

ABSTRACT

Title of thesis: **DIVERSION OF PRESCRIPTION MEDICATIONS IN A
COLLEGE STUDENT SAMPLE**

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This study sought to determine rates of prescription diversion, what medications are diverted, and what risk factors predict diversion. Surveys from 554 respondents in the College Life Study (CLS) who had been prescribed a medication were obtained and examined. Prevalence estimates for diversion were computed for four types of medications. Regressions were run testing for predictive effects of low self-control, prior deviance, and social bonds on diversion. Almost one third (31%) of students reporting either sharing or selling a prescription in their lifetime. Prescription ADHD medications were most likely to be diverted. Regression models supported the hypothesis that prior deviant behavior was related to diversion. These findings were partially mediated by the role of perceived social norms and perceived harm. Findings suggest diversion is a common problem on college campuses, and more must be done to identify risk factors of diversion to curtail this behavior. Implications for policy are discussed.

DIVERSION OF PRESCRIPTION MEDICATION IN A COLLEGE STUDENT
SAMPLE

by

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Chapter 1: Introduction

The diversion of prescription substances is a serious and growing trend in the United States. According to the DEA, prescription drug diversion is a \$25 billion a year industry (Weathermon, 1999). The financial magnitude of prescription diversions may rival black markets for crack cocaine and heroin combined (Cooper & Czechowicz, 1992). Records from the Pharmaceutical Security Institute show that in 2005, counterfeiting, theft, and diversion of prescription medications had jumped 16% in the previous year worldwide (Appleby, 2005). The same study demonstrated that the United States was ranked number one for the second consecutive year in reporting problems of prescription medication diversion.

The phenomenal amount of diversion in the United States feeds the prevalence of abuse of prescription drugs, which, in the United States, exceeds the prevalence of abuse of cocaine, hallucinogens, inhalants, and heroin combined (National Center on Addiction and Substance Abuse, 2006). Between 1992 and 2003, the US population rose by 14%, but the number of 12-17 year olds who used controlled prescription substances non-medically jumped by 212%, and the number of adults aged 18 and older who non-medically used them jumped 81% (National Center on Addiction and Substance Abuse, 2006). This level of non-medical use constitutes a significant risk to public health. Given the prevalence of non-medical prescription drug use, it is probable that prescription drug trafficking is also common, and responsibility for curtailing the diversion that feeds this black market falls to the criminal justice system. According to one article, police and prosecutors are already overwhelmed by the number of prescription abusers, the drug-related crime resulting from prescription diversion, and

crowding in jails as a result of recent prosecutions (Virginia, 2001). It is important to gather as much information as possible about this hidden practice quickly because with rates of prescription drug abuse rising and illicit drug abuse falling, prescription drugs are becoming the new drug of choice among users who see these medications as a safer, more easily obtained alternative to illicit drugs such as cocaine and heroin (Boyd et al, 2007; Chandra & Ozturk, 2004; Friedman, 2006; McCabe, Teter & Boyd, 2006; Prescription drug diversion, 1996).

Chapter 2: Literature Review

Although it often goes unrecognized, the diversion of prescription medication in the United States is an important matter that affects health professionals, patients, drug manufacturers and tax payers across the United States. The prevalence of prescription medication diversion among certain populations, the growing social acceptance of prescription diversion behavior, and the profound health consequences associated with diverting prescription medications makes prescription diversion a significant social, criminological, and public health issue that shows no signs of abating.

Prescription Medication and Abuse in the United States

Drug diversion and drug related crime have been prominent issues in the United States for over a century. As far back as 1880, the United States was attempting to limit drug trafficking in this country. Rising concerns about drug abuse and trafficking in the late 1960s and early 1970s launched President Richard Nixon's War on Drugs. As part of the War on Drugs, the federal government passed the Comprehensive Drug Abuse Prevention and Control Act of 1970, which combined several existing drug control laws and established a single system of controls for every substance with abuse potential (Sapienza, 2006). Title II of this act, called the Controlled Substances Act (CSA), applies to both illicit and prescription drugs (Sapienza, 2006). The CSA serves two purposes in regard to prescription medications: 1) to maintain a sufficient, uninterrupted supply of controlled substances in order to meet the medical needs of the country, and 2) to reduce diversion and abuse of prescription drugs (Sapienza, 2006). A growing recognition of the limitations of the Controlled Substances Act and the prevalence of diversion has resulted in recent laws cracking down on prescribing practices of physicians and helping states to

establish programs to target diversion at a local level (Collins & McAllister, 2006; Crosse, 2004; Forgione, Neuenschwander & Vermeer, 2001; House Passes Bill, 2004); however, recent research has demonstrated that current laws are ineffective in controlling prescribing practices, prevalence of abuse, and diversion.

Recent research has demonstrated that prescribing practices in the United States have changed over the past few decades. According to one study on Medicaid patients, the average number of prescriptions filled per person per year increased from 13.0 in 1998 to 15.5 in 2000 (Fink & Byrns, 2004). Studies focusing on specific types of prescription medication have shown that prescribing rates for both stimulants and analgesics have increased in recent years (DEA Congressional Testimony, 2001; Phillips, Salmon & James, 2003; Toh, 2006). This rise in the number of prescriptions results in a larger pool of prescription drugs in the population that have the potential to be abused and diverted.

Despite government controls, the misuse of prescription medication is a growing problem in the United States. Abuse of prescription sedatives, tranquilizers, opiates and stimulants is both common (Becker, Fiellin, & Desai, 2007; Johnston 2006) and increasing (Mohler-Kuo, Lee, & Wechsler, 2003). The Drug Abuse Warning Network has estimated that between 25 and 30 percent of all emergency department drug abuse episodes involve prescription drugs (Gibbs & Haddox 2003). This type of prescription abuse is largely found among the younger population. According to Kroutil et al (2006), more than half of the 3.2 million people who misused a stimulant in the past year were between the ages of 12 and 25. College students are at particular risk for prescription drug misuse because they are largely responsible for taking their own prescription

medications, in many cases for the first time. One study of the prescription stimulant methylphenidate found that 16.6% of college students reported trying methylphenidate recreationally (Babcock & Byrne, 2000). Another found that 3% reported past year non-medical use of methylphenidate (Teter et. al., 2003). A study on prescription pain relievers found that 12% of college students had used prescription opiates non-medically in their lifetime, and 7% had used them non-medically in the past year (McCabe, et. al., 2005).

According to Kroutil (2006), most non-medical use of prescription stimulants involves the diversion of prescription drugs. If this is the case, these individuals are likely to be less aware of the dangers or side effects associated with their use, and do not have the benefit of a doctor or pharmacist investigating their medical history to identify possible complications between the substance they are using non-medically and other substances or medical conditions it may interact with, potentially resulting in injuries (Daniel, Honein & Moore, 2003; Joranson & Gilson, 2007). Friedman (2006) notes, “Even in small doses, sedatives, hypnotics, and opiates have subtle effects on cognition and motor skills that may increase the risk of injury particularly during sports activities or driving” (pg. 1450). However, many non-medical users may be largely unaware of these risks because they are obtaining medication through diversion, rather than from a doctor, resulting in emergency room visits by non-medical users of stimulants, analgesics, muscle relaxers, and benzodiazepines (DAWN 2006a, 2006b).

Prevalence and Sources of Diversion

Diversion of prescription drugs is a prevalent problem in the United States. Between 1988 and 1995 there were 6,256 complaints to the Virginia State Police

Pharmaceutical Diversion Unit about suspected diversion (Prescription drug diversion 1996). However, this statistic only captures diversions that were large-scale enough to be noticed and reported to the proper authorities; thus, this is a poor estimate of the actual prevalence of diversion in Virginia. The Pharmaceutical Security Institute found that in 2005 the United States reported the highest prevalence of diversion incidents for the second year in a row (Appleby, 2005).

Estimates of the prevalence of prescription drug diversion differ depending on the population being studied. Table 1 summarizes the research findings on diversion. Health care professionals have long been the target of anti-diversion initiatives; however, studies vary on the extent of the role the health care industry plays in the diversion of prescription drugs. According to the National Center on Addiction and Substance Abuse at Columbia University (CASA) (2006), diversion at the retail level, including indiscriminant or illegal prescribing practices, forged or fraudulent prescriptions, doctor shopping, pharmacy theft, or in-transit losses, was the most significant source of abused prescription drugs. Using data obtained from the Cincinnati Police Division Pharmaceutical Diversion Squad, one study showed that between 1992 and 2002, there were 423 cases of prescription diversion involving health care professionals (Inciardi et al., 2006). The majority (51.3%) of the complaints resulting in police intervention were initiated by hospitals and other health care institutions (Inciardi et al., 2006). However, the health care profession is not the only source of diverted pharmaceuticals. Various drug-using street and club based populations who participated in an unstructured interview identified both health professionals such as physicians, doctor shopping, and

Table 1: Summary of Prior Studies on Prescription Drug Diversion

| Study | Study Type | Sample Characteristics | Medications Included | Diversion measurement | Findings |
|---|--|--------------------------------|--|---|---|
| McCabe, Teter, and Boyd (2006) | Web Survey, response rate 47% | 9161 undergraduate students | Stimulants | Occasions approached to share, sell or trade | 54% had been approached to divert their medication |
| McCabe, Teter and Boyd (2006) | Web Survey, response rate 47.3% | 9161 undergraduate students | Sleeping medications, sedative/ anxiety medications, stimulant medications, pain medications | Occasions approached to sell, trade, or give away | 27% of those prescribed a medication in the past year had been approached to divert; those with stimulants were most likely to be approached (54%), followed by pain medications (26%) |
| Poulin (2007) | Questionnaire, response rate 97% | 12990 adolescent students | Methylphenidate | Giving or selling in past 30 days | 23.9% gave away methylphenidate, 18.6% sold it |
| Poulin (2001) | Self report questionnaire, response rate 99% | 13549 adolescent students | Stimulants | Ever given or sold | 14.7% gave away, 7.3% sold, and 80% who had sold had also given away |
| Boyd, McCabe, Cranford and Young (2007) | Internet survey during school, response rate 68% | 1086 secondary school students | Sleeping medications, sedative/anxiety medication, stimulant medication, pain medications | Occasions approached to sell, trade, or give away | 24% gave away or loaned a prescription medication, students most likely to give away or loan rather than sell or trade medications, females more likely than males to give away or loan medications |

| Study | Study Type | Sample Characteristics | Medications Included | Diversion measurement | Findings |
|--|---|--|----------------------|---|--|
| McCabe, Teter and Boyd (2004) | Internet survey during school, response rate 89.1% | 1405 public school students grades 6 through 11 | Stimulants | Ever approached to sell, trade or give away | 23.3% approached to divert, females (29.6%) more likely than males (20.6%) to be approached, whites (27.4%) more likely than blacks (16.0%) to be approached |
| Moline and Frankenberger (2001) | Questionnaire | 50 public school students in grades 6-12 who were treated for ADHD | ADHD medications | Approached to sell or trade | 34% of those treated are 'sometimes' approached, 11% 'always' or 'almost always' approached |
| Daniel, Honein and Moore (2003) | Mail survey, response rate 52% | Children aged 9-18 | Any | Ever shared prescription medications | 10.9% shared prescription, girls aged 15-18 were most likely to share |
| Wilens, Gignac, Swezey, Monuteaux and Biederman (2006) | Self reports questionnaire | Males aged 16-27 (matched with and without ADHD) on psychiatric medication | Any | Selling medication | 11% of those with ADHD sold their medications, 0% of those without ADHD sold, 83% of those who diverted had Conduct Disorder, 83% had Substance Use Disorder |
| Fountain, Strang, Gossop, Farrell and Giffiths (2000) | Literature review of diversion by drug users in treatment | Drug users in treatment | Any | Various | 5% to 34% of drug users in treatment sell prescriptions |

| Study | Study Type | Sample Characteristics | Medications Included | Diversion measurement | Findings |
|--|------------------------|--|----------------------|---|---|
| Inciardi, Surratt, Kurtz and Cicero (2007) | Unstructured interview | Street and club based drug using populations | Any | Unclear | Virtually all admitted occasional sharing or trading of medications |
| Inciardi, Surratt, Kurtz and Burke (2006) | Summary | Health care professionals caught diverting | Any | Professional reported to police for diverting | Nurses most likely to be caught diverting, opioids most widely diverted, Hydrocodone is the most widely diverted drug |

personal resources (i.e. dealers, relatives, and friends or acquaintances) as sources of the prescription drugs they abuse (Inciardi, et. al., 2007).

