Poster to be presented at the 45th annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, Canada.

McDermott, M. J., Bordieri, M., Smitherman, T. A., Heiden, L., Damon, J. D., Hight, T. L., & Young, J. (Poster to be presented November, 2011). *Race and comorbid anxiety and depression as predictors of adolescent lifetime illicit substance use in a rural and ethnically diverse community sample.* Poster to be presented at the 45th annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, Canada

Klosky, J. L., **McDermott, M. J**., Foster, R. H., Gamble, H., & Rao, P. (April, 2011). *Knowledge of human papillomavirus (HPV) and vaccination among families with daughters surviving childhood cance*r. Poster presented at the National Conference of the Society of Pediatric Psychology: Division 54 of the American Psychological Association, San Antonio, TX.

Rao, P., Foster, R. H., Gamble, H., Hodges, J., **McDermott, M. J**., & Klosky, J. L. (April, 2011). *Sociodemographic and medical differences in the provision of acquaintance-control references among maternal caregivers of childhood cancer survivors.* Poster presented at the National Conference of the Society of Pediatric Psychology: Division 54 of the American Psychological Association, San Antonio, TX.

Drescher, C. F., **McDermott, M. J**., Heiden, L., Damon, J. D., Hight, T. L., & Young, J. (November, 2010). *Current substance use trends for Mississippi youth.* Poster presented at the 44th annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

Jakupcak, M., Tull, M. T., **McDermott, M. J**., Kaysen, D., Simpson, T., & Hunt, S. (November, 2010). *Associations between alcohol misuse and symptoms of PTSD and depression in Iraq and Afghanistan war veterans seeking post-deployment VA health care.* Poster presented at the 44th annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

McDermott, M. J., Drescher, C. F., Heiden, L., Damon, J. D., Hight, T. L., & Young, J. (November, 2010). *Trends in lifetime substance use among Mississippi adolescents.* Poster presented at the 44th annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

McDermott, M. J., Walters, A. B., Smitherman, T. A., Gratz, K. L., & Tull, M. T. (November, 2010). *The role of anxiety sensitivity and migraine symptoms in posttraumatic stress disorder among individuals in residential substance abuse treatment.* Poster presented at the 44th annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

Walters, A. B., Baskin, B. L., **McDermott, M. J**., & Smitherman, T. A. (November, 2010). *Chronic daily headache in a college population: Psychiatric comorbidity and psychiatric impairment.* Poster presented at the 44th annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

Klosky, J. L., Hodges, J., Foster, R., **McDermott, M. J**., & Nobel, A. (September, 2010). *Toward establishing the ecological validity of a sperm banking questionnaire among survivors of childhood cancer: A focus group approach.* Poster presented at the 3rd annual Oncofertility Consortium meeting, Chicago, IL.

Klosky, J. L., Hodges, J., Foster, R., Nobel, A., & **McDermott, M. J**. (September, 2010). *Querying parents about preservation: Utilizing focus group methodology for informing parent questionnaires in the study of sperm banking decision-making among adolescents diagnosed with cancer.* Poster presented at the 3rd annual Oncofertility Consortium meeting, Chicago, IL.

Brooks, R. J., **McDermott, M. J**., Fulton, J. J., Johnson, K., Gratz, K. L., & Tull, M. T. (March, 2010). *Risky sexual behavior: effects of cocaine dependence, PTSD, and gender.* Poster presented at the annual meeting of the Southeastern Psychological Association, Chattanooga, TN.

