

ABSTRACT

Title of Dissertation: A PRESCRIPTION FOR TROUBLE:
PRESCRIPTION DRUG DIVERSION AS THE
NEW TREND IN DRUG CRIME

Laura Garnier Dykstra, Doctor of Philosophy, 2013

Directed By: Professor Brian D. Johnson, Department of
Criminology and Criminal Justice, University of
Maryland

Nonmedical use of prescription drugs is rising in the United States (Substance Abuse and Mental Health Services Administration, 2001; Substance Abuse and Mental Health Services Administration, 2011). Diversion of these substances represents a growing problem for law enforcement and public health officials (Cai, R., Crane, E., Poneleit, K., & Paulozzi, L., 2010; U.S. Department of Justice, 2009). This study documents the extent of prescription drug diversion among an understudied population -- individuals with legitimate prescriptions -- and uses Social Learning Theory and Rational Choice Theory to examine risk factors relating to diversion. *Participants:* Participants in this study were 502 young adults who had been prescribed a medication in waves 5 through 7 of the College Life Study. The College Life Study is a prospective longitudinal study of a single cohort of young adults that were sampled from a large, public university in 2004. *Methods:* Diversion behavior was described in detail and differences between diverters and non-diverters were examined. Regression analyses examined the effects of theoretically driven peer and rational choice effects on the likelihood of diversion. Opportunity and perceptions were examined as potential mediators. *Results:* Individuals with legitimate prescriptions divert a substantial amount of medication. Reasons for refusing to divert, opportunities for diversion, and beliefs about diversion differ between

diverters and non-diverters. Regression analyses revealed both peer effects and exposure to information regarding prescription drugs predict diversion. Opportunity mediated the relationship between perceptions of peer diversion and likelihood of diversion.

Conclusions: Support for both social learning and rational choice approaches to diversion was found. Additional research is warranted to continue to explore risk and protective factors relating to diversion. Implications for the field are discussed.

A PRESCRIPTION FOR TROUBLE: PRESCRIPTION DRUG DIVERSION AS THE
NEW TREND IN DRUG CRIME

By

Laura Garnier Dykstra

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2013

Advisory Committee:
Dr. Brian Johnson, Chair
Dr. Amelia Arria
Dr. Denise Gottfredson
Dr. Kevin O'Grady
Dr. Raymond Paternoster

©Copyright by
Laura Garnier Dykstra
2013

Dedication

For my family, without whose love and support this would not have been possible.

Acknowledgements

I must thank my advisor, Dr. Brian Johnson for all of his support and feedback throughout this process and for how quickly he turned things around to me. Brian, you are a rockstar! I would also like to thank my dissertation committee, Dr. Amelia Arria, Dr. Denise Gottfredson, Dr. Kevin O’Grady, and Dr. Raymond Paternoster. Their attention and feedback on early versions of this work helped make it what it is. A special thank you also goes out to the entire committee for their flexibility in scheduling the dissertation defense. With two weeks to spare before the expected birth of my daughter, we just snuck it in under the wire. I would also like to thank the faculty and staff of the Department of Criminology and Criminal Justice at the University of Maryland, for helping me to obtain the permissions needed and complete the paperwork necessary to complete this before my “deadline.” Lastly, I would like to thank my husband, Peter, for believing in me, encouraging me, and generally making this all possible.

Table of Contents

List of Figures	vi
List of Tables	vii
Chapter 1: Introduction	1
Chapter 2: Literature Review	11
Brief History of U.S. Drug Control Efforts	11
The Relationship between Drugs and Crime	13
Brief History of Drug Control Efforts for Prescription Drugs	15
Diversion of Prescription Drugs	16
Correlates of Diversion	20
Costs of Prescription Drug Diversion	22
Limitations of Recent Initiatives to Combat Prescription Drug Diversion	24
Summary	29
Chapter 3: Theoretical Framework	30
Research Evidence for Social Learning Theory	31
Research Evidence for Rational Choice Theory	33
Application of Theoretical Understanding to Prescription Drug Diversion	37
Summary	44
Chapter 4: Methodology	46
Study Design	46
Participants	47
Measures	48
Analytic Plan	62
Summary	70
Chapter 5: Diversion	72
Describing Diversion	72
Description of Statistics Regarding Refusal to Divert	79
Comparing Diverters to Non-Diverters	80
Summary	83
Chapter 6: Main Effects	85
Bivariate Differences	85
Main Effects of Risk Factors on Diversion	87
Moderation Effects of Impulsivity	92
Additional Models to Examine Main Effects	94
Summary	97
Chapter 7: Mediation Analyses	99
Opportunity	100

Perception	104
Final Model	110
Summary	112
Chapter 8: Discussion	114
Conclusions	115
Limitations	124
Implications	126
Directions for Future Research	128
Summary	131
References	134

List of Figures

Figure 4.1: Main effects of independent variables on diversion	65
Figure 4.2: Mediation effects of opportunity on the relationship between hypothesized peer variables and diversion	68
Figure 4.3: Mediation effects of perceptions on the relationship between hypothesized rational choice variables and diversion	69
Figure 7.1: Illustration of the proposed mediating effect of opportunity on the relationship between perceived peer nonmedical use and young adult diversion	101
Figure 7.2: Illustration of the proposed mediating effect of opportunity on the relationship between perceived peer diversion and young adult diversion	101
Figure 7.3: Illustration of the proposed mediating effect of perceived legal risk on the relationship between positive messages heard and young adult diversion	105
Figure 7.4: Illustration of the proposed mediating effect of perceived legal risk on the relationship between negative messages heard and young adult diversion	105
Figure 7.5: Illustration of the proposed mediating effect of perceived harm on the relationship between positive messages heard and young adult diversion	108
Figure 7.6: Illustration of the proposed mediating effect of perceived harm on the relationship between negative messages heard and young adult diversion	108

List of Tables

Table 2.1: Number of prescriptions filled and percent change over time by prescription drug class	28
Table 4.1: College Life Study measures used by study wave	49
Table 5.1: Diversion by drug type among diverters ($n=119$)	73
Table 5.2: Descriptive statistics of diversion among 119 young adult diverters	75
Table 5.3: Relationship between diverters and recipients of diverted medication ($n=119$)	77
Table 5.4: Percent of young adult diverters endorsing reasons for diverting their prescription drugs ($n=119$)	77
Table 5.5: Reasons given for not diverting by individuals who declined to divert ($n=95$)	79
Table 5.6: Descriptive statistics of opportunity and diversion perceptions for individuals who did and did not divert in waves 5 through 7	82
Table 6.1: Sample characteristics of 483 individuals prescribed at least one drug in waves 5 through 7 by diversion status	86
Table 6.2: Logistic regression analyses examining the main effects of perceived peer behavior and positive and negative messages on young adult diversion	90
Table 6.3: Logistic regression analysis examining the moderating effect of impulsivity on the relationship between perceived peer diversion and young adult diversion	93
Table 6.4: Predicted probabilities of diversion based on levels of impulsivity and perceived peer diversion	94
Table 6.4: Logistic regression analyses examining the main effects of perceived peer behavior and positive and negative messages on diversion occurring in waves 6 or 7	96
Table 7.1: Regression analyses examining the mediating effects of opportunity on young adult diversion ($n=329$)	103
Table 7.2: Regression analyses examining the mediating effects of perceived legal risk on young adult diversion ($n=445$)	106

Table 7.3: Regression analyses examining the mediating effects of perceived harm on young adult diversion ($n=444$)	109
Table 7.4: Logistic regression analyses examining the effects of all independent and mediating variables on diversion ($n=310$)	111
Table 8.1: Summary of study predictors and diversion	117

Chapter 1: Introduction

Drug use and drug-related crime are not a new phenomenon in the United States. Recent studies have identified the United States as the leader in illicit drug use prevalence (Degenhardt et al., 2008). Given the high prevalence of both drug use and drug-related crime (U.S. Department of Justice, 2011), it is important to stay on top of emerging trends in this area in order to better and more effectively address the impacts of drug use on the nation. To this end, this study examines a recent and growing trend in drug use toward nonmedical use of prescription drugs and attempts to describe this practice, identify risk factors, and make recommendations for future research and prevention.

The high prevalence of drug use and drug trafficking in the United States has wreaked serious economic costs on the country (estimated at almost \$200 billion annually), and has resulted in an overburdened criminal justice system, strained healthcare resources, and lost productivity, among other consequences (U.S. Department of Justice, 2011). Currently in the United States, drug law violations constitute the most common arrest category (U.S. Department of Justice, 2010). In 2008, the most recent year for which full data are available, approximately 12.2% of arrests nationwide were for drug violations (U.S. Department of Justice, 2010). This percentage has risen substantially over the past several decades, where 20 years prior, drug violations comprised only 7.4% of arrests (U.S. Department of Justice, 2010). Drug offenders represent 20% of the states' incarcerated population and 53% of federal prisoners, as well as 27% of probationers and 37% of parolees (U.S. Department of Justice, 2010). The significant amount of criminal justice resources devoted to dealing with drug-related

crime make combating drug abuse and drug trafficking an issue of substantial interest to the criminal justice system.