Most Federal agencies focus on doctor Shopping, dishonest or easily duped physicians or pharmacists, and the Internet, but there are numerous active street markets, which constitute a rampant drug industry, that are fed by individuals (Fountain, et. al., 2000; Joranson & Gilson, 2007). Diversion at the doctor, pharmacist, or other health care worker level has dropped since the introduction of prescription drug monitoring programs (State prescription monitoring programs, 2002); however, diversion at the patient level is still prevalent (Boyd et al., 2007; Daniel, Honein, & Moore, 2003; Inciardi et al., 2007; Poulin, 2001; Wilens, et. al., 2006). In fact, many sources claim that patients who receive prescription medications in the course of routine medical care by well-intentioned doctors and later share or sell their medications are likely from whom the largest proportion of black market prescription medications is supplied (Joranson & Gilson, 2007).

Chandra and Ozturk (2004) claim that the patient is the main source of diversion for prescription pain relievers. A study using an unstructured survey of a street-based sample of prescription drug users yielded many participants who detailed selling their own prescription medications – usually to people they knew (Inciardi 2007). According to a qualitative study of drug users in treatment who sold their prescriptions, anywhere from 5% to 34% of drug users in treatment sell their prescription drugs (Fountain et al., 2000).

One study, using structured face-to-face interviews of 66 adults with a current prescription for the stimulant methylphenidate, found that 44% of their respondents admitted to ever diverting this drug (Darredeau et. al. 2007). Among these respondents,

97% of diverters had given away their medication, 17% had sold their medication, and 14% had both shared and sold (Darredeau et. al. 2007). This study demonstrates that even when adults are not deliberately sampled from ‘high risk’ populations such as street-based or club-based samples, diversion is still a serious and prevalent problem.

Among adolescent student samples, diversion of prescriptions is widespread but infrequent (Daniel et al., 2003). Adolescents typically obtain prescription medications from peers, friends, or family members (Hurwitz, 2005). Differences in methodology for measuring diversion make comparisons across studies difficult. Studies focusing on opportunity show that between 23.3% and 34% of students taking prescription stimulants have been approached to divert their prescriptions to someone else (McCabe, Teter, & Boyd, 2004; Moline & Frankenberger, 2001) and that those most likely to be approached are white females (McCabe et al., 2004).

Prevalence rates for adolescents selling their prescription drugs range from 7.3% to 18.6% (Poulin, 2001, 2007; Wilens et al., 2006) and sharing rates for the same population range from 10.9% to 24% (Boyd et al., 2007; Daniel et al., 2003; Poulin, 2001, 2007). Using data from 12,990 students in the Student Drug Use Survey in the Atlantic Provinces of Canada, Poulin (2001) found that 80% of students who had sold their prescription medications had also given them away. In addition, in their web-based survey of 1086 7th through 12th graders, Boyd et. al. (2007) found that rates of trading or giving away medications do not differ significantly by type of drug. This type of diversion behavior goes largely unrecognized by secondary school officials. Studies of middle and high school principals found that only about 8% of respondents knew

students had sold or traded their prescription medications in school (Farris, et. al., 2003; USGAO, 2001).

In addition, while not a great deal of information exists about what substances are most likely to be diverted among these populations, there is some literature on the subject. According to one study of health care workers who were diverting medications, prescription opiates are most likely to be diverted, accounting for 67.4% of the diversions (Inciardi et al., 2006). Among this sample, Hydrocodone was the most commonly diverted substance, accounting for 20.0% of diversions. According to the DEA, Hydrocodone is also the most commonly diverted drug nation-wide (USDEA Facts Sheet). Although in the general population, prescription painkillers appear to be the most commonly diverted type of substance (USDEA Facts Sheet), among college student samples, there appears to be a larger demand for prescription stimulants (McCabe, Teter & Boyd 2006a, 2006b). In addition, one study of young adults found that immediate release prescription stimulants are more often diverted than extended release formulations (Wilens et al., 2006). These medications, especially the Schedule II medications, are strictly regulated by the government, but are still commonly diverted out of licit channels.

Diversion among College Students

Evidence shows that non-medical prescription drug use, while a significant problem for young adults, is specifically relevant to the college undergraduate population. In a mail survey, Babcock and Byrne (2000) found that 35.7% of the 1401 respondents in their college student sample reported knowing students at college from whom they could purchase Ritalin if they desired. In their study of the prescription stimulant methylphenidate, Barrett et. al. (2005), found that their methylphenidate

misusers most commonly described obtaining the medication from a friend or an acquaintance who had a prescription.

Studies of college student samples show that undergraduates who are treated with prescription drugs are approached by their peers to divert their medications (McCabe, Teter & Boyd, 2006a). Few studies of diversion at the college student level have been conducted, however a web-based survey of 9,161 students at a Midwestern public research University that defined diversion as the number of occasions in the past 12 months the respondent was approached to sell, trade, or give away prescription medications, found that 27% of those prescribed medications in the past year had been approached to divert them (McCabe, Teter & Boyd, 2006a). Those prescribed stimulants (as opposed to other types of medication) were most likely to be approached (54%) followed by those with prescriptions for pain relievers (26%) (McCabe, Teter & Boyd, 2006a; McCabe, Teter, & Boyd, 2006b).

Friends and peers are the most common sources of diverted prescription medications among college students, regardless of the type of prescription medication (Barrett, et. al., 2005; McCabe & Boyd, 2005; McCabe, Cranford, Boyd, & Teter, 2007; McCabe, Teter & Boyd., 2006b). This is especially concerning because studies of college students have shown that individuals who obtain prescription medications from their peers, as opposed to those who do not abuse prescription medications or who obtain them from other sources such as family members, are at an increased risk for concurrent alcohol and other drug use (McCabe & Boyd, 2005), heavy episodic drinking (McCabe & Boyd, 2005; McCabe et al., 2007) alcohol abuse (McCabe & Boyd, 2005), illicit drug abuse (McCabe et al., 2007), and alcohol or drug related problems (McCabe et al., 2007).

Characteristics of Individuals who Divert

Few studies have been conducted examining the characteristics of individuals who divert their prescription medications as opposed to those who do not. Among college students, McCabe, Teter and Boyd (2006a) found that men were significantly more likely to be approached for prescription pain relievers, but no other gender differences were found. McCabe, Teter and Boyd (2006b) noted that of those who had a prescription for stimulants, no significant differences for gender, race, class year, family income, or religious affiliation existed among those who were approached to divert and those who were not. However, these findings must be approached cautiously, given that they were based on a web-based survey with a limited response rate, and did not address diversion directly, only the likelihood of being approached to divert.

Studies among other populations have found that diverters are typically private citizens aged 21-40 (Prescription Drug Diversion 1996) who obtain prescriptions for legitimate pain or medical conditions from their personal physicians (Chandra & Ozturk, 2004) and may be either male or female (Prescription Drug Diversion 1996). One study of an adult sample with prescriptions for methylphenidate found that diverters of this prescription stimulant were typically younger, were originally prescribed methylphenidate at a younger age, were more likely to report the use of illicit substances since receiving their prescription, and were more likely to report misusing the drug themselves (Darredeau et. al. 2007). These findings reinforce the idea that diversion is a particular problem among young adults and college students. Given that one of the places the authors recruited individuals to participate in their study was on a college

campus, it is reasonable to conclude that some of these young adults may have been attending a local college.

Studies of secondary school students found no significant gender, age, race or ethnic differences in the likelihood of being approached to divert medications (Boyd et al., 2007), but found that girls were more likely than boys to report having shared or given away a prescription in their lifetime (Boyd et al., 2007; Daniel et al., 2003). Furthermore, high school girls were significantly more likely to divert to female friends, while high school boys were more likely to divert to male friends (Boyd et al., 2007). In addition, one study of high school students found that the individuals with ADHD who diverted their prescription stimulants all had either Conduct Disorder or a Substance Use Disorder in addition to ADHD (Wilens et al., 2006).

Studies also found a variety of reasons explaining why individuals divert their prescriptions. Among adolescent samples, the most common reasons for diversion have to do with helping others. Adolescents say they would divert a prescription if the recipient had the same medical problem as the diverter, had a prescription that ran out, or had a prescription but were not currently carrying the pills with them (Daniel, Honein & Moore, 2003). Among other populations, reasons for diversion include being dissatisfied with the prescriptions that one is currently on and wanting to trade for new prescriptions, and the desire to make money, in some cases to spend on other drugs (Goldman, 1998; Grand jury, 2004).

Collectively, this body of literature makes several contributions, including prevalence estimates of diversion among health care workers and street-based populations, examinations of substances most likely to be diverted in the general

population, and characteristics of diverters among secondary school populations. However, these contributions are tempered by several limitations in the existing research. First, most diversion literature focuses on diversion among health care practitioners or other high risk populations, and there is almost no literature focusing on diversion among college students. Second, the limited amount of literature that exists on diversion among students often measures how often individuals are approached to divert, not how often they actually divert their medications (McCabe, Teter & Boyd, 2006a, 2006b). Finally current research on prescription diversion has failed to examine theoretical risk factors that may contribute to diversion. The current study will examine these gaps in the literature, drawing on current criminological theory for possible correlates of diversion behavior.

Chapter 3: Theoretical Perspectives

Given the limited amount of existing literature on diversion in this population, before examining theoretical predictors of diversion, it was necessary to examine the prevalence of this problem and to determine which substances are most likely to be diverted. Existing literature demonstrates moderate rates of diversion with diversion estimates among adolescents ranging from 7% to 24%, and a higher prevalence of sharing rather than selling prescription drugs among high school students (Boyd et al., 2007; Daniel et al., 2003; Poulin, 2001, 2007; Wilens et al., 2006). Since this study examines lifetime prevalence of diversion among a college student population it is expected that diversion will be slightly higher among this population since they are older than high school students and have likely had more opportunities to divert. Consequently, the rate of diversion in this sample is expected to be slightly higher than rates in high school student samples.

Hypothesis 1: It is expected that more than 20% of college students who are prescribed medications will divert them, and that sharing occurs more frequently than selling.

In the general population, prescription pain relievers, are the most commonly diverted prescription substances (Inciardi et al., 2006). However, a great deal of recent research has documented the market for prescription stimulants among college students. College students use these substances to help them study or stay awake to pull an all-nighter (Teter et al., 2003), thus the market for this type of drug may extend beyond individuals with an extensive history of drug involvement and involve individuals who simply want to succeed in school. A larger market would indicate that stimulants may be

more commonly diverted than other types of drugs. In addition, the rates of prescribing for stimulants have increased rapidly in the past decade (Phillips, Salmon & James, 2003), so they may be more commonly found in the population, increasing opportunity for diversion.

Hypothesis 2: Prescription stimulants are expected to be the most commonly diverted substances.

In addition to estimating the prevalence and type of diversion in a college student population, the current study also draws on criminological theory to examine who is most likely to engage in diversion. Specifically, hypotheses 3 through 9 of this study are guided by the Self Control Theory, General Theory, Social Control Theory, Differential Association Theory, and Rational Choice Theory.

Self Control Theory

Self Control Theory holds that individuals with low self control are at an increased risk for criminality and analogous acts (Gottfredson & Hirschi, 1990). Self Control Theory assumes that crime is, “the natural consequence of unrestrained human tendencies to seek pleasure and avoid pain” (Gottfredson & Hirschi, 1990; p. xiv). Individual differences in self control remain stable over time (Hay & Forrest, 2006), and determine how much restraint an individual possesses to prevent them from committing a criminal act (Gottfredson & Hirschi, 1990). Tittle, Grasmick, and others have shown that both cognitive and behavioral measures of self control predict deviant behavior (Grasmick et. al. 1993; Tittle, Ward & Grasmick 2003). Recent research has demonstrated the relationship between low self control and criminal behavior and analogous acts (Paternoster & Brame, 1998; Ribeaud & Eisner, 2006); however, it is

important to note that the relationship between self control and crime hinges on opportunity (LaGrange & Silverman, 1999).

The current study seeks to determine whether individuals with higher levels of impulsive sensation seeking are more likely to divert their prescription medications. According to theory, those with higher levels of impulsive sensation seeking will be more likely to commit criminal acts, including diversion. This is because, according to Gottfredson and Hirschi, criminal acts provide instant gratification of desires and require little thought or planning. These characteristics are true of diversion. Diverting medications provides instant gratification in that it results in the exchange of money, other drugs, or favors, and the act of diversion is rarely complex. Consequently someone who is impulsive would be more likely to engage in this behavior than someone who carefully plans and considers long term consequences. This study will test Self Control Theory by determining if individuals who have higher levels of impulsive sensation seeking are more likely to engage in prescription diversion. The study assumes opportunity in the presence of a substance that has the potential to be diverted.