McDermott, M. J., Tull, M. T., Soenke, M., Brooks, R. J., & Gratz, K. L. (November, 2009). *The effect of posttraumatic stress disorder on residential substance abuse treatment drop-out: Examining the mediating role of emotion dysregulation.* Poster presented at the 43rd annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

Matusiewicz, A. K., Gratz K. L., **McDermott, M. J**., & Tull, M. T. (November, 2008). *Predicting PTSD symptom severity following exposure to a potentially traumatic event: The role of temperamental vulnerabilities, emotion dysregulation, and experiential avoidance*. Poster presented at the 42nd annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

McDermott, M. J., Tull, M. T., Gratz, K. L., Matusiewicz, A. K., & Lejuez, C. W. (November, 2008). *Examining distinct dimensions of emotion dysregulation as predictors of PTSD among crack/cocaine users in residential substance use treatment*. Poster presented at the 42nd annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

Soenke, M., Matusiewicz, A. K., **McDermott, M. J**., Tull, M. T., & Gratz, K. L. (November, 2008). *An examination of childhood maltreatment, emotion dysregulation, and deliberate self-harm as a function of a borderline personality disorder and posttraumatic stress disorder diagnosis.* Poster presented at the 42nd annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

Soenke, M., **McDermott, M. J**., Gratz, K. L., Jakupcak, M., & Tull, M. T. (November, 2008). *The role of masculine gender role stress in posttraumatic stress disorder among male crack/cocaine users in residential substance abuse treatment,* Poster presented at the 42nd annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

Weitzman, M. L., Gratz, K. L., **McDermott, M. J**., Tull, M. T., & Lejuez, C. W. (November, 2008). *The interrelationship of trait vulnerabilities, childhood abuse, and childhood borderline personality Symptoms.* Poster presented at the 42nd annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

Richards, J., Tull, M. T., Gorka, S., **McDermott, M. J**., Daughters, S. B., & Lejuez, C. W. (June, 2008). *Examination of a brief adjunctive interoceptive-based intervention for heroin users with high anxiety sensitivity.* Poster presented at the 70th annual conference of the College on Problems of Drug Dependence, San Juan, Puerto Rico.

McDermott, M. J., Tull, M. T., Malouf, E. T., Daughters, S. B., Lejuez, C. W., & Gratz, K. L. (March, 2008). *Examining the role of anxiety sensitivity and emotion dysregulation in*

PTSD among crack/cocaine users. Poster presented at the 28th annual conference of the Anxiety Disorders Association of America, Savannah, GA.

AD-HOC REVIEWING

Annals of Behavioral Medicine
Behaviour Research and Therapy
Cognitive Therapy and Research
European Health Psychology Society
Headache
Journal of Abnormal Psychology
Journal of Behavior Therapy and Experimental Psychiatry
Psychotherapy: Theory, Research, Practice, Training

ADDITIONAL EXPERIENCE

Clinical Assessment:
- Structured Clinical Interview for DSM-IV (SCID-IV) (67)
- Clinician Administered PTSD Scale (CAPS) (83)
- Diagnostic Interview for Personality Disorders (DIPD) – Borderline Personality Module (87)
- Diagnostic Interview for Personality Disorders (DIPD) – Avoidant Personality Module (39)

Research:
- Experience in the development and programming of information processing tasks (e.g., the Implicit Association Task, Dot-Probe Attentional Bias Task).
- Experience in creating data sets in SPSS, as well as the analysis of data using SPSS.
- Experience in administering information processing (e.g., Dot-Probe) and behavioral tasks (e.g., the Balloon Analogue Risk-Taking Task [BART] and the Paced Auditory Serial Addition Task [PASAT])

REFERENCES

Todd A. Smitherman, Ph.D.
Assistant Professor
Department of Psychology
University of Mississippi
Oxford, MS 38655
Voice: 662-915-1825
Email: tasmithe@olemiss.edu

John Young, Ph. D.
Assistant Professor
Department of Psychology
University of Mississippi
Oxford, MS 38655
Voice: 662-915-1775
Email: jnyoung1@olemiss.edu

Matthew T. Tull, Ph.D.
Assistant Professor
Director, Anxiety Disorders Research
Department of Psychiatry and Human Behavior
University of Mississippi Medical Center
2500 North State Street
Jackson, MS 39216
Voice: 601-815-6518
E-mail: mtull@psychiatry.umsmed.edu

Kim L. Gratz, Ph.D.
Assistant Professor
Director, Personality Disorders Research
Department of Psychiatry and Human Behavior
University of Mississippi Medical Center
2500 North State Street
Jackson, MS 39216
Voice: 601-815-6450
E-mail: klgratz@aol.com