Additionally, drug abuse (including both illicit drug use and overuse of prescription drugs) is associated with substantial healthcare costs including treatment for addiction, emergency department visits resulting from overdose, mortality, contraction of illnesses resulting from drug delivery methods or from a compromised immune system, and prolonged hospital stays, to name a few (Substance Abuse and Mental Health Services Administration, 2010a; U.S. Department of Justice, 2010). The recent federal initiatives focusing on healthcare and health-related expenditures make this the perfect time to re-focus the war on drugs to incorporate elements of not only enforcement, but also prevention, in order to decrease costs to all agencies. Illnesses, incarceration for drug-related crimes, and absenteeism from the workforce due to drug use and dependence all decrease national productivity (U.S. Department of Justice, 2011), a key governmental concern with regard to global competition. In a globally competitive market, the large expenditure of public financial resources in the areas of health care or criminal justice due to the high prevalence of drug use and drug trafficking represent resources that could otherwise be spent in other areas, and the lost productivity resulting from the high prevalence of drug use in the United States essentially handicaps the country in a global context.

Given the concerns about high costs, crime, and lost productivity, the criminal justice system has attempted to deal with drug use on several fronts. Drug use and crime are associated with one another in three main ways. First, for many types of drug use, simple possession and distribution of the drug in question is illegal. Thus, by definition,

having the drug to use is criminal. Enforcement of drug possession and distribution laws remains a substantial priority and has resulted in large increases in the prison population. As of 2008, almost three hundred and fifty thousand individuals were incarcerated with drug-related charges as their most serious offense (West, Sabol, & Greenman, 2010).

Second, drug use and crime share many common risk factors, such as association with delinquent peers, leading them to co-occur in many individuals, especially during adolescence and young adulthood. Research suggests that the drug-crime relationship is strong and non-recursive (McBride & McCoy, 1993). Evidence of the co-occurrence of drug use and crime can be found in the high prevalence of drug use among arrestees (Taylor, Fitzgerald, Hunt, Reardon, & Brownstein, 2001). Prior research has long demonstrated that among both adults and juveniles, drug use is associated with criminal involvement (Hser, Hoffman, Grella, & Anglin, 2001; Wish & Johnson, 1986), and that reducing drug use is associated with a reduction in crime (Hser et al., 2001; Jofre-Bonet & Sindelar, 2002). Drug use can also lead to instrumental crime and violence as drug users seek money to purchase drugs to feed their addiction and dealers battle for territory on which to sell their product. Prior research has shown that drug offenders, especially heavy drug users, account for a large portion of crime (Kleiman, 2001). Drug use and the drug market have been linked to a broad array of criminal activity including homicide, property crime, and assault (French et al., 2004; Ousey & Lee, 2002). More problematic is the fact that economic costs of processing through the criminal justice system, productivity loss as a result of a criminal career, and community costs are higher for drug-using offenders than for non-drug using offenders (French, McCollister, Alexandre, Chitwood, & McCoy, 2004).

Finally, drug users are not only more likely to be offenders, but are also more likely to be victims of crime (French et al., 2004). Additionally, drug users have higher economic costs associated with victimization relating to medical care, lost wages, reduced productivity, property damage, and personal loss of life (French et al., 2004), compared to non-users.

Despite the existing emphasis on drug use and drug crime, simple enforcement of existing laws has failed to curtail the rising prevalence of drug abuse and drug-related crime. The high volume of drug-related incarcerations has sparked renewed interest in methods that would be more effective in combating drug use (Boyum & Reuter, 2005), especially given the economic costs of incarceration. Recent advances in dealing with drug-related crime, such as the use of drug courts (Gottfredson & Exum, 2002; Gottfredson, Najaka, & Kearley, 2003; Peters & Murrin, 2000), and programs like Breaking the Cycle (Harrell, Mitchell, Hirst, Marlowe, & Merrill, 2002), which are designed to disrupt the non-recursive cycle between drug use and crime, reflect an evolving focus beyond simple enforcement of drug laws and toward prevention of drug-related crime. These evolving tactics require that the criminal justice field remain abreast of recent developments in drug-related crimes and continue to engage in research in order to target prevention efforts and inform practices.

One of the first steps in combating any problem, including drug use, is to recognize and respond to emerging trends. Within the field of drug-related crime, one of the emerging trends that is garnering increased recognition is the growing trend toward nonmedical use and diversion of prescription drugs. Prescription drug diversion refers to the movement of prescription drugs out of licit channels and onto the illicit market for the

purpose of nonmedical use (use without a prescription or use in a way that is inconsistent with prescribed recommendations). In 2010, National Institute of Drug Abuse (NIDA) Director Nora Volkow, M.D. was invited to testify before the Congressional Caucus on Prescription Drug Abuse about the prescription drug problem in the United States. She identified prescription drug abuse as a growing problem in the United States due to several factors, including the increased availability of prescription drugs (Volkow, 2010).

Nonmedical use (or abuse) of prescription drugs has become a substantial problem in the United States (Volkow, 2010). While use of illicit drugs such as inhalants, hallucinogens, cocaine and methamphetamine are decreasing, nonmedical use of prescription drugs is increasing (Johnston, O'Malley, Bachman, & Schulenberg, 2009). Over the past decade, past-year prevalence of nonmedical prescription drug use rose from 3.9% in 2000 to 6.3% in 2010 (Substance Abuse and Mental Health Services Administration, 2001; Substance Abuse and Mental Health Services Administration, 2011). Studies show that prescription drugs are quickly replacing street drugs among users, because the perception is that these drugs are safer and produce a more reliable high than illicit drugs (Friedman, 2006; Inciardi & Cicero, 2009). National data indicate that prescription pain relievers are one of the most commonly abused drugs in the United States, with almost 15 million individuals using prescription medications nonmedically annually (Substance Abuse and Mental Health Services Administration, 2012). Additionally, among young adults, nonmedical use of prescription stimulants is second only to marijuana use with regard to prevalence (Arria et al., 2008a).

A great deal is known of the consequences of nonmedical prescription drug use. First, using prescription drugs nonmedically can be deceptively dangerous. Prescription

drugs are controlled substances that may have high abuse or dependence potentials and significant health risks if used improperly (Drug Enforcement Administration, 2005a). Recent research suggests that emergency department visits and overdose deaths attributed to prescription drug use, especially analgesic use, are increasing (Cai, Crane, Poneleit, & Paulozzi, 2010; Warner, Chen, & Makuc, 2009). Additionally, prescription drug diversion is associated with substantial economic costs. The 2009 National Prescription Drug Threat Assessment reports that the Coalition Against Insurance Fraud estimates that prescription medication diversion costs insurance companies up to \$72.5 billion annually; this cost is largely passed on to consumers through higher premiums (U.S. Department of Justice, 2009). Finally, nonmedical use of prescription drugs has been associated with both delinquency (Volkow, 2010), and other drug use (McCabe, Cranford, Boyd, & Teter, 2007; Volkow, 2010), and the 2009 National Prescription Drug Threat Assessment stated “law enforcement agencies are increasingly associating [controlled prescription drug] diversion and abuse with violent and property crime nationwide” (U.S. Department of Justice, 2009) suggesting that the linkage between drug use and crime holds true for nonmedical prescription drug use as well.

As a result of the rising prevalence of nonmedical use of prescription drugs and the serious consequences associated with such use, prescription drug diversion has become a problem of substantial interest to the criminal justice field. Recent research suggests that the United States leads the world in counterfeiting, theft, and diversion of prescription medications (Appleby, 2005). From a criminal justice perspective there are two main ways to deal with drug-related crime: demand reduction and supply reduction. With respect to prescription drug use, recent research has focused largely on demand

reduction. Recent studies have identified characteristics of people who engage in nonmedical use of prescription drugs (Arria, O'Grady, Caldeira, Vincent, & Wish, 2008c; DuPont, Coleman, Bucher, & Wilford, 2008; Hall, Irwin, Bowman, Frankenberger, & Jewett, 2005; Teter, McCabe, LaGrange, Cranford, & Boyd, 2006), reasons why prescription drugs are used nonmedically (Barrett, Darredeau, Bordy, & Pihl, 2005; Carroll, McLaughlin, & Blake, 2006; DeSantis, Noar, & Webb, 2010; DuPont et al., 2008; Teter et al., 2006), and what environmental factors increase the likelihood of nonmedical use (Arria et al., 2008c; McCabe, Knight, Teter, & Wechsler, 2005).