Hypothesis 3: Impulsive sensation seeking personality characteristics will be related to prescription drug diversion.

Generalist Theory

The next issue investigated is whether prescription diverters are generalists or specialists. A general criminal is a criminal who engages in a variety of criminal acts across a variety of fields. Proponents of general criminality hold that someone who engages in any type of criminal behavior will go on to engage in other types of criminal behavior. Consequently, from this point of view, individuals who had engaged in other

types of deviant behavior would be more likely to divert a prescription drug. On the other hand, others believe that criminals specialize in a specific type of crime, such as robbery, and hone their skills in that area only. These individuals would predict that individuals who divert their prescriptions restrict their illegal activities to drug diversion, or at least to other similar acts within the drug field.

Research in the area generally supports the generalist view. Gottfredson and Hirschi (1990) reported that most offenders are not specialists. Farrington (1999) showed that offenders were predominantly generalists, especially at younger ages. A study of offenses committed between the ages of 16 and 20 by a group of respondents showed that for both males and females, a greater percentage of offenders generalize rather than specialize (Soothill, Francis, Ackerley & Humphreys, 2008). However, despite the evidence on the generalist side, this debate is still a significant issue for newly recognized types of crime. Given the frequency of diversion among college students, it is possible that this behavior is not seen as deviant by the offender. Such a normalized view of diversion would render studies of generalist vs. specialist offenders moot because the prescription drug diverter does not consider him or herself to be an offender. If the diverter does not consider diversion a deviant act, it is possible this may have an impact on whether or not he has or will engage in other types of offending.

While little research has been conducted on prescription drug diverters, prior research has shown that other types of drug dealers have criminal careers involving other types of deviance (Denton & O'Malley, 2001). In addition, most deviant behaviors are thought to be related to underlying risk factors that apply to deviant behavior across the board, not to a specific type of criminal behavior. This study addresses the generalist vs.

specialist debate by examining whether prescription diversion is part of a larger pattern of criminal behavior or if it is an isolated criminal act. It is expected that prescription drug diverters, who are in effect taking the role of a prescription drug dealer, if only on a small scale, would also engage in other types of deviant behavior, supporting the generalist perspective.

Hypothesis 4: Prior deviance is expected to be associated with drug diversion.

Social Control Theory

Hirschi's (1969) Social Control Theory can also be used to explain prescription drug diversion. According to Hirschi, the less an individual is bonded to society by belonging to and interacting with social groups, the more he depends on himself and comes to recognize no rules of conduct other than those founded on his own interests. This theory assumes that individuals will commit crimes unless they are constrained from doing so through the bonds they have formed with society (Krohn & Massey, 1980). Hirschi has identified four elements of social bonds that interact to produce a strong or a weak bond to society. The first is attachment, which has been defined as the affection for and sensitivity to others in society. Individuals who display low attachment are more likely to commit crimes because they do not consider how their actions may influence others or society as a whole. The second element is commitment. Commitment is the rational investment that the individual has in conformity. In other words, if an individual's interests would be endangered by their committing criminal acts, they are less likely to engage in criminal behavior. For this reason, those who are married are considered less likely to commit a crime because they have a reason to be invested in

social conformity. The third element is involvement, which is conceptualized as participation in conventional activities. Those who are more involved in these activities interact more with society and social groups, and would thus be more committed to protecting society by upholding the law. Finally, belief in social rules is the last element of Hirschi's theory. Those who have been socialized to believe in the rules they follow are less likely to break them.

Hirschi explains that those with weak social bonds are more likely to engage in criminal behavior. In the words of Nagin and Paternoster (1994), these individuals have accumulated less *personal capital*, thus they have less to lose because they have fewer activities or relationships that would be jeopardized by formal or informal sanctions. Krohn and Massey (1980) found that social bonds better predict less serious crimes.

In terms of drug crimes, research has shown conflicting support. A study by Seredycz and Meyer (2005) found support for Hirschi's theory in that college students with stronger bonds were less likely to be illicit drug users. Another study by Kandel and Davies (1991) found that frequent drug users had similar friendship networks, and more intimate friend relationships than non-drug users studied. Very little research has focused specifically on drug dealing or diversion and Social Control Theory. The current study will test Social Control Theory by examining whether factors in an individual's environment, such as the strength of their relationships with friends and how involved they are in extra-curricular activities, affects the likelihood of whether someone will divert their prescription medications. It is expected that poor peer relationships, as an element of Hirschi's attachment component of social bonds, will be related to diversion behavior. In addition, less involvement in extracurricular activities, a measure of low

involvement according to social bond research, and more frequent class skipping, an indication of low commitment to school, are also expected to be associated with prescription diversion.

Hypothesis 5: Poor relationships with friends, less involvement in extracurricular activities, and frequent class skipping are expected to be associated with prescription drug diversion.

Differential Association Theory

Differential Association Theory explains criminal behavior as a learned process. Akers defines differential association as direct and indirect, verbal and nonverbal communication, interaction, and identification with both conforming and non-conforming others (Akers, 1998). According to Sutherland, criminal behavior, including the techniques of committing crimes, motives, and rationalizations are learned in interaction with intimate groups (Sutherland, 2002). Through the learning process, individuals are exposed to definitions both favorable and unfavorable to crime. Deviance results when there is an excess of definitions favorable to violating the law versus definitions unfavorable to violating the law (Sutherland, 2002). Differential associations vary in frequency, duration, variety, and intensity (Sutherland, 2002). Peer associations are the most common types of differential association leading to deviant behavior among adolescents, however, family associations can also play a role (Akers, 1998). Both selection of delinquent peers by a delinquent and influence of delinquent peers on a non-delinquent explain the reciprocal relationship between deviance and delinquent peer associations (Elliott & Menard, 1992; Matsueda & Anderson, 1998).

Associating with deviant peers, who can teach deviant behaviors and definitions favorable to deviance, has been linked to deviant behavior by a variety of studies (Alarid, Burton & Cullen, 2000; Hochstetler, Cooper & DeLisi, 2002; Sutherland, 1947). In addition, research has demonstrated that often, an individual's perceptions of their peers' behavior will affect their own likelihood to offend (Aseltine, 1995). Research focusing on drug use and drug related crimes has found that this effect is especially significant for adolescents and young adults (Aseltine, 1995; Neff & Waite, 2007).

This paper accounts for the role of deviant peer associations by controlling for the percentage of peers that individuals believe to divert prescription medications. The paper tests whether perceptions of peer delinquency predicts the diversion of the two most commonly diverted types of prescription substances. This examination assumes that an individual's perception of peers' behavior is sufficiently likely to change their own beliefs and attitudes about the behavior, an assumption that has been well established in the differential association literature (Aseltine, 1995; Costello, 1999). It is expected that perceptions of a high percentage of peers sharing or selling their prescriptions will predict a respondent's sharing or selling prescriptions.

Hypothesis 6: Perceiving a higher percentage of peers who share or sell prescriptions will increase the likelihood of an individual diverting their prescriptions.

Rational Choice Theory

The final theory relevant for this examination is Rational Choice Theory. Rational Choice Theory holds that humans are rational beings who decide whether or not to commit a crime through a series of rational cost/benefit analyses. The theory makes no

claims on motivation, only explaining what situational aspects predict whether or not an individual will engage in criminal acts. While situational factors may include the presence or absence of capable guardians, recent research has predicted that personal factors, such as attitudes and beliefs about crime, and beliefs about the impact one's criminal behavior has on another, may have an impact on the decision of whether or not to commit a crime, even holding economical factors constant. This study attempts to address how individual morality may impact this type of offending.

While moral beliefs have not been largely studied in relation to their impact on rational choice, what few studies there are show support for the assumption that moral beliefs have a significant impact on the choices people make, including their intention to commit crimes. Moral beliefs have been found to significantly predict a variety of crimes, including corporate crime, sexual assault, drunk driving, and petty theft (Bachman, Paternoster & Ward, 1992; Nagin & Paternoster, 1994; Paternoster & Simpson, 1996). Etzioni (1988) explains this relationship by saying that in situations in which moral rules have been internalized, costs and benefits fail to be fully considered because they are overwhelmed by the belief of the immorality of the criminal act. Paternoster and Simpson (1996) hypothesize that this may have to do with the effect of shame as a cost of crime.

Little research has examined the effects of morality and perceived harm to others for drug dealing specifically. However, research has shown that perceived harm and morality do not significantly impact drug use (Musher-Eizenman, Holub & Arnett, 2003; Yacoubian et. al., 2004). The one study that touches on the issue of morality and drug dealing found that values and morality of cultural background had a greater impact on

drug dealing choices than economic rationality (Bucerius, 2007). This implies that beyond the economic realities involved in rational choice, personal beliefs also had an effect on dealing behavior.

This study tests the effect of personal morality on the decision to divert prescriptions. If only rational choice and economical considerations were relevant in the decision of whether or not to divert, we would expect to see no impact of perceived harm on diversion. The current study assumes that personal beliefs, defined here as perceived harm of taking another's medication, will predict diversion in that believing one's actions would result in harm decreases the likelihood of diversion.

Hypothesis 7: Believing that taking someone else's prescription occasionally causes great harm will decrease the likelihood of diverting a prescription.

Given the growing trend of prescription drug abuse, and the increasing problems that continued drug diversion can create, it is important to fully understand the nature and extent of diversion, how diverters can be recognized, and what can be done to prevent diversion before it occurs. This study attempts to answer those questions with a thorough review of the extent of drug diversion in one high risk sample (college students), and an examination of how diverters differ from non-diverters in terms of characteristics common to deviant behavior. Identifying individual or environmental characteristics that contribute to prescription diversion could help parents, schools, and health professionals reduce the prevalence of diversion by identifying individuals most at risk for diversion to be closely monitored, and by designing effective anti-diversion education programs that target significant risk factors.

Chapter 4: Data and Methods

Sample

The sample for this study was taken from data acquired by the College Life Study (CLS). The College Life Study is a prospective, longitudinal study of the health behaviors of a single cohort of college students in a large, public university in the mid-Atlantic region of the United States. A screening survey was administered to first-time first-year students between 17 and 19 years of age at new student orientation (a mandatory event for all students attending this four-university) during the summer of 2004. In order to include students who did not attend orientation, surveys were mailed to this population. A total of 3,849 students received the survey at orientation or by mail. Overall, the response rate to the screener survey was 88.7% (n=3,413). After excluding individuals who did not complete the survey properly or who did not consent to follow-up, the sampling frame consisted of 3,291 students (79.1%).

The screening survey, which was administered to the 3,291 students at orientation, included questions regarding the frequency, recency and age of initiation of alcohol and illicit substances (marijuana, cocaine, heroin, ecstasy, hallucinogens, amphetamines, methamphetamine and prescription stimulants, analgesics, and tranquilizers). The survey also asked about the use of a dummy drug in order to weed out untruthful responses.

The sampling frame was stratified into three groups based upon responses given on the screener survey to questions measuring lifetime illicit drug use. The first group, 'illicit drug users' was defined as respondents who had used any illicit substance other than or in addition to marijuana in their lifetime (n=469; 14.3% of the respondents). The

second group, 'high- risk cases', was defined as respondents who had used marijuana at least once in their lifetime but had not used any other illicit substances (n=847; 25.7% of respondents). The final group, 'low-risk cases', was defined as respondents who had not used any illicit substance in their lifetime (n=1,975; 60.0% of respondents). All respondents in the illicit drug users and high risk cases were sampled in order to ensure that a sufficient number of drug users was included in the sample. The low risk cases were stratified by gender and race, and a stratified random sample of these individuals was taken (n=790), resulting in 2,106 students to be contacted for a follow-up interview.

Of the 2,106 students to be contacted for a follow-up interview, only 1,449 were able to be intensely recruited before resources ran out. Of those 1,449 students, 1,253 completed the two hour baseline (wave 1) interview during the 2004-2005 school year, representing an 86.5% response rate. There were not systematic differences between those who were recruited and those who were not. Sampling weights were calculated to allow the sample to be generalized to the student population. Follow-up assessments were then conducted with this group at six month intervals following the date of the respondents' baseline interviews. At the six month mark (wave 2), a brief online survey was administered. At the twelve month mark (wave 3) a two-hour in-person interview was conducted. This pattern continued for successive waves (i.e. 18-month follow-up was online; 24-month follow-up was in person, etc.). This study's analysis will use data drawn from the 24-month assessment, which occurred during the respondent's third year in college, as well as some data from the baseline assessment.