Many demand-reduction recommendations have been made regarding nonmedical use of prescription drugs; however, little research has examined the supply of these drugs onto the illicit market. This dearth of information is in sharp contrast to the amount of time and resources spent on tracking the supply of illicit drugs. Little is known about where prescription drugs on the illicit market come from and who is supplying them (U.S. Department of Justice, 2009), and basically nothing is known about what types of programs or messaging might be effective in curtailing the supply. Existing programs, including drug scheduling (Drug Enforcement Administration, 2005a) and prescription drug monitoring programs (U.S. Department of Justice, 2009) focus on the macro scale. However, what limited research there is shows that a large portion of diverted medication comes from individuals with legitimate prescriptions (Chandra & Ozturk, 2004; Joranson & Gilson, 2005; Monte, Mandell, Wilford, Tennyson, & Boyer, 2009). Given this information, the next step in combating the prescription drug problem is to identify factors that influence the likelihood of prescription drug diversion by individuals, so that

prevention and intervention initiatives can be designed. Unfortunately, very little is known about prescription drug diverters, seriously complicating prevention efforts.

To date, identified correlates of being a prescription diverter include gender (Boyd, McCabe, Cranford, & Young, 2007; Daniel, Honein, & Moore, 2003), nonmedical use of prescription medication (Garnier et al., 2010), substance use disorder (Wilens, Gignac, Swezey, Monutaux, & Biederman, 2006), and conduct disorder (Garnier et al., 2010; Wilens et al., 2006). However, little research has examined malleable factors that may influence an individual's decision of whether or not to engage in diversion. The purpose of the current study is to shed light on the process of prescription medication diversion at the individual level in order to better inform prevention efforts. The study examines diversion behavior and predictors of diversion among a prospective, longitudinal sample of young adults. The aims of the study are to:

- 1) Describe the practices of diversion, including route of diversion, recipients of diverted medication and amount of medication diverted
- 2) Explore diversion-related decision-making, including reasons that diverters give for diverting their medications and reasons individuals refuse to divert
- 3) Identify malleable risk factors associated with diversion using a theoretical framework
- 4) Examine whether identified risk factors operate similarly for all participants, regardless of individual differences
- 5) Evaluate whether risk factors are mediated by situational or individual factors such as opportunity and attitudes/beliefs about diversion

These aims fill several gaps in the literature on prescription drug diversion. First, very little is known about diversion practices. Most studies regarding diversion are limited in that they examine only whether or not diversion occurs. Few studies have attempted to identify within what kinds of friendship/kinship networks diversion occurs or examined the quantity of diverted medication. This study provides a much broader and more comprehensive description of diversion practices than has been provided elsewhere.

Second, this study is the first of its kind to describe reasons for diverting a prescription drug. Although reasons for nonmedical use have been documented, the reasoning behind the decision of whether or not to divert has never been explored. This information has the potential to be extremely useful because knowing the thought process behind diversion behavior allows governmental entities or other prevention agencies to engage in programs designed to change these thought processes. For example, if an individual were diverting a medication because they felt it was helpful to the recipient to do so (so the recipient would not have to waste time or money going to the doctor), highlighting the potential hazards of taking prescription medication without being examined by a doctor could be an effective potential deterrent.

Third, the study is one of the few to examine correlates of prescription medication diversion, and is the first to use a theoretical approach to identify risk factors. Identification of risk factors related to diversion will allow prevention and intervention efforts to begin at an earlier stage for those most at-risk for diversion.

Fourth, this study will be the first to consider possible moderating and mediating influences. It is possible that individual characteristics may interact with observed risk

factors, such that some individuals are more easily influenced by risk factors than others. Additionally, it seems likely that certain risk factors would have a direct effect on diversion, while others may operate indirectly by changing attitudes regarding diversion or affecting the likelihood of having the opportunity to divert. Identifying these pathways has important implications for prevention.

This study tackles the issue of prescription drug diversion by reviewing the existing literature surrounding drug use, drug-related crime, and prescription drug diversion, introducing a theoretical rationale for examining risk factors for prescription drug diversion, engaging a methodology and analytic framework for examining the relationships between proposed risk/protective factors and prescription drug diversion, and finally, discussing potential limitations and contributions of the research.

Chapter 2: Literature Review

Dating back to the 1800s, the United States has engaged in efforts to combat drug use. However, the past fifty years have seen dramatic increases in both drug use and drug control efforts. These increases have been accompanied by a body of research examining the correlates of drug use and drug-related crime. However, extremely little scholarly research has examined the emerging trend of prescription drug diversion, specifically. Below is a discussion of the history of drug control efforts, the establishment of a relationship between drugs and crime, and what is currently known about prescription drugs. Ultimately, prescription drug diversion is an emerging problem in the world of drug crime, and much about this topic remains unknown.

Brief History of U.S. Drug Control Efforts

Drug use and distribution have always been important topics in criminal justice. As far back as the 1870s and 1880s, the United States was attempting to limit drug abuse in this country by prohibiting opium shipments to the United States from China. The passage of the Harrison Narcotics Tax Act of 1914 essentially prohibited the distribution of drugs such as heroin and cocaine within the United States. In 1922, the Narcotic Drugs Import and Export Act was established in order to oversee the import and export of opiates. A later bill, in 1924 prohibited the manufacture of heroin in the United States. By 1930, the Federal Bureau of Narcotics had been formed to enforce the Harrison Act and the Narcotic Drugs Import and Export Act. The passage of the Marijuana Tax Act in 1937 imposed taxes on the growth, distribution, sale and purchase of marijuana, essentially making it more expensive to legally engage in marijuana sale or production.

This act was passed in an effort to curtail what Federal Bureau of Narcotics Director Henry Anslinger believed to be an increase in marijuana usage.

Rising drug use among young people in the United States in the 1960s prompted future-President Richard Nixon to run, in 1968, on a platform that included combating drug use as a way to combat crime (Baum, 2004). The Controlled Substances Act was passed in 1970. As part of this act, substances were placed into 5 schedules according to the relative abuse and dependence potential and accepted medical uses (Sapienza, 2006). The act criminalized the possession, usage, purchase, sale and cultivation of all Schedule I drugs, including marijuana, heroin, and many hallucinogens.

To summarize the scheduling system, which was laid out in the Controlled Substances Act, Schedule I substances have a high potential for abuse and have no accepted medical use in the United States. This includes many illicit drugs such as lysergic acid diethylamide (LSD), mescaline, and psilocybin (Drug Enforcement Administration, 2005b). Schedules II through IV are available by prescription. Although they have accepted medical uses, they also have the potential for abuse and dependence. Schedule II medications have a high abuse potential, where abuse may lead to severe psychological or physical dependence (Drug Enforcement Administration, 2005b). Examples of Schedule II medications include oxycodone and many amphetamine salts, such as those found in Adderall®. Schedule III medications have abuse potential (albeit lower than earlier schedules), and a moderate risk of dependence. Seconal® and Ritalin® are common Schedule III medications. Schedule IV drugs have a relatively low abuse potential and may lead to limited physical or psychological dependence. Some of the most recognizable Schedule IV medications include benzodiazepines such as

Clonazepam (the active ingredient in Klonopin) and Diazepam (Valium®). Finally, Schedule V medications have low abuse and dependence potential (Robitussin® for example). In order to qualify as a Schedule II-V medication, the drug must have a currently accepted medical use in the United States (Drug Enforcement Administration, 2005b).

By 1972, President Nixon had launched an all-out “War on Drugs” (Baum, 2004), and in 1973, he created the Drug Enforcement Agency (DEA) and charged it with enforcing the Controlled Substances Act. Shortly thereafter, the Rockefeller drug laws were passed in New York, introducing a mandatory minimum sentence of 15 years for possession of more than four ounces of any “hard drug”.

The trend toward harsh penalties for drug possession continued, as concerns about the relationship between drug use and crime grew. In 1986, Federal Sentencing Guidelines included a 5 year minimum sentence for possession of five grams of crack cocaine (or for trafficking 500 grams of powder cocaine). Recent research suggests that as of 2008, there were approximately three hundred and fifty thousand people incarcerated on drug-related charges (West et al., 2010). Currently, over half of federal prisoners and one fifth of state prisoners are drug offenders (U.S. Department of Justice, 2010).

The Relationship between Drugs and Crime

Given the long history of attempts by the government to criminalize the possession and distribution of certain substances, the body of literature linking drug use and crime is hardly surprising. Research suggests that at the individual level, the drug-crime relationship is strong among both juveniles and adults (Hser et al., 2001; Wish &

Johnson, 1986), and that the relationship is bi-directional, with drug use leading to criminal behavior, and criminals being more likely to initiate drug use (McBride & McCoy, 1993). Rates of drug use among arrestees are high (Taylor et al., 2001). Drug users (and especially heavy drug users) account for a disproportionately large portion of crimes committed (Kleiman, 2001), and drug use is associated with a wide variety of criminal activity including violent crime and property crime (French et al., 2004; Ousey & Lee, 2002). Research has also linked drug distribution to other forms of crime. Denton and O'Malley (2001), for example, show that drug dealers are likely to engage in other forms of deviance beyond drug distribution, such as property crimes. Several studies have found that the majority of drug dealers are not significantly different from drug users to whom they sell their product, and, in fact, are often users of the drugs they sell (Denton & O'Malley, 2001; Hunt, 1990). Reductions in drug use prevalence have been linked to reductions in crime (Hser et al., 2001; Jofre-Bonet & Sindelar, 2002).

Given the strong incentive to control illicit drugs as a means of keeping crime under control, it is of interest to the criminal justice system to keep abreast of emerging trends with regard to drugs and drug-related crime. One emerging trend, with a great deal of evidence to support it, is the rising prevalence of nonmedical use of prescription drugs (Substance Abuse and Mental Health Services Administration, 2001; Substance Abuse and Mental Health Services Administration, 2011). Prescription drugs have been closely controlled and monitored in the United States for over 40 years; however, an examination of their history demonstrates that the potential for abuse has long been recognized.

Brief History of Drug Control Efforts for Prescription Drugs

Investigation (in a limited fashion) into the problem of nonmedical use and diversion of prescription drugs began in the late 1960s and early 1970s (Inciardi & Cicero, 2009), when illicit drug use and drug-related crime was rising rapidly. It was pioneered by Carl Chambers, a Director of Research at the New York State Narcotic Control Commission. According to Inciardi and Cicero (2009), Chambers' early work focused on substances such as opioid analgesics, amphetamines, and barbiturates. Specifically, among other studies, Chambers documented early cases of diversion where participants in methadone maintenance clinics enrolled in multiple programs and sold extra medication on the street (Chambers, Taylor, & Moffet, 1972; Chambers & Brill, 1973).

The first efforts to control the rise in prescription drug abuse and the perceived liberty with which physicians were prescribing medications resulted in the passage of the Comprehensive Drug Abuse Prevention and Control Act of 1970. This act combined several existing laws regarding prescription drugs, and established a single system of controls for all substances deemed to have potential for abuse (Sapienza, 2006). Within this act, Title II (called the Controlled Substances Act) outlines the controls implemented on both illicit and prescription drugs (Sapienza, 2006). There are currently seven control mechanisms: drug scheduling, registration of handlers, import/export permits and declarations, prescription monitoring and tracking, security, and investigations and penalties. The purposes of the Controlled Substances Act were twofold: first, to maintain an uninterrupted supply of controlled substances, sufficient to meet the

country's health needs, and second, to reduce prevalence of prescription drug nonmedical use and diversion (Sapienza, 2006).

Following the passage of this Act, attention toward prescription drugs began to wane, especially in the 1980s, as the cocaine epidemic focused both research and resources back on hard drugs. However, the issue arose again in the 1990s. Initial studies by pharmaceutical companies in the 1990s documented low prevalence of nonmedical use and diversion (Cicero et al., 1999; Inciardi et al., 2006a). However, national studies, including the National Survey of Drug Use and Health suggest that nonmedical use of prescription drugs has risen over the past several decades. In 1990, approximately 11.3% of individuals over age 12 had used a prescription drug nonmedically in their lifetime, and 3.4% had used in the past year (Substance Abuse and Mental Health Services Administration, 1995). By 2000, lifetime prevalence rates of nonmedical use had increased to 14.5%, and past-year prevalence to 3.9% (Substance Abuse and Mental Health Services Administration, 2002). The most recent national data suggest that prevalence rates for lifetime nonmedical use are now almost 20%, and for past-year use approach 6% (Substance Abuse and Mental Health Services Administration, 2012).

Diversion of Prescription Drugs

Currently, prescription drugs are considered by many to be a new, safer alternative to street drugs that are able to give predictable highs similar to that of illicit drugs (Friedman, 2006). Nonmedical use of prescription drugs is second only to marijuana in terms of prevalence of use (Substance Abuse and Mental Health Services Administration, 2010b), and the growing movement of medical marijuana legalization may soon place marijuana in a similar category to prescription drugs in many states.

The high (and rising) prevalence of nonmedical prescription drug use makes curtailing the supply of these drugs a key factor in combating drug-related crime. Early research on the problem focused on medical professionals as the source for prescription drugs being used nonmedically (Inciardi, Surratt, Kurtz, & Burke, 2006b). Studies of street- and club- based drug using populations have also identified physicians as a source of diverted medication (Inciardi, Surratt, Kurtz, & Cicero, 2007); however these same studies demonstrate that in addition to deliberately diverting medication, sometimes physicians are unwittingly contributing to the diversion problem by prescribing medication to “doctor shoppers”, or people who go from one physician to another seeking pills (Inciardi et al., 2007).

Most researchers agree, however, that the majority of medication diverted to the illicit market comes not from doctor shopping or physician diversion, but from individuals who were prescribed a medication for a legitimate medical condition (Chandra & Ozturk, 2004; Joranson & Gilson, 2007; Monte et al., 2009). These findings hold up across various age groups and samples. Adolescents report peers, friends, and family members as their most common sources of diverted medication (Hurwitz, 2005). Among college students, friends and peers are the most common sources of prescription medications used nonmedically (Barrett et al., 2005; McCabe & Boyd, 2005; McCabe, Teter, & Boyd, 2006a; McCabe et al., 2007), and among one sample of drug users in treatment, 61% of participants using buprenorphine/naloxone (a drug prescribed to treat opioid addiction) nonmedically got it from someone with a legitimate prescription (Monte et al., 2009). Additionally, the National Prescription Drug Threat Assessment agrees that the majority of prescription medication used nonmedically comes from

individuals with legitimate prescriptions (U.S. Department of Justice, 2009). One study of street-based drug users who divert their own prescription medications found that they typically sell prescription drugs to friends and acquaintances (Inciardi et al., 2007).

Estimates of the prevalence and impact of diversion are difficult to find. Among adolescents in middle and high school, between 10.9% and 24% have shared and 7.3% to 18.6% have sold a prescription medication (Boyd et al., 2007; Daniel et al., 2003; Poulin, 2001, 2007). Another study of adolescents and young adults prescribed an ADHD medication found 11% of participants sold their medication (Wilens et al., 2006). Rates of diversion appear higher among young adults, with one study finding that approximately 36% of college students prescribed any medication have diverted it (Garnier et al., 2010). A study of slightly older adults (mean age 27) prescribed methylphenidate (a prescription stimulant) found that 44% of participants had ever diverted their medication (Darredeau, Barrett, Jardin, & Pihl, 2007). Additionally, between 5% and 34% of drug users in treatment have sold their prescription medications (Fountain, Strang, Gossop, Farrell, & Griffiths, 2000).

Overall, sharing is more common than selling. One study of adults prescribed a stimulant found that among diverters, 97% had shared, 17% had sold, and 14% had done both (Darredeau et al., 2007). Among college students, 33% of students prescribed a medication shared it, and 9% sold it (Garnier et al., 2010). Only a small percentage of diverters (3%) exclusively sold their medications. In an adolescent sample, Poulin (2001) found that 80% of students who had sold their prescription medications had also given them away.

Among adolescent and young adult samples, diversion is described as prevalent but infrequent (Daniel et al., 2003; Garnier et al., 2010). One study of college student diverters found that the majority of those sharing their medications did so only once (61.1%), while more than half of sellers sold their medications “sometimes” or “regularly” (Garnier et al., 2010).

The most commonly diverted prescription drugs include Ritalin, Dexedrine, Oxycodone (Schedule II drugs), Vicodin, Codeine (Schedule III drugs), Valium, Xanax, and Klonopin (Schedule IV drugs) ("Prescription drug diversion," 1996). Prescription analgesics are the most commonly diverted class of medication (Drug Enforcement Administration, 2007a, 2007b). In one sample of medication diverted by medical professionals (Inciardi et al., 2006b), opioids (especially hydrocodone) were most likely to be diverted, accounting for 67% of diverted medications; however, the demand for various medications may differ by population.