For the purposes of this analysis, the sample was limited to people who completed the 24 month interview assessment.¹ The response rate for the 24 month assessment was 87.9% (n=1,101). This assessment was administered during the respondents' third year in college (or what would have been their third year if they followed a conventional college trajectory). Individuals were recruited regardless of whether or not they still attended the university. Of the 1,101 individuals who completed the assessment, 48.59% did not report being prescribed any medications (n=535). These individuals were excluded based on the knowledge that if they were not prescribed a medication, they would have no opportunity to divert a medication, resulting in a final sample size of 554.²

Measures

Unless otherwise specified, the measures used were taken from the 24-month assessment, administered at some point during the respondent's third year in college. The majority of the questions included in these surveys were taken from or adapted from national epidemiological surveys, such as the National Survey on Drug Use and Health (NSDUH) and the Monitoring the Future (MTF) survey, whose reliability and validity have been established (Colliver, et. al., 2006; Johnston, et. al., 2006). A complete summary of items included in each scale, is provided in the Appendix.

¹ The 24-month interview was selected because it was the first interview in which questions about the diversion of prescription medications were asked.

² One individual was excluded because researchers were unable to determine what medication the individual was taking. Twelve individuals were excluded because the only prescription they reported taking was a gender-specific medication. These individuals were excluded because not everyone in the sample could have been prescribed these medications, and the analysis conducted was not gender-specific. Overall, 31 individuals were prescribed a gender-specific medication; however, 19 also had other prescriptions, so they were included in the analysis. For these 19 individuals, the gender-specific medication was dropped from the data so it was not included in the analysis. Of the 31 total individuals who reported being prescribed a gender-specific medication, 29 were taking an oral contraceptive, 1 had a prescription for Viagra, and 1 had a prescription for Propencia. None of the individuals taking a gender-specific medication reported diverting that medication. No other type of medication had a 0% diversion rate. In addition, for some analyses, it was necessary to further reduce the sample size because of missing data on specific questions/measures, or because of data limitations. Additional footnotes address missing data.

Demographics

Race was reported by the respondent. For the purposes of this study, race was dichotomized into white and non-white because almost three quarters of the sample (74%) were white.³ Sex was recorded by the interviewer at the baseline interview. For this interview, males were coded as one and females were coded as zero. In addition, respondents were also asked where and with whom they were living. The options were parent or guardian's home, other relative's home, university residence hall, fraternity or sorority house, off campus and other. This variable was dichotomized into supervised living arrangements and unsupervised living arrangements. Off campus housing was considered to be unsupervised for the purpose of this study because in most off campus housing residences, there is no one in charge on the premises to monitor activity. Parent's home, relative's home, university residence hall and fraternity or sorority house were grouped together to represent supervised living situations, since parents, relatives, residence hall directors, and sorority or fraternity risk management directors were thought to represent an increase in supervision from an off-campus situation. The variable was dichotomized in this way because it was believed that those with less supervision find it easier to divert their prescription medications. Finally, respondents were asked whether or not they were a member of a sorority or fraternity, since involvement in Greek organizations is considered a risk factor for prescription drug abuse. This variable was dichotomized into "member" and "non-member".

Prescription Medications

In order to determine whether the respondent had any prescription medications, respondents were first asked if they have any *current* health conditions and if they have

³ The remainder of the sample was Black (8.7%), Asian (6.5%), Hispanic (4.0%), and Other (7.2%).

ever been diagnosed with ADD or ADHD, Anxiety, Depression, sleeping problems, or if they have had any pain, surgeries or injuries for which they may have been prescribed a medication. If the respondent answered affirmatively to any of these questions, they were then asked to specify any medications that were prescribed to them. Responses were recorded verbatim even if the medication was not known to the interviewer or did not have medical implications for the condition described (i.e. a respondent reporting a prescription for Percocet to treat ADHD).

Responses were later coded by the author. Medications were researched in the Physicians Desk Reference (PDR) to determine active ingredients and implications. Medications not found in the PDR were evaluated for misspellings (i.e. Vikoden vs. Vicodin) and were looked up in several reliable online prescription directories.⁴ Medications that could not be identified were dropped from the sample.⁵

After all medications were identified by their proper name, medications were coded both by type (ADHD medication, pain reliever, psychotropic medication, asthma/allergy medication, and other) and by brand name (Adderall®, Ritalin®, Concerta®, etc.). This coding did not take into account what the respondent said the medication treated. The “other” type category included muscle relaxers, gastric secretion inhibitors, and other miscellaneous medications. These medications were not commonly prescribed, thus it would have been difficult to evaluate them individually.⁶ Medications

⁴ <http://www.nlm.nih.gov/medlineplus/druginformation.html>, <http://www.drugs.com>, or <http://www.rxlist.com/script/main/hp.asp>. As a final resort, unidentified medications were typed into www.google.com in order to see if other suggested spellings of the medication came up.

⁵ Only four prescription drugs were unable to be identified. Of the individuals prescribed these medications, three also had other prescriptions, so these individuals were included in the sample with the unidentifiable medication dropped from their lists of prescriptions.

⁶ The most commonly prescribed type of medication in the ‘other’ category was prescription antibiotics. However, only 27 respondents reported a prescription for an antibiotic, and ten different antibiotics were

that would only be used by one sex, such as birth control, were ignored for reasons discussed in the sample section.

Diversion

Anyone who reported being prescribed a medication was asked the questions, “How often have you shared for free your prescription drug(s) with someone else” and “How often have you sold your prescription drug(s) to someone else?” The response options were never, once or twice, sometimes, or regularly. Respondents were also asked to specify the medication(s) that was shared and/or sold. These medications were identified and coded by type and brand name using the methods described above. For the purpose of this investigation, diversion was dichotomized into diverters and non-diverters. Individuals were said to have diverted if they answered once or twice, occasionally, or regularly to either “How often have you shared for free this drug with someone else?” or “How often have you sold this drug to someone else?”

The author chose to use a dichotomous dependent variable for several reasons. First, only 175 individuals reported diverting any prescription medication, and only 11 (6.7%) reported diverting regularly. In addition, for individuals who reported diverting more than one substance, the question did not address each substance separately. This would create a problem in a non-dichotomous variable because it would not be possible to identify how often any specific drug was diverted.

Sensation Seeking

Sensation seeking was measured through the impulsive sensation seeking subscale of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) in the baseline

reported. Consequently, name-specific diversion rates for these medications would be limited by sample size.

interview during the respondents' first year of college. This seven-item subscale is a streamlined derivative of the Sensation Seeking Scale-V (SSS-V). It has been widely used as a measure of impulsive sensation seeking, and its reliability and validity have been well-established (Zuckerman, 2002; Wu et. al., 2000; Ball, 1995). In the sample used for this study, the Cronbach's Alpha for the Sensation Seeking Scale was .740.⁷ Sensation seeking is considered to be a stable trait, thus the timing of this measure in relation to the timing of the other items measured should not be an issue (Zuckerman, 1994).

Conduct Problems

Deviant behavior in childhood was assessed during the baseline interview using questions that were created based on the symptoms of Conduct Disorder listed in the DSM-IV. These questions, taken from Johnson et. al. (1995), ask whether the respondents have ever engaged in several deviant behaviors, including damaging property, shoplifting, hurting others physically, harming animals, and setting fires. They also ask for the number of times the respondent had engaged in these behaviors and the age at which the behavior first occurred. The options to measure lifetime incidence of conduct problems at the start of the baseline interview were never, once, twice, three times, and more than three times. Behaviors were weighed based on severity, and were considered a symptom of Conduct Disorder if they occurred at least two or three times, depending on the weighted severity of each behavior. The number of symptoms is summed, creating a scale to summarize the severity of conduct problems in childhood. This scale had a Cronbach's Alpha of .667 for this sample.

⁷ A Sensation Seeking measure was missing for six students due to missing data. These students were not included in analyses regarding Sensation Seeking. Of the six students missing data for the Sensation Seeking Scale, three had diverted a substance, and three had not.

College Deviance

Deviant behavior in college was assessed through six questions used in the 12 month and 24 month interviews.⁸ These questions addressed housing violations due to alcohol or drug use, citations, arrests, and drunk and drugged driving. During both interviews, the respondents were asked how often in the past year each of these items had happened to them. Response options were never, once or twice, 3-6 times, 7-9 times, and 10 times or more. Each item was dichotomized into ‘never’ and ‘once or more in the past two years’ for several reasons. First, many individuals did not engage in any of these events, resulting in small cell sizes if the variables were not dichotomized. Of the twelve events described (six events for two years) less than 30% of the sample engaged in each act. Second, these are typically rare events for those who did experience them, so happening once is an acceptable measure of the behavior. Consequently, the deviance measure measures the number of deviant indicators (out of two types of housing violations, citations, arrests, drunk driving and drugged driving) the respondent had engaged in during the past two years of college.⁹

Illicit drug use

Illicit drug use was measured through the questions “In the past twelve months, on how many days have you used [drug]?” for marijuana, inhalants, cocaine, hallucinogens, heroin, amphetamines, and methamphetamine. In addition, the question was also asked regarding the non-medical use of prescription stimulants, prescription

⁸ The same questions relating to deviance were asked in the Baseline interview as well; however, Baseline (first year of college) data was not included because the author was unable to differentiate between events that had happened in the past year and events that had happened since starting college during the Baseline interview.

⁹ This score was unable to be calculated for 27 individuals because of missing data. These individuals were not included in any analysis involving the deviance scale. Of the 27 students for whom a deviance measure was unable to be calculated, twelve had diverted a prescription substance in their lifetimes, and fifteen had not.

analgesics, and prescription tranquilizers in order to measure the non-medical use of prescription drugs, yielding a total of 11 substances investigated. The number of days each of these substances was used was recorded for each individual.¹⁰ The mean number of days the substance was used in the past year was then calculated for each substance, and z-scores were computed in order to standardize the relative frequency of use for each substance. Z-scores for each substance were summed, yielding an 11-item scale measuring the frequency of illicit drug use.¹¹ Cronbach's Alpha for the Illicit Drug Use Scale was .675.

Peer Attachment

The Index of Peer Relations (IPR) was used to measure the type of relationships respondents had with their peers. The IPR is a 25-item instrument with questions about peer relations (Hudson, 1982). Responses are coded using a likert-type scale ranging from 1 to 7 where 1 is "None of the time" and 7 is "All of the time." Following scoring mechanisms described by Hudson (1982), the respondent's answers are summed, the number of completed questions is subtracted from the sum, and the result is multiplied by 100, and then divided by the number of items completed times 6. The final score falls between 0 and 100, with higher scores indicating more problematic relationships. Forte (1994) and Klein, Beltran and Sowers-Hoag (1990) found this scale to have good construct, criterion-related, discriminate and factorial validity. Among this sample, the Cronbach's Alpha Score was .958.¹²

¹⁰ The number of days respondents used prescription tranquilizers in the past 12 months was missing for two people.

¹¹ This scale has some potential limitations, in that a chronic marijuana user could potentially score higher than an occasional heroin user; however, given that many of the "soft" drugs typically precede use of "harder" drugs, it is unlikely that a heroin user would have a low score.

¹² An Index of Peer Relations (IRP) score was unable to be calculated for 13 individuals due to missing data. These individuals were not included in any analysis involving the IPR. Of the 13 students for whom

Commitment to School

Class attendance was measured as a proxy for commitment to school by asking the respondents how many class sessions per week were on their schedule in the current semester and how many class sessions per week they typically skip. Number of class sessions skipped was divided by total number of sessions to determine the percentage of classes the respondent typically skips.

Extra-Curricular Involvement

Social involvement was measured through the question “How regularly do you participate in the following extracurricular activities during a typical week in the current academic year” for the activities of volunteer work, religious or church groups, athletics, exercise, and another activity. Response options were none, irregular (defined as “not in a usual pattern, or less than once a week”), or regular (several times a week). Each item was dichotomized, with 1= “engaged in activity regularly” and 0= “did not engage in any activity regularly.” The items were then summed to produce a total number of activities in which each respondent regularly participates.