Prescription stimulants are the most commonly diverted class of medication among college students, with 62% of stimulant users diverting in their lifetime, followed by 35% of students with analgesic prescriptions (Garnier et al., 2010). Additionally, 17% of students with prescription muscle relaxers, 14% of students with psychotropic medications (e.g. anti-depressants, anti-anxiolytics), and 13% of students with asthma or allergy medications diverted a prescription (Garnier et al., 2010). In contrast, one web-based survey found that among adolescents, the prevalence of diversion does not significantly differ by class of medication (e.g. analgesics, anxiolytics, sedatives, and stimulants). Also noteworthy is that one study of young adults found that immediate

release prescription stimulants are more often diverted than extended release formulations (Wilens et al., 2006).

Correlates of Diversion

Very few studies have examined correlates of diversion. Studies among adult populations have found that diverters may be either male or female ("Prescription drug diversion," 1996), are typically between the ages of 21 and 40 ("Prescription drug diversion," 1996), and typically obtain prescriptions for legitimate pain or medical conditions from their personal physicians (Chandra & Ozturk, 2004; Davis & Johnson, 2008). Darredeau (2007) found that younger adults are more likely to divert than older adults. Studies of individuals asked to divert their medications find that white females are most likely to be approached (McCabe, Teter, & Boyd, 2004). However, in one sample of college students, males were more likely than females to be approached to divert prescription analgesics, specifically (McCabe, Teter, & Boyd, 2006b). Gender differences may vary by population. Among adolescents, females are more likely than males to share their medication (Boyd et al., 2007; Daniel et al., 2003); however, a study of college students found the opposite (Garnier et al., 2010).

Similar to findings relating to drug use and drug distribution, substance use is also associated with prescription drug-related crimes. Both nonmedical use of prescription medication and a diagnosis of substance use disorder have been associated with prescription diversion (Garnier et al., 2010; Wilens et al., 2006). Additionally, several studies (Garnier et al., 2010; Wilens et al., 2006) found an association between diversion and early conduct problems, a consistent predictor of delinquent behavior (Fergusson & Lynskey, 1998; Fergusson, Horwood, & Nagin, 2000; Flory, Milich, Lynam, Leukefeld,

& Clayton, 2003). Finally, one study of nurses notes that workgroup norms affect nurses' diversion behavior (Dabney, 1995), suggesting that the behavior or beliefs of others may influence the likelihood of diversion.

There are also many factors that have not yet been linked specifically to diversion, but which we have reason to believe may be relevant. For example, studies have demonstrated the role that perceptions play in both the decision to use prescription drugs nonmedically (Arria, Caldeira, Vincent, O'Grady, & Wish, 2008b) and the decision to engage in deviant behavior (Nagin & Paternoster, 1993a; Wright, Caspi, Moffitt, & Paternoster, 2004), so it is logical to suspect that such perceptions may also play a role in diversion of prescription medications.

An additional, but relevant unknown factor in prescription medication diversion is the role of opportunity. One study of adolescents found that 34% of students taking an ADHD medication were asked by someone else to divert it (Moline & Frankenberger, 2001). Similarly, a web-based survey of college students found that 27% of students prescribed a medication in the past year had been approached to share, sell, or trade their medication with someone else (McCabe, Teter & Body, 2006b). Although it is unclear how many did so, it seems likely that being asked to divert medication increases the likelihood of doing so. Unfortunately, there remain many unanswered questions about why individuals choose to divert their medications and the types of people most likely to make such a choice. Answering these questions is a critical step in combating this new type of drug crime, which has serious and far-reaching costs if left unabated.

Costs of Prescription Drug Diversion

The consequences of diversion are numerous, spanning fields of criminal justice and public health. The continued nonmedical use and diversion of prescription drugs needs to be curtailed for several reasons. First, using a prescription drug without proper medical supervision can be dangerous and is associated with numerous, costly, medical health problems. From a medical perspective, individuals obtaining a diverted drug lack the benefit of a consultation with a physician. Without consulting a physician, possible complications arising from the interaction of a prescribed medication with an existing medication or health condition are not detected, and individuals do not receive the warnings associated with prescription drug use, such as limitations on driving activities. Friedman (2006) notes that many classes of prescription medications, including sedatives, hypnotics, and opiates can affect cognition and motor skills even in small doses, increasing the risk of injury. Studies show that rates of overdose deaths due to prescription drugs have been increasing (Warner et al., 2009). Additionally, Emergency Department visits due to prescription drug overdose have increased over the past several years (Cai et al., 2010). Between 2004 and 2008, emergency department visits for opioid analgesics increased by 111%, and for benzodiazepines increased by 104% (Cai et al., 2010), making visits for nonmedical prescription drug use as common as visits for illicit drug use. Federal studies of treatment center admissions also find an increase in the prevalence of individuals entering treatment for addiction to prescription drugs (Substance Abuse and Mental Health Services Administration, 2007). Although it is unclear what percentage of these cases can be attributed to nonmedical use of diverted

medications as opposed to overuse of one's own medication, it is clear that nonmedical use is not without possible consequences.

Second, the drug-crime linkage, and early evidence on prescription diversion suggests that diversion is likely associated with crime (U.S. Department of Justice, 2009). A study by Garnier and colleagues (2010) found an association between diversion and early conduct problems, a well-known risk factor for other delinquent behavior (Fergusson & Lynskey, 1998; Fergusson, Horwood & Nagin, 2000; Flory et al., 2003). In addition, the National Prescription Drug Threat Assessment notes that law enforcement agencies are reporting an uptick in property and violent crime that is prescription drug-related (U.S. Department of Justice, 2009). Steps have been taken to attempt to curtail diversion at the manufacturer or pharmacist level, and to control distribution, but diversion persists at the individual level. Allowing illicit distribution of prescription drugs to continue unabated will only continue to contribute to drug-related crime and delinquency. In some cases, the procurement of the medication may itself involve criminal activity. Crimes such as Medicare and Medicaid fraud persist among diverters attempting to increase the supply of medication available for diversion ("1st Circuit: Sharing Medicaid pills is same as drug dealing," 2004). Additionally, the United States leads the world in counterfeiting, theft, and diversion of prescription medications (Appleby, 2005).

Third, crime among nonmedical prescription drug *users* is also of concern. Ford and Schroeder (2009) have linked nonmedical use to strain and negative affect, a combination Agnew (1992) theorizes to lead to criminal behavior. Also, research suggests that some people sell their prescription medication so that they have money with

which to buy other drugs (either illicit or prescription) (Goldman, 1998). This suggests that these users are not only using drugs, but are also engaging in other types of deviant behavior.

Limitations of Recent Initiatives to Combat Prescription Drug Diversion

The growing awareness of the prescription drug problem has led to the development of pharmaceutical drug diversion units in several large cities, and increased enforcement resulting in prescription drugs becoming better represented in the scope of felony drug arrests (Hobbs, 1998). However, although this topic is beginning to receive more recognition and attention, little is known about diversion as a type of drug crime and law enforcement is uncertain where to concentrate their efforts.

While recent studies have demonstrated that both prescribing rates, and prevalence of nonmedical use have increased in the last decade (Compton & Volkow, 2006b; National Center on Addiction and Substance Abuse at Columbia University, 2005; Caudill-Slosberg, 2004; Stagnitti, 2009), there are still many gaps, limitations, and misconceptions in what we know about diversion. To date, despite scientific findings, many Federal agencies maintain that the main sources of diversion are a) doctor shopping, b) inappropriate prescribing practices, c) inappropriate dispensing of medication by pharmacists, and d) Internet shopping (Inciardi & Cicero, 2009). Inciardi and Cicero (2009) point out the problems with this belief by contrasting two studies -- first, a study of police and regulatory agencies and secondly the National Survey of Drug Use and Health (NSDUH) -- regarding sources of prescription medication. Not surprisingly, the study of police showed that almost three-quarters of police personnel considered doctor shopping, theft, and forgery to be the primary sources of diverted drugs

(Inciardi et al., 2007), while 72% of NSDUH participants reporting past-year nonmedical use of prescription analgesics identified a friend or relative as the source. In short, while recent research by the DEA clearly indicates that some diversion is occurring through theft and loss prior to being prescribed (Drug Enforcement Administration; Joranson & Gilson, 2005), a substantial amount of diversion is going largely ignored and undocumented at the patient level.

Although there are mechanisms currently in place to track prescription drugs, these mechanisms are largely ill-suited to detect diversion as it is occurring in the United States. At the state and national level, multiple mechanisms are in place to deal with the problem of diversion. In order to control the availability of substances with higher abuse potentials, governmental quotas for manufacturing and distribution were implemented; however, current quotas based on assessment of need do not take into account that some “needed” prescriptions are actually being diverted (Sapienza, 2006). This has led to a great deal of argument and controversy between proponents of reducing the amount of prescription medication on the market by encouraging more conservative prescribing practices, and physicians who are concerned that revising prescribing practices could result in patients not receiving the prescription medication they need (Hall & Degenhardt, 2007).

In addition, state-administered multiple copy prescription programs (MCPs) are in practice, where doctors are required to use state-issued, preprinted, serialized triplicate forms, to maintain copies of all prescriptions written, and to forward a copy to the state authorities (Forgione, Neuenschwander, & Vermeer, 2001). Some states also require the dispenser to retain copies and transfer the information electronically to the state

authorities (Forgione et al., 2001). These safety measures were put in place to reduce errant prescribing practices and prescription forgeries, and have been used by law enforcement officials to identify fraudulent consumers and unethical doctors (Forgione et al., 2001). Simoni-Wastilla and Tompkins (2001) note that these programs can be useful in preventing diversion, identifying diversion (both prospectively and retrospectively) and as investigative tools; however, they are better suited to dealing with the problem of forgeries than the problem of diverting legitimately prescribed medication.

Additionally, drug manufacturers have been required by the FDA to place warning labels on certain medications with high abuse potential (such as Oxycontin), and have been cautioned against aggressive marketing plans (Collins & McAllister, 2006). The DEA released an aggressive national action plan in 2001 designed to decrease nonmedical use and diversion by increasing enforcement, intelligence gathering, and regulatory efforts and to increase public awareness by focusing on education regarding appropriate prescription drug use (Collins & McAllister, 2006). Unfortunately, little research is available to guide the development of educational materials or to identify appropriate targets for education or enforcement.

Drug packaging products have also changed, with the FDA suggesting the use of radio frequency identification tags on prescription medications in order to track the flow of medications through the “chain of custody” from the drug manufacturer to the pharmacy dispensing the medication (Collins & McAllister, 2006). Finally, numerous states have implemented Prescription Drug Monitoring Programs (PDMPs) to deter diversion (United States General Accounting Office, 2002). Researchers in Canada have also begun to suggest some type of monitoring program to reduce forgery, doctor

shopping and illegal prescribing (El-Aneed et al., 2009). Early results have suggested that these types of programs may deter drug diverters, as some observations imply that doctor shopping has moved to nearby, non-monitored states (Crosse, 2004; United States General Accounting Office, 2002). Unfortunately, as with other prevention mechanisms, this has little effect on prescribing for legitimate health conditions, and diversion is still prevalent among patients prescribed legitimate prescriptions (Boyd et al., 2007; Daniel et al., 2003; Inciardi et al., 2007; Poulin, 2001; Wilens et al., 2006).

At the pharmaceutical or physician level, drug manufacturers are working to develop abuse-resistant formulations of commonly diverted medications in an effort to reduce the appeal of nonmedical use (Collins & McAllister, 2006; Compton & Volkow, 2006a), and doctors are prescribing abuse-resistant formulations. However, prescribing practices in the United States have changed in other ways over recent decades, as well, effectively increasing the amount of medication available for diversion. Despite increasing controls on prescription medication, prevalence of prescribed drugs has increased substantially. Research shows that prescribing rates for both stimulants and analgesics have increased (National Center on Addiction and Substance Abuse at Columbia University, 2005; Woodworth, 2000). According to Volkow, between 1991 and 2007 (while the total US population increased from 252 million to 301 million) the total number of stimulant prescriptions in the United States increased from approximately 5 million to almost 35 million and the total number of opiate prescriptions increased from approximately 40 million to almost 180 million, substantially increasing the per capita amount of prescription medication available to be diverted (Volkow, 2010).

According to a study of Medicaid patients, the average annual number of prescriptions filled per person increased from 13.0 in 1998 to 15.5 in 2000 (Fink & Byrns, 2004). Analgesic medications are one of the most commonly prescribed classes of drugs in the U.S. (Kuehn, 2007; McLellan & Turner, 2010), with a total of 230.7 million prescriptions written annually, resulting in approximately 19% of US adults purchasing at least one prescription analgesic in 2006 (Stagnitti, 2009). Table 2.1, compiled based on data provided to the National Center on Addiction and Substance Abuse by National Prescription Audit (NPA) Plus, demonstrates that rates of opioid analgesic, benzodiazepine, barbiturate and stimulant prescriptions soared in the decade between 1992 and 2002 (National Center on Addiction and Substance Abuse at Columbia University, 2005). According to US Census data, during the same time period, the U.S. population increased by less than 13%.

Table 2.1: Number of prescriptions filled and percent change over time by prescription drug class

	Number of Prescriptions Filled		Percent Change
	1992	2002	
Barbituates	3,651,000	5,043,000	38
Benzodiazepines	20,184,000	29,248,000	49
Opioids	33,186,000	123,725,000	222
Stimulants	4,997,000	23,413,000	369

Overall, data indicate that the United States has the highest prevalence of diversion in the world (Appleby, 2005), and that diversion in this country costs insurance companies billions of dollars each year (U.S. Department of Justice, 2009). Additionally, violent and property crime associated with diversion and nonmedical use has increased in the past five years (U.S. Department of Justice, 2009), which, the National Prescription Drug Threat Assessment (2009) suggests has resulted in higher

budgetary expenditures for criminal justice resources. The National Prescription Drug Threat Assessment (2009) also notes that the distribution of prescription drugs for nonmedical use by street gangs is increasing. Higher rates of nonmedical use of and dependence on prescription drugs is also burdening substance abuse and healthcare resources (U.S. Department of Justice, 2009).

Summary

To briefly summarize the state of the literature, although some attention has been paid to drug use and drug-related crime, there is little information about the emerging trend of prescription drug diversion. Little is known about risk factors associated with this behavior, and it seems clear that initiatives including prescription drug monitoring programs and multiple copy prescription programs are not fully able to stem the flow of prescription drugs onto the illicit market. Given the implications of a rise in drug-related crime, it is of substantial interest to the field of criminal justice to investigate the risk and protective factors associated with prescription drug diversion in order to inform prevention efforts.

Chapter 3: Theoretical Framework

This chapter outlines the theoretical framework under which the study's specific aims will be examined. This is accomplished by introducing the criminological theories best associated with the behavior in question. Next, support and extensions of each theory are explained. Finally, a series of hypotheses are outlined along with their theoretical rationale.

Unfortunately, no theory-driven research has been conducted on the problem of prescription drug diversion. However, approaching the issue from a theoretical perspective is important because it provides guidance in identifying risk and protective factors that may be associated with diversion. This study primarily incorporates ideas from Social Learning Theory and Rational Choice Theory. The advantage to using these two theoretical approaches specifically is that both draw from risk and protective factors that are both changeable and easily understood in a multi-disciplinary perspective. Social Learning Theory is an appropriate approach given the importance of peers and peer influences in a young adult age group. Rational Choice Theory is equally appropriate in this context because the young adult age group in question should be fully able to engage in rational thought given their likely level of brain development.

The primary theoretical framework from which this study draws is Social Learning Theory and Rational Choice Theory. Social Learning Theory suggests that deviant behavior is learned in a social context -- namely that norms, values, and techniques associated with deviant behavior are learned through differential association, differential reinforcement, imitation and definitions picked up through interaction with others (Akers, 1985). Rational choice theory posits that individuals partake in a rational

consideration of costs and benefits of both criminal activity and non-activity before choosing whether or not to engage in the criminal behavior. Rational Choice Theory assumes that human actions are based on rational decisions and are informed by probable consequences of actions (Akers, 1990) and focuses on factors that may raise the perceived costs or lower the perceived benefits for criminal behavior. These two perspectives overlap in some areas and can easily build off of one another (Akers, 1990).

Research Evidence for Social Learning Theory

Social Learning Theory explains criminal behavior as a learned process. According to Akers (1985), behavior is shaped through differential associations, definitions, differential reinforcement and imitation. Through the process of differential association, individuals are exposed to ideas both favorable and unfavorable to crime. These are thought to determine the norms/values of the individual. Deviance results when there is an excess of definitions favorable to violating the law versus definitions unfavorable to violating the law (Sutherland, 2002). Direct and indirect, verbal and nonverbal communication, interaction, and identification with both conforming and non-conforming others inform the development of these ideas (Akers, 1998). Not all associations equally influence the development of definitions. Peer associations are the most common sources of differential association leading to deviant behavior among adolescents, however, family associations can also play a role (Akers, 1998).