Perceived Social Norms

Perceived norms of prescription diversion were also measured for stimulants and analgesics. Perceived norms were measured through the questions “In the past 12 months, what percentage of your peers do you think have shared for free their prescriptions for [drug type]?” and “In the past 12 months, what percentage of your peers do you think have sold their prescriptions for [drug type]?” These questions measure the perceptions of peer behavior on diversion. The perceived social norm for sharing rather

an IPR score could not be calculated, seven had diverted a prescription substance in their lifetimes, and six had not.

than selling was used because perceptions of sharing and selling were highly correlated (.6712). Sharing of each medication was selected because it is a more common mechanism of diversion than selling for both ADHD medications and pain medications.

Perceived Harm

The perceived harm of misusing prescription drugs was also measured specifically for stimulants and analgesics. This measure was meant to represent a form of deterrence, in that those who believe their actions cause great harm may be deterred from a behavior because of their unwillingness to hurt others. Perceived harm was measured in the question “How much do you think people risk harming themselves (physically or in other ways) if they use prescription [drug type] non-medically occasionally.” Response options were no risk, slight risk, moderate risk, great risk, and can’t say/drug unfamiliar. For the purposes of this paper, responses were dichotomized “more risk” and “less risk” categories, with great risk=1 and no/slight/moderate/can’t say=0. The variables were divided up in this way because approximately one third of the respondents reporting associating “great risk” with both non-medical stimulant use and non-medical analgesic use.¹³ Lumping moderate risk and great risk together resulted in over 79% of respondents falling into the ‘more risk’ category for both substances (79.4% for stimulants; 79.3% for analgesics), thus this option was not pursued.

¹³ Perceived harm of non-medical use of prescription stimulants was unable to be calculated for four people. Of the four people for whom this measure could not be calculated, three had diverted a prescription stimulant, and one had not. Perceived harm of non-medical use of prescription analgesics was unable to be calculated for six people. Of the six people for whom this measure could not be calculated, four had diverted a prescription analgesic and two had not. These people were excluded from any analyses involving perceived harm for stimulants or analgesics respectively.

Chapter 5: Analytic Approach

The analysis for this study was conducted in three waves. First, descriptive analyses of the data were performed. Demographics were compared between diverters and non-diverters, and simple z-tests were run to check for differences between the two groups. In addition, substances prescribed and diverted were thoroughly described in order to determine the extent of the diversion problem among this population and the medications on which the problem is focused.

Second, logit models were used to evaluate the relationship between measured variables and the likelihood of engaging in diversion. Theoretically important variables are entered beginning with a base model that includes background demographics and prescription drug types, followed by additional models that separately measure the effect of sensation seeking, deviant behavior, and social bonds on diversion, in a theoretically competitive environment. This method of theoretical competition was used to avoid violating the underlying assumptions of each theory by integrating them into one model.

Finally, a series of models that control for perceived harm and perceived social norms were calculated separately for both ADHD medications and pain medications. This was done in order to test for possible mediating effects of deterrent considerations and deviant peer associations on previous findings. This analysis was limited to ADHD and pain medications because information about the perceived harm of diverting and the percentage of peers thought to divert was only available for ADHD and pain medications, not for prescription medication in general.

The basic regression model is estimated below:

$$Y_i = \beta_0 + \beta_j(\text{demographics}) + \beta_k(\text{prescription}) + e_i \quad (\text{Model 1})$$

where Y_i is the dependent variable representing the log odds that individual i diverts a prescription medication, β_j represents the effect of a series of independent demographic background variables (race, sex, fraternity/sorority involvement, and living arrangements), and, β_k represents the effect of a series of independent variables addressing whether the individual had been prescribed different types of prescription medication (ADHD medications, pain medications, psychotropic medications, and asthma/allergy medications).¹⁴ β_0 represents a constant and e_i an individual error term.

This basic model is extended to include theory-specific predictors of prescription diversion, including measures of low self-control, prior deviance, and social bonding:

$$Y_i = \beta_0 + \beta_j(\text{demographics}) + \beta_k(\text{prescription}) + \beta_l(\text{self control}) + e_i \quad (\text{Model 2})$$

$$Y_i = \beta_0 + \beta_j(\text{demographics}) + \beta_k(\text{prescription}) + \beta_l(\text{deviance}) + e_i \quad (\text{Model 3})$$

$$Y_i = \beta_0 + \beta_j(\text{demographics}) + \beta_k(\text{prescription}) + \beta_l(\text{bonding}) + e_i \quad (\text{Model 4})$$

where self control is captured by the individual's composite score on the Impulsive Sensation Seeking scale, deviance is represented by the Conduct Disorder Scale, the number of types of deviant activities the individual had engaged in during the past two years, and the respondent's score on the Illicit Drug Use Scale, and bonding is represented by the respondent's score on the Index of Peer Relations scale, the percentage of classes respondents typically skip, and the number of extracurricular activities the respondent has been regularly involved in during the current academic year.

¹⁴ The type of medication prescribed was controlled for because prescriptions for different types of substances often yield different types of opportunities to divert. For example, a prescription for an ADHD medication is often an ongoing prescription that an individual refills every month. In contrast, a prescription for an analgesic is usually prescribed only for a limited amount of time, with no re-fills. Thus, the student prescribed an ADHD medication has more medication on hand because they have the opportunity to refill their prescription, and has a longer time period over which the opportunity to divert may present itself because they have a less limited supply of medication whereas a student with a prescription for an analgesic can only use or divert the amount of medication they currently have on hand, and when it is gone, so is the opportunity for diversion.

Following the original four models, separate models were run to examine two additional theoretically relevant components missing from previous models: perceived harm of diversion and perceived social norms. Perceived harm was included to test for deterrent effects in prescription diverters, and perceived social norms addresses the role of deviant peer effects.

It was necessary to run eight logit models with these two additional variables - four predicting the diversion of prescription ADHD medications and four predicting the diversion of prescription pain medications - for several reasons. First, in the survey, questions about perceived social norms and perceived harm were only asked for stimulants (ADHD medications), analgesics (pain medications), and tranquilizers, and were not asked about prescription medication in general; consequently these measures were not available for the larger sample of all prescription medication. Second, stimulants and analgesics were the two most commonly diverted types of substances; thus further research focusing on each of these substance types is warranted. Finally, there is a chance that ADHD medications and pain medications may be diverted for different reasons given that many individuals use prescription stimulants for study as opposed to recreational purposes. These final eight models will test for mediating effects of deterrence and peer associations. It is important to include these theoretically relevant concepts in order to reduce the likelihood of spurious relationships in previous models.

Models 1, 2, 3, and 4 were therefore rerun on the subsample of respondents who had been prescribed an ADHD medication (n=83). The same models were rerun on the subsample of respondents who had been prescribed a pain medication (n=323). All eight models used the same demographic and theoretical controls as Models 1 through 4, but

also included measures of perceived harm and perceived social norms, where perceived harm was represented by whether or not the respondent associated great harm with taking someone else's ADHD or pain medication, and perceived social norms are represented by perceived percent of peers who shared their ADHD medication or shared their pain medication, respectively.

Chapter 6: Results

Descriptive Analyses

Table 2 reports the results of the descriptive analyses. This analysis shows that of the 1,101 individuals surveyed, 554 were prescribed a non-gender specific medication. Of those individuals with a medication, 31.59% (n=175) diverted a medication at least once in their lifetime.¹⁵ Z-tests comparing prescription diverters to non-diverters revealed that diverters were more likely to be male and to live off-campus. There were no significant differences between diverters and non-diverters for race or membership in a Greek organization. In addition, levels of conduct problems, college deviance and illicit drug use were significantly higher for diverters than for non-diverters.

Table 3 further disaggregates the descriptive findings by type of medication, offering a clearer picture of the prevalence of diversion among college students and the types of medications most likely to be diverted. Since individuals may be prescribed multiple medications to treat the same disorder (for example an individual with ADHD may have been prescribed Ritalin, then Adderall, then Dexedrine), results were examined on the prescription level as well as the individual level in order to determine what was most likely to be diverted. Table 3 includes the total number of prescriptions and diversions of each type of medication, and brand names (or in the case of Any Other Med, medication types) of the three most commonly prescribed substances.

¹⁵ Of the individuals with prescriptions, 164 (29.6%) had shared a medication at least once, and 46 (8.4%) had sold their prescription at least once in their lifetime. Of those who shared medications 20.1% (n=33) also sold them, and only 28.3% (n=13) of sellers exclusively sold medications. Type specific frequency of diversion was unable to be determined because 34.5% of diverters diverted more than one substance, and frequency of diversion was not asked specifically for each substance. However, results did indicate that diversion was not a frequent occurrence. According to the data, only 5.5% (n=9) of those who share do so frequently, and 6.5% (n=3) of those who sell prescriptions do so frequently.

Table 2: Descriptive Statistics

| | Total (n=554) | Non-Diversers (n=379) | Diversers (n=175) |
|---|-----------------------------|-----------------------------|-----------------------------|
| Dependent Variable | n (%) | n (%) | n (%) |
| Diversion | | | |
| Never | 379 (68.41%) | | |
| At least once | 175 (31.59%) | | |
| Independent Variables | n (%) | n (%) | n (%) |
| Race | | | |
| White | 413 (74.55%) | 275 (72.56%) | 138 (78.86%) |
| Non-white | 141 (25.45%) | 104 (27.44%) | 37 (21.14%) |
| Sex | | | |
| Male* | 254 (45.85%) | 160 (42.22%) | 94 (53.71%) |
| Female | 300 (54.15%) | 219 (57.78%) | 81 (46.29%) |
| Living Situation | | | |
| Off-campus* | 223 (40.25%) | 138 (36.41%) | 85 (48.57%) |
| Non off-campus | 331 (59.75%) | 241 (63.59%) | 90 (51.43%) |
| Sorority/Fraternity | | | |
| Member | 134 (24.19%) | 93 (24.54%) | 41 (23.43%) |
| Non-member | 420 (75.81%) | 286 (75.46%) | 134 (76.57%) |
| Theoretical Predictors | Mean (SD) | Mean (SD) | Mean (SD) |
| Sensation Seeking Scale | 3.63 (2.16) | 3.52 (2.22) | 3.88 (2.01) |
| Conduct Problems* | 3.17 (2.35) | 2.83 (2.11) | 3.91 (2.67) |
| College Deviance* | 1.01 (1.17) | 0.80 (1.01) | 1.47 (1.36) |
| Illicit Drug Use Scale* | 0.02 (5.35) | -0.60 (3.47) | 1.38 (7.86) |
| Index of Peer Relations | 27.08 (8.46) | 26.90 (8.26) | 27.50 (8.88) |
| Classes skipped | 0.17 (0.92) | 0.18 (1.10) | 0.13 (0.18) |
| Extra-curriculars | 1.43 (1.05) | 1.49 (1.03) | 1.31 (1.09) |
| Mediating Variables | n (%)/ Mean (SD) | n (%)/ Mean (SD) | n (%)/ Mean (SD) |
| Perceived Harm of ADHD Medication | 16 (20.25%) | 8 (23.50%) | 8 (16.30%) |
| Perceived Normalcy of Diverting ADHD Medication* | 20.87 (24.75) | 12.09 (13.98) | 27.17 (28.73) |
| Perceived Harm of Pain Medication* | 91 (28.71%) | 71 (31.70%) | 20 (20.20%) |
| Perceived Normalcy of Diverting Pain Medication* | 16.43 (19.14) | 13.84 (17.87) | 22.46 (20.69) |

* Difference between diversers and non-diversers is significant at $p < .05$ level

Note: Sample sizes for perceived harm and perceived norms of ADHD medications were limited to those who had been prescribed an ADHD medication (n=83), those who had not diverted an ADHD medication (n=33), and those who had diverted an ADHD medication (n=50). Sample sizes for perceived harm and perceived norms of pain medications were limited to those who had been prescribed a pain medication (n=323), those who had not diverted a pain medication (n=219), and those who had diverted a pain medication (n=104).