The concept of definitions refers to one's own attitudes and evaluations. Some studies suggest that deviant behavior is related more to one's own definitions than to exposure to others' definitions (Akers, 2009). Differential reinforcement involves the consequences and rewards (both actual and anticipated) that result from engaging in the

behavior. Consequences or punishment provide negative reinforcement, serving as a deterrent, while rewards provide positive reinforcement, making it more likely that the behavior will occur. Finally, imitation involves the observation and copying of another's behavior.

Support for Social Learning Theory is strong. Studies show that associating with deviant peers who can teach deviant behaviors and definitions favorable to deviance has consistently been linked to deviant behavior (Alarid, Burton & Cullen, 2000; Haynie, 2002; Hochstetler, Cooper & DeLisi, 2002; Sutherland, 1947). In studying substance use, Akers (1979) found that differential association was the most important component of social learning, highlighting the role of peer behavior. The effects of peers hold up even in the presence of individual factors (Haynie, 2001). Additionally, these effects are important across age groups, and although they are typically most influential in adolescence (Fergusson, Swain-Campbell & Horwood, 2002) they persist into adulthood (Wright, Caspi, Moffitt & Silva, 2001). Critics of the theory point out that directionality is unclear. Both selection of delinquent peers by a delinquent and influence of delinquent peers on a nondelinquent explain the reciprocal relationship between deviance and delinquent peer associations (Elliott & Menard, 1992; Matsueda & Anderson, 1998).

The role of self-control within the social learning framework is unclear. Some studies suggest that individuals with low self-control are more often rejected by peers and are more likely to associate with deviant peers (Baron, 2003; Chapple, 2005), which would imply that these individuals select into delinquent peer groups. Interestingly, other research notes that peer acceptance is often a necessary component in prompting individuals to conform to peer behavior (Urberg, Luo, Pilgrim & Degirmencioglu, 2003),

suggesting that those with low self-control may be less susceptible to peer influences because they often face peer rejection. A study by Gardner, Dishion and Connell (2008) found that self-regulation moderates the relationship between peer deviance and subsequent deviant behavior among adolescents, such that self-regulation serves as a buffer, protecting individuals from negative peer influences.

Extensions of learning research have yielded interesting findings. Research demonstrates that, often, an individual's *perceptions* of their peers' behavior will affect their own likelihood to offend (Aseltine, 1995; Iannotti & Bush, 1992) just as actual peer behavior will. 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). It is likely that an individual's perception of peers' behavior may 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).

Additionally, the role of opportunity has been examined in a learning context. In early research on differential association, Sutherland (1944) acknowledged that differential association alone does not fully explain offending. He notes that offending is also a function of opportunity, and that such opportunity may be partially a function of deviant associations. Haynie and Osgood (2005) have found that opportunity matters regardless of the presence or absence of delinquent peers, suggesting that while learning is important, other variables cannot be ignored.

Research Evidence for Rational Choice Theory

Rational Choice Theory draws considerably from Deterrence Theory (Akers, 1990), which argues that the certainty, severity, and swiftness of punishment inhibit

crime. According to Rational Choice Theory, aspects that would deter an individual would factor into any cost-benefit analysis. A body of research has produced mixed support for deterrence, with most research finding an effect of certainty of sanctions on offending (Nagin, 1998; von Hirsch, Bottoms, Burney, & Wikstrom, 1999). Anderson, Chiricos and Waldo (1977) found that both formal and informal sanctions can have a deterrent effect, thus both fear of a legal reprisal and fear of, say, disappointing one's parents could both have an effect on the decision to commit a crime. In fact, many studies highlight the role of informal sanctions and extralegal consequences as strong predictors of offending (Paternoster, Saltzman, Waldo & Chiricos, 1983; Nagin & Paternoster, 1991; Nagin & Pogarsky, 2001). These studies suggest that while certainty of punishment is a deterrent to offending, informal sanctions can be just as much of a deterrent as formal sanctions, if not more so.

Several studies have also examined whether rational choice plays the same role in every potential offender. Rational Choice Theory does not assume a completely well-informed and calculated decision for every potential offender in every scenario, but leaves room for all levels of rationality (Akers, 1990). Pogarsky (2002) divides the population into three groups: acute conformist, deterrable, and incorrigible. Acute conformists do not break the law. For them, extralegal factors, such as a moral belief in the law, supplant other factors, such as legal sanction threats (Pogarsky, 2002). Several studies (Bachman, Paternoster & Ward, 1992; Paternoster & Simpson, 1993; Paternoster & Simpson, 1996) identify moral beliefs as a contextual factor that influences the rational choice model. These studies seem to indicate that for some individuals, belief that a criminal act is morally wrong will trump any rational choice considerations. At the other

end of the continuum, incorrigibles are likely to engage in crime regardless of dissuading factors because they suffer from some type of biological or psychological urge or because they tend not to consider potential consequences of their actions (Pogarsky, 2002). The middle category encompasses those who respond to rationality, and numerous studies have attempted to identify factors representative of both the acute conformist and incorrigible group.

Pogarsky (2002) hypothesized that some individuals may be less deterrable than others because they have low self-control. Nagin and Paternoster (1993b) note that low self-control is associated with offending, even taking rational choice factors into account, suggesting that impulsive individuals may not engage in the rational process prior to offending. Piquero and Tibbetts (1996) found that models combining self-control and situational factors have good explanatory power. These findings suggest that for some people with low self-control, rational choice concerns are of little consequence because they will simply act impulsively without considering possible benefits or consequences. However, rational choice considerations hold up in some populations. Nagin and Paternoster (1994) argue that instrumental considerations seen in Rational Choice Theory, such as damage to social bonds, are significant factors on marginal offenders with medium self-control. Additionally, impulsive individuals are more influenced by their own experiences, while unimpulsive individuals pay attention to experiences of others (Piquero & Pogarsky, 2002).

Waldo and Chiricos (1972) modified deterrence theory, arguing that *perceived* certainty and severity could be just as important as objective deterrence, highlighting the role that perceptions play in choice. Jensen, Erickson and Gibbs (1978) found that

perceived risk had a significant impact on offending. Identifying factors that affect these perceptions is a key component of Rational Choice Theory. In a reconceptualization of deterrence, Stafford and Warr (1993) argued that perceptions come from both personal and vicarious experience, such that both experiencing something oneself and hearing about someone else experiencing it can help form overall perceptions regarding a likely outcome. Paternoster and Piquero (1995) clarify that among those with limited personal experience, perceived sanction threats are more affected by vicarious experiences. It is important to note that one limitation of deterrence theory is that some studies have found a strong experiential effect (where prior behavior and experience color perception), but only a weak deterrent effect (where perception colors behavior) (Paternoster et al., 1983), suggesting that behavior may drive perception more reliably than perception drives behavior. However, longitudinally, studies have identified a relationship between perceptions and criminal offending (Matsueda, Kreager, & Huizinga, 2006; Pratt, Cullen, Blevins, Daigle, & Madensen, 2008).

Opportunity is important and it is assumed that opportunities for crime exist and present themselves; it is up to the weight of costs and benefits assessed by the potential offender whether or not they will participate in the crime. It cannot be ignored that opportunity is a strong predictor of criminal behavior, even controlling for other theoretically relevant variables (Grasmick, Tittle, Bursik Jr., & Arneklev, 1993; Longshore, 1998). Piliavin, and colleagues (1986) note that in a rational choice model, opportunity has a strong effect on crime.

To summarize, briefly, Social Learning Theory highlights the role of peer behavior on offending, even in the presence of individual risk factors, although it appears

that some individuals may be more susceptible to peer influences than others. Perceptions of peer behavior are also important in predicting offending. However, research demonstrates that some factors, such as opportunity, are even more strongly related to deviant behavior. Given the strength of these associations, it is possible that the reason deviant peer affiliations increase the likelihood of offending is at least partially due to criminal opportunities that these affiliations create.

Rational choice considerations of costs and benefits of crime inform the decision of whether or not to engage in criminal activity, although it appears that some factors, such as self-control can moderate the relationship between rational choice and crime. Additionally, perceptions are extremely important to rational choice. These perceptions can be informed by a variety of factors, including both personal and vicarious experience. The role of opportunity is assumed by rational choice theorists.

Application of Theoretical Understanding to Prescription Drug Diversion

Drawing from this theoretical framework, multiple hypotheses relating to the study's aims emerge. These hypotheses can be divided into three main categories: descriptive, main effects, and mediation effects. Because the first aim is wholly exploratory in nature, it did not generate any specific hypotheses; however, the remaining aims are linked with hypotheses below.

Descriptive

The second aim of this study involves describing the reasons given for choosing to divert or not to divert a medication. Rational Choice Theory would expect that individuals choosing to divert their medications would cite reasons relating to low risks or high gains. In contrast, reasons given for not diverting a medication would be related

to fear of sanctions. Those who had occasion to refuse but who diverted on other occasions would have less of a concern regarding sanctions. Thus,

Hypothesis 1: Non-diverters and diverters who have had the opportunity to divert and refused to do so will differ on their reasons for refusal.