Table 3: Prevalence of Diversion

| | Number Individuals w/ Rx | Number (%) Individuals Diverted | Number of Rx | Number (%) Rx Diverted |
|---------------------------|--------------------------------|---------------------------------------|-----------------|---------------------------|
| ADHD Medication | 83 | 50 (60.24%) | 107 | 54 (50.47%) |
| Adderall | | | 46 | 33 (71.74) |
| Concerta | | | 23 | 8 (34.78) |
| Ritalin | | | 27 | 10 (37.04) |
| Other | | | 11 | 3 (27.27) |
| Pain Medication | 323 | 104 (32.20%) | 386 | 119 (30.83%) |
| Hydrocodone | | | 38 | 14 (36.84) |
| Percocet | | | 109 | 30 (27.52) |
| Vicodin | | | 100 | 31 (31.00) |
| Other | | | 139 | 44 (31.65) |
| Psychotropic Medication | 154 | 20 (12.99%) | 247 | 19 (7.69%) |
| Lexapro | | | 30 | 1 (3.33) |
| Wellbutrin | | | 19 | 0 (0.00) |
| Zoloft | | | 54 | 3 (5.56) |
| Other | | | 144 | 15 (10.42) |
| Asthma/Allergy Medication | 113 | 14 (12.39%) | 158 | 13 (8.23%) |
| Albuterol | | | 32 | 5 (15.63) |
| Allegra | | | 29 | 4 (13.79) |
| Claritin | | | 20 | 1 (5.00) |
| Other | | | 77 | 3 (3.90) |
| Other Medication | 109 | 7 (6.42%) | 112 | 7 (6.25%) |
| Antibiotic | | | 27 | 1 (3.70) |
| Muscle Relaxer | | | 12 | 2 (16.67) |
| Anti-inflammatory | | | 16 | 1 (6.25) |
| Other | | | 57 | 3 (5.26) |
| Total | 554 | 175 (31.59%) | 1010 | 212 (20.99%) |

Individuals prescribed medication to treat ADD/ADHD were most likely to divert their medications, with 60.24% of individuals with an ADHD medication diverting it.¹⁶ Almost one third of individuals with an analgesic medication (32.20%) diverted an analgesic. In addition, the 554 respondents who had been prescribed a medication reported a total of 1,010 prescriptions. Of the prescription medications reported, 20.99% were diverted. Since this estimate is almost 10 percentage points lower than the estimated percentage of individuals who diverted their medication, it may be that only specific types of medication are able to be diverted. For example, there may be a large underground market for stimulants, but not for psychotropic medications.

Among prescriptions, ADHD medications were still the most commonly diverted drugs, with 50.47% of ADHD medication prescriptions being diverted. In this case, the over 10 percentage point difference between the percent of people who divert ADHD medications and the percent of ADHD medication prescriptions that are diverted may be a result of the age at which the medication was prescribed. Individuals with ADHD were asked if they had ever been prescribed a medication to treat their condition. As a result, individuals may have reported both current prescriptions and medications they were prescribed as children, when their opportunities to divert were reduced or nonexistent. After switching to another medication at a later date, these individuals may have had more opportunity to divert their medication as a high school or college student.

Among commonly prescribed medications, Adderall®, an ADHD medication, was most likely to be diverted, with 71.74% of Adderall prescriptions being diverted. The next most frequently diverted substance was Ritalin® (37.04% of Ritalin

¹⁶ Individuals with an ADHD medication were most likely to both share their medication and sell their medication respectively, indicating that prevalence holds up across different routes of diversion.

prescriptions diverted), followed by Hydrocodone (36.84% of prescriptions diverted).

Ritalin® is an ADHD medication, and Hydrocodone is a generic pain reliever.

Interestingly, three of the top four most commonly diverted substances were used to treat ADHD, demonstrating the significant market among college students for medications thought to increase concentration.

Multivariate Analyses

Logit regression models were used to examine the relationship between a variety of variables and prescription medication diversion. Table 4 reports the odds ratios for Models 1 through 4 described above. The first model in Table 4 illustrates that sex, living off-campus, and having a prescription for ADHD medication, pain medication, and psychotropic medication all increase the likelihood of diverting a prescription medication in the absence of any theoretical predictive variables.¹⁷ Overall, having a prescription for an ADHD medication had the strongest effect on diversion, where those with a prescription for an ADHD medication were more than seven times as likely as those with a prescription of an “other” medication to divert a substance.

¹⁷ The base model was re-run using only individuals who reported being *currently* prescribed a medication (n=257), and defining diversion as ever having diverted a medication the respondent was currently taking. Under this revised model, only having a prescription for an ADHD medication was significantly related to diversion of a current medication (p=0.000), and having a prescription for a psychotropic medication was marginally related to diversion (p=0.082). The most likely explanation for the strong relationship between diversion and having a prescription for an analgesic dropping out is that very few respondents reported having a current analgesic prescription (n=9).

Table 4: Multivariate Odds Ratios for Base Model, Self Control Model, Deviance Model, and Social Bond Model

| Variables | Model 1 Base Model | | Model 2 Self Control Model | | Model 3 Deviance Model | | Model 4 Social Bond Model | |
|-------------------------------------|-----------------------|-------|-------------------------------|-------|---------------------------|--------|------------------------------|-------|
| | Odds Ratio | SE | Odds Ratio | SE | Odds Ratio | SE | Odds Ratio | SE |
| Race | 1.0755 | 0.256 | 1.0645 | 0.254 | 0.8824 | 0.224 | 1.1476 | 0.282 |
| Sex | 1.5171** | 0.305 | 1.5331** | 0.311 | 1.0836 | 0.247 | 1.5188** | 0.316 |
| Living off-campus | 1.4493* | 0.296 | 1.4756* | 0.306 | 1.3907 | 0.302 | 1.4904* | 0.315 |
| Fraternity/sorority member | 0.9304 | 0.223 | 0.8775 | 0.214 | 0.7926 | 0.205 | 1.0145 | 0.250 |
| Prescription for ADHD med | 7.4357*** | 2.194 | 7.0261*** | 2.102 | 6.1068*** | 1.874 | 7.3543*** | 2.240 |
| Prescription for pain med | 3.3084*** | 0.833 | 3.2778*** | 0.830 | 2.7145*** | 0.711 | 3.1873*** | 0.825 |
| Prescription for psychotropic med | 1.6729** | 0.419 | 1.6941** | 0.426 | 1.3676 | 0.366 | 1.5154 | 0.401 |
| Prescription for Asthma/allergy med | 1.5062 | 0.426 | 1.5198 | 0.431 | 1.5090 | 0.4442 | 1.6367* | 0.471 |
| Sensation Seeking | | | 1.0116 | 0.048 | | | | |
| Conduct Problems | | | | | 1.1205** | 0.052 | | |
| College Deviance | | | | | 1.3732*** | 0.131 | | |
| Illicit Drug Use | | | | | 1.0391* | 0.022 | | |
| Attachment to Peers | | | | | | | 1.0059 | 0.013 |
| Commitment to School | | | | | | | 0.8804 | 0.248 |
| Involvement in Extra-Curriculars | | | | | | | 0.8184* | 0.084 |
| Pseudo R2 | 0.1227 | | 0.1207 | | 0.1613 | | 0.1237 | |

* significant at p<.1

** significant at p<.05

*** significant at p<.01

Models 2 through 4 extend the baseline model to include measures of theoretical predictors of prescription diversion. The Self Control Model provides no evidence that impulsive sensation seeking is significantly related to prescription diversion behavior. In this model, only sex ($p=0.035$) and having a prescription for a specific type of medication (e.g. ADHD medications, pain medications or psychotropic medications) were significant predictors of diversion. Living off-campus was also marginally significant ($p=0.061$). Of these predictors, the odds ratios indicated that being male, having a prescription for an ADHD medication, having a prescription for a pain medication, having a prescription for a psychotropic medication, and living off-campus all increase the probability of diversion. Having a prescription for an ADHD medication again had the largest impact on diversion, where those with an ADHD medication were still seven times as likely to divert.¹⁸ In addition, similar to the Base Model, individuals with a prescription for pain medications were over three times more likely to divert than those with a prescription for an “other” medication. Overall, self control did little to mediate the significant effects of demographics and prescription types.

Model 3 in Table 4, includes measures of college deviance, conduct problems and illicit drug use, in order to investigate the proposition that prescription drug diversion is part of a larger pattern of deviant behavior. Higher scores of Conduct Problems and College Deviance ($p=0.001$) were significantly related to prescription diversion. In this model, the odds ratio for Illicit Drug Use was marginally significant, with greater scores indicating a greater likelihood of diversion ($p=0.074$). Having a prescription for an ADHD medication or a pain medication remained significant in this model as well. In

¹⁸ Because ADHD medications and sensation seeking were slightly correlated (Pearson’s correlation = 0.14) the model was re-run excluding ADHD medications. In the exclusionary model, the odds ratio for sensation seeking was in the expected direction, but was still not significant.

addition, after controlling for prior deviance measures, sex, living off-campus and having a prescription for a psychotropic medication no longer predict diversion, indicating a mediating effect where these findings are explained away by controlling for prior deviant behavior. In this model, the magnitude of the effect of both having an ADHD medication and having a pain medication was reduced in comparison to the previous model; however, both still demonstrated a strong effect on diversion. Prior deviance also demonstrated a strong effect on diversion.

Model 4 in Table 4 includes measures of social bonds, such as attachment to peers, commitment to school, and involvement in extra-curricular activities. This model demonstrates very limited support for Social Bond Theory. Although sex and living off-campus both predicted diversion at similar magnitudes as in the base model, the only aspect of social bonds that predicted prescription diversion was involvement, measured by involvement in extra-curricular activities. In this model, involvement in extra-curriculars reduced the likelihood of diversion. In addition, having a prescription for an ADHD medication ($p=0.000$), a prescription for a pain medication ($p=0.000$), or a prescription for an asthma or allergy medication ($p=0.087$) increased the likelihood of diversion.

These models all share some similarities. In every model, having a prescription for an ADHD medication most strongly increased the odds of diversion. This finding is not unexpected given that ADHD itself, with or without treatment, is a marker for increased risk of a variety of deviant behavior. In addition, in all four models, respondents with a prescription for a pain medication were more than twice as likely as those prescribed an “other” medication to divert a prescription. Of the three models

discussed, the Deviance Model appears to best explain diversion, both because all three deviance measures are significantly related to diversion and because of the three models, this one has the highest McFadden's pseudo R-squared value. However, these results do not take into account the roles of perceived harm of non-medical use (one type of consequence) or perceived social norms (the peer effect). The final analyses add these measures.

Interaction Effects

The remaining analyses examine the extent to which the inclusion of perceived harm (i.e. how much respondents think people risk harming themselves by taking someone else's medication) and perceived norms (the perceived percentage of peers who divert) mediate the aforementioned results.¹⁹ In order to examine the effects of perceived harm and perceived social norms, ADHD medications and pain medications were chosen to be re-examined controlling for these factors. These two types of medications were chosen because of data availability and because they are the two most commonly diverted types of prescriptions. As shown in Table 5, perceived social norms were significant predictors of ADHD medication diversion across all four models.

¹⁹ Students typically underestimate diversion of stimulants and analgesics. For stimulants, the actual percentage of individuals who share their stimulants is 55.42%. The perceived percentage of peers who share is 16.48%. While this is not an exact comparison because 'peers' can be interpreted in a variety of ways, it does show that in general, individuals who engage in diversion behavior are not convinced that "everyone is doing it." For analgesics as well, sharing is underestimated (perceived 16.30% versus 28.17% actual) but selling is overestimated (perceived 14.29% versus 6.81% actual). Across the board, prescription medication diverters had higher estimates of both perceived sharing and perceived selling than non-diverters.

Table 5: Multivariate Odds Ratios for Diversion Models of (n=83) Prescription ADHD Medication Diverters

| | Model 5 Base Model | | Model 6 Self Control Model | | Model 7 Deviance Model | | Model 8 Social Bond Model | |
|----------------------------------|-----------------------|--------|-------------------------------|-------|---------------------------|-------|------------------------------|--------|
| | Odds Ratio | SE | Odds Ratio | SE | Odds Ratio | SE | Odds Ratio | SE |
| Perceived Social Norms | 1.0463*** | 0.017 | 1.0482*** | 0.017 | 1.0421** | 0.018 | 1.0470*** | 0.018 |
| Perceived Harm | 1.0614 | 0.689 | 0.9749 | 0.655 | 0.7357 | 0.540 | 1.2039 | 0.873 |
| Race | 1.6880 | 1.164 | 1.5731 | 1.093 | 0.8514 | 0.658 | 1.6417 | 1.211 |
| Sex | 2.6314* | 1.5486 | 3.0469 | 1.847 | 1.9986 | 1.358 | 2.2643 | 1.476 |
| Living Off-campus | 1.0176 | 0.524 | 1.1542 | 0.606 | 1.0133 | 0.606 | 0.9792 | 0.527 |
| Fraternity/Sorority Member | 2.2027 | 1.2596 | 2.3901 | 1.461 | 1.8422 | 1.173 | 2.1581 | 1.280 |
| Sensation Seeking | | | 0.9480 | 0.130 | | | | |
| Conduct Problems | | | | | 1.2090* | 0.134 | | |
| College Deviance | | | | | 1.2648 | 0.327 | | |
| Illicit Drug Use | | | | | 1.1758 | 0.153 | | |
| Attachment to Peers | | | | | | | 0.9804 | 0.028 |
| Commitment to School | | | | | | | 23.5993 | 48.610 |
| Involvement in Extra-Curriculars | | | | | | | 1.1103 | 0.330 |
| Pseudo R2 | 0.1216 | | 0.1338 | | 0.2422 | | 0.1608 | |

* significant at p<.1

** significant at p<.05

*** significant at p<.01

In all four models presented in Table 5 perceived social norms had a slight but significant effect on diversion of prescription ADHD medications, where reporting a higher percentage of their peers who they thought had shared their prescription ADHD medication raised the odds of diversion by approximately 4%. Perceived harm had no effect across all three models, failing to support the hypothesis that the perceived harm of using stimulants non-medically had an effect on diversion of ADHD medications.²⁰ This null finding may be due to the limited sample size of individuals who were prescribed stimulants (n=83), and the very small cell size of these individuals who believed that using someone else's prescription stimulant occasionally could result in great harm (n=16). Given this limitation, these findings must be considered exploratory, and far from conclusive as to the role perceived harm plays in the likelihood of deterrence. As with results in Table 4, the Deviance model in Table 5 has the highest pseudo R-squared value.²¹ However, across models 6 through 8, the effects of perceived social norms and perceived harm mediated every previously significant predictor of diversion with the exception of Conduct Problems in the Deviance Model.

Table 6 demonstrates significantly different results when perceived social norms and perceived harm were applied to a model predicting the diversion of prescription pain relievers. In all four models in Table 6, perceived social norms, perceived harm, and

²⁰ Both the significance of perceived social norms and the insignificance of perceived harm held up across all three models when perceived social norms were defined as the percentage of peers who sold their stimulant medication (as opposed to the percentage of peers who shared their stimulant medication). Also, in all four models, there were no significant differences between the odds ratios for perceived normalcy of sharing and perceived normalcy of selling. Conduct Problems remained marginally significant in the Deviance model substituting perceived normalcy of selling for perceived normalcy of sharing. No other variables proved to be significant in any of the models in which perceived normalcy of selling was used, indicating that perceptions of sharing and selling both affect the likelihood of diversion in similar ways.

²¹ Both the Odds Ratio and Standard Error of attachment to school in Model 8 were highly inflated due to the homogeneity of the sub-sample with regard to this particular variable. Given the limited sample size, the model was rerun without this variable, and the other results remained constant when it was omitted. It is reported in this model because it remains theoretically relevant; however, its strong effect can be attributed to limitations in the sub-sample.

living off-campus were significant predictors of prescription analgesic diversion, such that people who live off-campus were more than twice as likely as those who did not live off-campus to divert a prescription analgesic, and higher perceptions of the percentage of peers who share analgesics also slightly increased the odds of prescription analgesic diversion. Perceiving great harm decreased the likelihood of diversion of analgesics, as predicted. In addition, more deviance in college was also associated with prescription analgesic diversion.²² Overall, these models demonstrate the both perceived social norms and perceived harm play a role in diversion of analgesics. However, they do not completely mediate the effects of demographic variables and theoretical predictors, as demonstrated by the strong and significant relationships between living situation and college deviance and diversion. Table 6 did follow the results of Tables 4 and 5 in that the model with the highest pseudo R-squared was the Deviance Model.

²² The results of Table 6 differed between models using the perceived normalcy of sharing and models using the perceived normalcy of selling. In both the Sensation Seeking and Deviance models, when perceived normalcy of sharing was replaced with perceived normalcy of selling, perceived norms was not a significant predictor of diverting prescription analgesics. In addition, living off-campus was significant in all four models. Finally, the significance of the college level deviance measure in the Deviance model held up when perceived normalcy of sharing was replaced with perceived normalcy of selling, and illicit drug use also became marginally significant.

Table 6: Multivariate Odds Ratios of Diversion Models of (n=323) Prescription Pain Medication Diverters

| | Model 9 Base Model | | Model 10 Self Control Model | | Model 11 Deviance Model | | Model 12 Social Bond Model | |
|----------------------------------|-----------------------|--------|--------------------------------|-------|----------------------------|-------|-------------------------------|-------|
| | Odds Ratio | SE | Odds Ratio | SE | Odds Ratio | SE | Odds Ratio | SE |
| Perceived Social Norms | 1.0232*** | 0.007 | 1.0219*** | 0.007 | 1.0203*** | 0.007 | 1.0241*** | 0.007 |
| Perceived Harm | 0.5301** | 0.162 | 0.5380** | 0.165 | 0.4263** | 0.145 | 0.5763* | 0.179 |
| Race | 0.9682 | 0.317 | 0.9473 | 0.311 | 0.7355 | 0.266 | 0.9851 | 0.331 |
| Sex | 1.0833 | 0.2786 | 1.1052 | 0.288 | 0.6442 | 0.201 | 1.2024 | 0.325 |
| Living Off-campus | 2.1991*** | 0.581 | 2.3132*** | 0.627 | 2.5899*** | 0.752 | 2.3371*** | 0.636 |
| Fraternity/Sorority Member | 0.9823 | 0.301 | 0.9778 | 0.302 | 0.8484 | 0.286 | 1.1259 | 0.356 |
| Sensation Seeking | | | 0.9988 | 0.062 | | | | |
| Conduct Problems | | | | | 1.0822 | 0.061 | | |
| College Deviance | | | | | 1.5376*** | 0.211 | | |
| Illicit Drug Use | | | | | 1.0425 | 0.028 | | |
| Attachment to Peers | | | | | | | 1.0047 | 0.016 |
| Commitment to School | | | | | | | 0.5618 | 0.435 |
| Involvement in Extra-Curriculars | | | | | | | 0.7965* | 0.106 |
| Pseudo R2 | 0.0685 | | 0.0673 | | 0.1386 | | 0.0800 | |

*significant at p<.1

** significant at p<.05

*** significant at p<.0

The results for predicting prescription ADHD medication diversion and prescription pain reliever diversion are similar in that in both tables, a higher perception of peers who share the medication similarly increased the likelihood of diverting. However, the two tables also differed in several ways, the most significant of which was the magnitude and significance of the effect of perceived harm. In Table 6, those who perceived great harm resulting from taking another's medication were half as likely to divert as those who perceived lesser harm, and this finding was significant in all four models. In contrast, in Table 5, the effect of perceived harm varied in direction, and did not achieve significance. The fact that results for predicting prescription ADHD medication diversion and prescription pain medication diversion differ may be due to several factors, but limitations in sample size inhibit the model's ability to say that true differences exist.

Chapter 7: Discussion

Findings regarding the descriptive analyses were largely consistent with expectations. The hypothesis that at least 20% of students with prescriptions would divert them was supported by the data. Among a sample of college students with prescriptions, over 31% of them diverted a medication at least once. Weighted back to represent the general population of students at the large public university from which they were sampled, 27% of students with prescriptions diverted their medication. In addition, consistent with prior literature, sharing was more common than selling.

The hypothesis that prescription stimulants would be the most commonly diverted type of substance was also supported. Sixty percent of students with a prescription for an ADHD medication diverted an ADHD medication at least once. In addition, almost 50% of the prescriptions written to treat ADHD were diverted at least once, indicating there is a considerable market for ADHD medications among college students. This finding was a contrast to studies of other populations that have found prescription pain relievers to be most commonly diverted (USDEA Fact Sheet; Inciardi, 2007). According to data from the current study, three of the top four drugs diverted (Adderall®, Ritalin® and Concerta®) are all stimulants used to treat ADHD. This finding is most likely related to the unique properties of the college population, where a demand for prescription stimulants is probably higher due to the desire to use stimulants to stay up late to study and do work. It is interesting to note that Adderall® was by far the most commonly diverted substance, being diverted close to twice often as the other commonly prescribed ADHD medications. One possible explanation for this may be that the active ingredient

of Adderall® (mixed amphetamine salts) affects users differently than methylphenidate, which is the active ingredient in both Ritalin® and Concerta®.

Findings regarding competing theoretical models were less consistent with expectations. The hypothesis that impulsive sensation seeking would be related to prescription diversion was not supported. This finding indicates that low self control may not be a good predictor of prescription diversion; however, this must be accepted with caution. The measure used to indicate low-self control (the Impulsive Sensation Seeking scale) may not be a good proxy for self control given that impulsivity is only one dimension of self control as described by Gottfredson and Hirschi (1990). It would be wise to repeat the study using other, more comprehensive measures of self control before drawing any conclusions.

The deviance model supported the hypothesis that individuals who engage in prior deviance will engage in diversion. Conduct problems, deviance during college, and illicit drug use were related to diversion. This finding is consistent with prior literature demonstrating that the majority of offenders are typically generalists who do not engage in a specific form of deviance, but instead engage in a variety of deviant acts (Farrington, 1999; Soothill et. al., 2008). This means we would expect diversion to be an especially significant problem among populations with Conduct Disorder, juveniles or adults in correctional facilities, and among illicit drug users.

The fourth model offered little evidence for the influence of social bonds on diversion, with only one indicator of social bonds being significantly related to diversion. This finding may have to do with the measures of social bonds used. Prior studies have used a variety of measures to capture elements of social bonds, and this study only used

three indicators, hardly an exhaustive list. It is possible that other elements of social bonds not measured here, such as attachment to parents or religiosity may be more related to prescription diversion behavior.

The data supported the hypothesis that perceptions of social norms would impact the likelihood of diversion. For both ADHD medications and pain medications, higher perceptions of the percentage of peers who share prescription medications were significantly related to prescription diversion. This finding indicates that there is a relationship between perceptions of peer behavior and diversion, but the causal direction of the relationship remains unclear (i.e. it may be that increases in perception of the percentage of one's peers who divert lead to a greater likelihood of diversion, or it may be that individuals who divert develop a perception that a high percentage of their peers are engaging in the same behavior). Interestingly, for diversion of ADHD medications, this finding partially mediated other diversion predictors.

The hypothesis that perceptions of harm would impact whether or not an individual would divert a prescription was supported for pain medications, but not for ADHD medications. This may be due, in part, to the limited sample size studied in the ADHD medication models. In addition, the differences between predictors for ADHD medication diversion and pain medication diversion may be partially explained by the differences in reasons for using each substance non-medically. If prescription ADHD medications are primarily diverted to help people study (as opposed to help them get high), this type of diversion may be less 'deviant' in the traditional sense because students equate it with giving out a study guide. On the other hand, diverting prescription pain relievers may be more deviant because pain relievers are commonly used to get high

or taken with alcohol to increase the effects of drunkenness, thus explaining why deviance is a significant predictor. In addition, if diverting ADHD medication is not seen as deviant, supervision will not be an issue, possibly explaining why living off-campus (presumably unsupervised) was significant for predicting diversion of prescription analgesics, but not for diverting prescription ADHD medication. However, it is unclear at this point whether these findings reflect true differences between diversion of ADHD medications and pain medications, or whether they were a product of this dataset and its limitations. Future research is needed to better explore this issue.

It is important to note that for prescription analgesics, college deviance continued to be a highly significant predictor of diversion, even after controlling for perceived social norms and perceived harm. In addition, living off-campus had a strong and significant effect in all four analgesic models, doubling the likelihood of diverting a pain medication. Future study is needed to clarify relationships between types of diversion and predictors of diversion, and to address other limitations of this study.

Limitations and Suggestions for Future Research

This study has several limitations that bear mentioning. The first is that the method used to administer the survey (face-to-face interview) may have affected the answers received. Respondents may be less likely to disclose illegal behavior in a face-to-face interview than in another type of survey, thus the amount of diversion disclosed could be considered an underestimate of the true level of diversion among this population. Furthermore, as in any self-report measure, the quality and accuracy of responses received depends largely on the respondent's memory. As human memory is always fallible, it must be accepted that possible exaggeration, telescoping, or other

problems may affect the quality of the data provided. However, given that the dependent variable of diversion is dichotomized into whether or not diversion ever occurred, the author believes that this limitation does not present as significant a challenge as it otherwise could have been. Future research can minimize potential problems with time frames by focusing only on medications that an individual received in the past year.

In addition, because the question asked about lifetime incidents of diversion and did not specify a time frame, it is impossible to establish temporal precedent in the analysis in order to determine whether certain characteristics predict future diversion or result from diversion behavior. Certain psychological characteristics, such as sensation seeking are considered stable characteristics that do not alter over time, thus in some instances, it is possible to infer that the characteristic may predate the diversion behavior, however, additional studies should be performed using longitudinal research in order to better determine what predicts diversion and what results from diversion.

This study is also subject to the limitations of its dataset and analysis. The limited sample size available, especially in the examination of prescription stimulants may have affected the results. In addition, a limited number of demographic control variables were included in the models. Future research should examine the role of socioeconomic status (SES) and other common control variables on diversion. In terms of clarifying the role of theoretical risk factors, future research should more closely examine the role of low self control in diversion, and the effects of social bonds not included in this study, such as religiosity or attachment to parents. The role of parents is an especially significant object of study, given its importance in many criminal justice theories, and the body of literature linking parental attachment to successful socialization, a protective factor for delinquent

behavior. Finally, any of the models run may be affected by omitted variable bias, since such models cannot be expected to account for everything. Future research can correct these problems by gaining larger, more generalizable samples, and controlling for other theoretically relevant variables not included in the present analysis.

Furthermore, this data comes from a large-public university and can be weighted to reflect the university class population. However, any findings will not be generalizable to another population. The respondents are not representative of a national sample, nor are they generalizable to a specific community. Thus, further research will be required to investigate and duplicate any findings before policy implications can be embraced. Additional studies also need to examine other populations that may be at risk for diversion, such as illicit drug users, and individuals in the criminal justice correctional system. Examination of other populations could also include gender comparisons in order to determine whether or not different factors predict diversion by males or females, or whether males and females divert for different reasons.

In addition, in coding the asthma/allergy medications students were using, it was difficult to determine if some of the medications were prescription or over-the-counter. For example, Claritin® is available in both a prescription strength and over-the-counter strength dose. In cases in which strength of dosage was unclear, the author assumed the medication was prescribed to the student, since the interview asks what medications have been prescribed. This may affect diversion estimates for this type of medication because while the author believes that the assumption of a prescription dose is acceptable given the question asked, it is possible some students reported non-prescription medications.

Finally, the diversion questions may not capture prescription trading behavior. A few studies have been published examining prescription trading behavior (Boyd, et. al., 2007; McCabe, Teter & Boyd, 2004, 2006a, 2006b). This study did not specifically ask about trading, thus it is possible that diversion behavior was under-measured by this omission. Future research should specifically address this behavior.

Future research also should take several factors into consideration to connect this study with other research in the field. First, future research should examine how often people divert their medications in comparison to how often they are approached to divert. In addition, future research should address the issue of what percentage of college students who are approached to divert their prescriptions actually do. This will link the current study to other research focusing on opportunities to divert. In order to build on this line of thought, additional research should also examine differences in personality and environmental characteristics of diverters and non-diverters, among those who were approached to divert. It is currently unclear what factors contribute to refusal to divert when the opportunity is present.

In addition, in order to contribute to the literature, future research should examine to whom college students divert. Most college students say that they received diverted medications from friends, but it is unclear if diversion is done within an intimate friend network, or if it extends to a network of acquaintances. Future research should determine the relationship between the diverter and recipient. Diverters should also be questioned about the reasons they had for diverting their prescription. A diverter who gives away their prescription to a friend because they think their friend has a health condition and will benefit from the prescription may be systematically different from a diverter who

sells their prescription to an acquaintance knowing that the acquaintance will use the medication for recreational purposes. Future research should also differentiate between diverters who share prescriptions and diverters who sell them. It may be that these individuals are prompted to act by different motivations, and may have inherently different habits or personality characteristics.

Research should also examine diversion of specific types of substances. It is possible that individuals divert different types of substances for different reasons, or in different ways. For example, it may be that individuals typically share prescription stimulants but typically sell prescription analgesics. Studies in the future can determine whether different characteristics predict different types of diversion.

Future research should also investigate the impact that age of diagnosis or age the prescription was received has on the likelihood of diversion. The process of selective diversion should be more closely investigated in order to determine why certain medications are diverted when others are not (i.e. is it because there is no market for those other medications or because those taking multiple types of prescription medications really need certain prescription medications but have less of a need for others).

Chapter 8: Conclusion

Despite the limitations, the study has made 3 main contributions to the field of criminal justice. First, the study has identified the types of medication most commonly diverted in a college student sample, enabling university and Criminal Justice officials to target resources toward the most commonly diverted substances. Second, the study identifies characteristics of people most likely to divert (such as a history of prior deviance) that will allow health care providers and criminal justice officials to know which students have a greater likelihood of diversion. Finally, the study highlights the role of perceptions of social norms and harms in diversion behavior, providing criminal justice officials with ideas about attitudes that can be targeted during prevention initiatives.

The implications of these findings are broad, spanning fields of criminal justice, public health, and education. First, this study demonstrates that many college students engage in diversion. This finding may imply that administrators need to address issues of prescription diversion during freshman orientation, or need to include policies relating to diversion in the student handbook. In addition, campus health care facilities may want to hand out a pamphlet on the dangers of diversion when a doctor prescribes a medication, in order to increase perceptions of harm, which this study shows to reduce diversion. Compton and Volkow (2006) also point out that doses of prescription drugs taken for therapeutic purposes are typically lower than doses of prescriptions taken when they are abused, consequently, campus doctors may also want to reduce the amount of medication that is prescribed at one time, and mandate follow-up visits before a new prescription is issued. Given the effect having an ADHD medication had on prescription diversion,

prevention initiatives may especially want to target individuals with ADHD. The study also found a link between minor deviance and diversion, indicating that those who engage in deviant behavior or illicit drug use are more likely to divert a medication. Based on this finding, university administrators and campus police should focus diversion prevention and control initiatives on students with disciplinary problems.

Many of the implications for college campuses can also be generalized to the population. Given that doses of prescription drugs taken for therapeutic purposes are typically lower than doses of prescriptions taken when they are abused new governmental policies may want to target prescribing practices. Mandating that physicians prescribe fewer pills at a time and require follow-up visits before another prescription is issued would result in closer supervision of patients at risk for diversion. However, such an approach may face challenges from doctors who claim that any sort of increase of the controls on prescription medication holds a substantial risk of reducing the availability of prescription to patients who need them (Goldman 1998). In addition, mandating that prescribing doctors take a thorough patient history before prescribing a medication would identify potential risk factors for diversion, such as illicit drug use, in the patient prior to the prescription being written. Citing data from the National Center for Addiction and Substance Abuse (CASA), which found that 43.3% of doctors in the US do not ask patients about prescription substance abuse when they are taking medical histories and only 39.1% of doctors had training in recognizing prescription drug abuse or addiction, Markel (2005) highlights how these types of prescribing practices can facilitate diversion. Factors that show up in a patient history could be taken into account in decisions of what to prescribe, when to prescribe it, and how much to prescribe at a time.

In addition, doctors, pharmacists, and others should inform prescription takers of the dangers of taking someone else's prescription medication. The current study demonstrates that at least in some cases, perceiving that great harm can result from taking someone else's medication reduces the likelihood of diversion. This has important implications for the field of prevention, in that creating a prevention campaign aimed at raising awareness of the dangers associated with using prescription drugs non-medically would presumably raise the number of people who perceive great harm resulting from diversion, and consequently, would reduce the number of people who divert.

Also, based on the relationship between prior deviance and diversion, it is likely that among both juveniles and adults in correctional settings, diversion is a significant problem. Similar to the way university officials need to be especially vigilant of the habits of students with behavioral problems with respect to diversion, both corrections officers and probation officers dealing with individuals with medical problems or individuals in any court-ordered drug therapy need to be especially vigilant in detecting diversion among their charges, who are at high risk for engaging in this type of behavior. This may include policies such as not allowing inmates or delinquents to dispense their own medication, and drug testing, both of the individual being supervised to make sure prescribed medications maintain therapeutic levels in their systems, and of other inmates or juveniles in a residential facility to make sure they are not the recipients of a diverted substance.

In conclusion, despite the widespread policy implications of this study in the fields of Criminal Justice and Public Health, some questions remain unanswered. While this use of the College Life Study dataset fills a significant gap in the criminal justice

literature relating to prescription drug diversion in college, future research needs to examine diversion among other populations, and should more thoroughly look into predictors of diversion in a longitudinal model in order to better understand how diversion can be prevented. Investigating these complex issues will benefit not only these diverse academic fields, but also the countless individuals in the government, public health, and criminal justice fields who remain ignorant of this silent, growing, and dangerous new world of drug crime.

Appendix 1: Scale Items

Sensation Seeking Scale ($\alpha=.740$)

- True or False: I am an impulsive person
- True or False: I enjoy getting into new situations where you can't predict how things will turn out
- True or False: I prefer friends who are exciting and unpredictable
- True or False: I often get so carried away by new and exciting things that I don't think of possible consequences
- True or False: I like "wild" and uninhibited parties
- True or False: I would like to live a life on the move, with lots of change and excitement
- True or False: I often do things on impulse

Conduct Problem Behavior Scale ($\alpha=.667$)

- Before you turned 18, how many times did you take property belonging to others?
- Before you turned 18, how many times did you bully, threaten, or tried to intimidate another person?
- Before you turned 18, how many times did you damage property on purpose?
- Before you turned 18, how many times did you shoplift?
- Before you turned 18, how many times did you forge someone's signature?
- Before you turned 18, how many times did you lie to get something or to avoid responsibility?
- Before you turned 18, how many times did you hurt others physically?
- Before you turned 18, how many times did you start fights with other people?
- Before you turned 18, how many times did you cause physical harm to an animal?
- Before you turned 18, how many times did you often stay out at night without parental permission before you were 13 years old?
- Before you turned 18, how many times did you break rules?
- Before you turned 18, how many times did you skip school before age 13?
- Before you turned 18, how many times did you run away from home (overnight) at least twice while living at home or once twice without returning for a lengthy period?
- Before you turned 18, how many times did you steal something from someone?
- Before you turned 18, how many times did you use a weapon in a fight?
- Before you turned 18, how many times did you force someone into sexual activity?
- Before you turned 18, how many times did you break into someone else's house, building, or car?

Before you turned 18, how many times did you set fires on purpose?

College Deviance Composite Score (Note: two years worth of data were combined for this score)

How many times did the following things happen to you during the past 12 months?

- ... You got into trouble for a housing violation due to alcohol use?
- ... You got into trouble for a housing violation due to other drug use?
- ... You received a citation for alcohol use?
- ... You were arrested?
- ... You drove while drunk on alcohol?
- ... You drove while high on other drugs?

Illicit Drug Use Scale ($\alpha=.675$)

- In the past 12 months, on how many days have you used any type of marijuana?
- In the past 12 months, on how many days have you used inhalants?
- In the past 12 months, on how many days have you used cocaine?
- In the past 12 months, on how many days have you used hallucinogens?
- In the past 12 months, on how many days have you used heroin?
- In the past 12 months, on how many days have you used amphetamines?
- In the past 12 months, on how many days have you used methamphetamine?
- In the past 12 months, on how many days have you used ecstasy?
- In the past 12 months, on how many days have you used prescription stimulants non-medically?
- In the past 12 months, on how many days have you used prescription analgesics non-medically?
- In the past 12 months, on how many days have you used prescription tranquilizers non-medically?

Index of Peer Relations ($\alpha=.958$)

- I get along well with my peers.
- My peers act like they don't care about me.
- My peers treat me badly.
- My peers really seem to respect me.
- I don't feel like I am "part of the group."

My peers are a bunch of snobs.
My peers understand me.
My peers don't seem to like me very much.
I really feel "left out" of my peer group.
I hate my present peer group.
My peers seem to like having me around.
I really like my present peer group.
I really feel like I am disliked by my peers.
I wish I had a different peer group.
My peers are very nice to me.
My peers seem to look up to me.
My peers think I am important to them.
My peers are a real source of pleasure to me.
My peers don't seem to even notice me.
I wish I were not part of this peer group.
My peers regard my ideas and opinions very highly.
I feel like I am an important member of my peer group.
I can't stand to be around my peer group.
My peers seem to look down on me.
My peers really do not interest me.

Extracurricular Involvement Composite Score

How regularly do you participate in volunteer work during a typical week in the current academic year?
How regularly do you participate in religious/church groups during a typical week in the current academic year?
How regularly do you participate in athletics during a typical week in the current academic year?
How regularly do you participate in exercise during a typical week in the current academic year?
How regularly do you participate in any other activity during a typical week during the current academic year?

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