In addition to the probable lack of fear of sanctions relating to diversion, research shows that beliefs can strongly influence individuals, to the exclusion of outside influences (Bachman, Paternoster & Ward, 1992; Paternoster & Simpson, 1996). The current study examines how individuals feel about diversion. It is expected that diverters will be less likely to have beliefs or judgments leading them to object to diversion, compared to non-diverters.

Hypothesis 2: Diverters will be more likely than non-diverters to believe that diversion is not a problem.

Main Effects

The third purpose deals with examining the relationship between diversion and factors that would theoretically affect the likelihood of diversion. There are a variety of factors that are thought to contribute to diversion based on theory and prior research. Hypotheses three and four focus on the relationships between diversion and peer-related variables, consistent with a social learning approach. Hypotheses five and six explore the rational choice perspective. The seventh hypothesis examines the extent to which these relationships hold true for everyone.

Prior research demonstrates the impact of peer influences on both delinquent behavior (Costello & Vowell, 1999; Jensen, 1972; Warr & Stafford, 1991) and substance-related behavior (Bahr, Hoffmann, & Yang, 2005; Hawkins, Catalano, & Miller, 1992;

Reifman, Barnes, Dintcheff, Farrell, & Uhteg, 1998). Piquero & Paternoster (1998) noted the role of friends' attitudes, in particular, in their study of drinking and driving. Further, research suggests that while peer behavior is important, perceptions of peer behavior can be equally influential (Aseltine, 1995; Iannotti & Bush, 1992). Based on this research, it is expected that perceived peer behaviors regarding nonmedical use and diversion of prescription drugs will have an effect on whether or not diversion occurs. If an individual believes that many of their peers engage in nonmedical use of prescription drugs, they may be more likely to divert their own prescription drugs, either because they view diversion and nonmedical use as normative or because they are pressured to do so by their peers. Similarly, if an individual believes that many of their peers divert prescription drugs, they may be more likely to follow suit in an effort to conform.

Hypothesis 3: The perceived number of close friends who use prescription drugs nonmedically will be positively associated with the likelihood of diversion.

Hypothesis 4: Perceiving a greater percentage of peers engaging in diversion will increase the likelihood of diversion.

Extrapolating from typical rational choice predictors, it is of interest from a preventive standpoint to determine whether or not information regarding the effects of using diverted medication might act as a deterrent. Some qualitative research has suggested that some individuals who divert medication think that they are "helping" the recipient (DeSantis, Noar & Webb, 2010). It may be that exposure to a plethora of positive messages relating to nonmedical use and diversion increase the perceived benefits of diversion and minimize the perceived costs. Similarly, being exposed to a large amount of negative information on the same topic may increase perceived

consequences while decreasing perceived benefits. Consequently, positive information regarding prescription drugs and nonmedical use may make individuals more inclined to divert, while negative information regarding the effects of nonmedical use of prescription medications may reduce the likelihood of diversion for fear of harming the recipient rather than helping him.

Hypothesis 5: Hearing a greater number of positive messages relating to prescription drugs will increase the likelihood of diversion.

Hypothesis 6: Hearing a greater number of negative messages relating to prescription drugs will decrease the likelihood of diversion.

The fourth purpose has to do with determining for whom these relationships hold. It is expected that the hypothesized main effects relationships may be moderated by impulsivity. Social learning research has suggested that for individuals with low self-control, peer influences tend to be weaker than for individuals with high self-control (Urberg et al., 2003), potentially because greater levels of peer rejection of those with low self-control render peer influences immaterial. In contrast, there is also evidence to suggest that higher levels of self-control can serve as a buffer against negative peer influences, making individuals with high self-control less likely to engage in deviance than those with low self-control even when associating with deviant peers (Gardner, Dishion & Connell, 2008). It may be that those with high self-control are less susceptible to peer influences or are better able to resist pressure to conform with peers.

In addition, prior research on Rational Choice Theory has divided the population into three groups: conformists, deterrables, and incorrigibles (Pogarsky,

2002). Pogarsky's work suggests that one subset of the population (deterables) is likely to engage in rational choice; however, other subsets of the population may be less influenced by rational choice considerations. In this framework, incorrigibles are less likely to respond to rational choice because they are less likely to think through an action and its consequences prior to engaging in it. If this is true, then impulsive individuals with low self-control are more likely to engage in deviant behavior than others (Nagin & Paternoster, 1993b), taking into account rational choice considerations. Because these individuals are more impulsive and less likely to engage in a cost-benefit analysis that would regulate their actions, they may be less likely to respond to rational choice considerations.

Given the likely differences in effects of social learning and rational choice variables on diversion for individuals with different levels of self-control, it is expected that,

Hypothesis 7: The main effects of the independent variables on diversion will be moderated by participants' levels of impulsivity such that less impulsive individuals will be less susceptible to the influence of these variables.

Mediating Effects

The fifth aim of the study is to identify factors that mediate the relationship between theoretical predictors and diversion. Described below is a rationale to suspect that some factors may mediate the observed main effects. Primarily, it is expected that the roles of opportunity and of one's own perceptions may mediate other observed relationships.

Opportunity is strongly related to offending behavior (Grasmick et al., 1993; Longshore, 1998) and learning theorists acknowledge the importance of opportunity (Haynie & Osgood, 2005; Sutherland, 1944). Not only does opportunity remain an important predictor of offending regardless of deviant peer associations (Haynie & Osgood, 2005), but opportunity may in fact act in part as a mechanism through which peer influences work. For example, having many peers who engage in nonmedical use and diversion of prescription drugs may indicate that there is a high demand for diverted medication within that individual's peer group. Consequently, it may be that certain participants are more likely than others to be asked by their peers to divert their medication. Along that same reasoning, individuals with substance using peers who may be inclined to divert have a handy pool of recipients ready and willing to receive or purchase their medications, while those who run in different circles may not find it so easy to divert even given the inclination. Within those same peer groups, it seems likely that individuals who are approached by their peers to divert medications are more likely to have done so both because they have a clear opportunity to divert and because of the aspect of peer pressure inherent in the request to divert.

Hypothesis 8: Opportunity to divert will mediate the relationship between perceived peer nonmedical use and diversion.

Hypothesis 9: Opportunity to divert will mediate the relationship between perceived peer diversion and diversion.

Perceptions play an important role in the decision of whether or not to offend.

Prior research has demonstrated that perceived risk has a substantial impact on offending (Jensen, Erickson & Gibbs, 1978; Waldo & Chiricos, 1972), and can be just as influential

as objected risk. Fear of formal sanctions, such as legal consequences can have a deterrent effect (Chiricos & Waldo, 1977). Given this body of research, it seems likely that perceived legal risk would decrease the likelihood of diversion. Paternoster and Piquero (1995) found that vicarious experiences can have a strong impact on perceived sanction threats. Along these lines, it is possible that being exposed to positive or negative messages regarding nonmedical use and diversion could increase or decrease the perceived likelihood of legal risk associated with diverting. Based on this reasoning, it is expected that being exposed to a high number of positive messages relating to prescription drugs is likely to decrease one's perceived risk of legal sanctions. In contrast, exposure to a greater number of negative messages regarding nonmedical use and diversion likely increases one's perceived risk of legal consequences. It is further expected that higher levels of perceived legal risk will be associated with a lower likelihood of diversion.

Hypothesis 10: Perceptions relating to the legal risk associated with diversion will mediate the relationship between positive messages and diversion.

Hypothesis 11: Perceptions relating to the legal risk associated with diversion will mediate the relationship between negative messages and diversion.

Extralegal costs (that is consequences that occur outside the law) have also been found to play a role in the rational choice framework (Chiricos and Waldo, 1977; Paternoster et al., 1983; Nagin & Paternoster, 1991; Nagin & Pogarsky, 2001). Given that some individuals likely divert in an effort to be helpful (DeSantis, Noar & Webb, 2010) it is reasonable to expect that those who feel their actions and the resulting nonmedical use are harmful rather than helpful may be less likely to engage in delinquent

behavior. Along those same lines, factors such as what individuals hear regarding prescription drugs (both positive and negative) would be likely to influence perceptions of how harmful they may or may not be. According to Stafford and Warr (1993) perceptions can come from both personal experience, and hearing about experiences from others. Consequently, it is expected that hearing positive messages regarding nonmedical use and diversion will decrease perceived harm relating to nonmedical use. In addition, hearing negative messages regarding nonmedical use and diversion are likely to increase perceived harm of nonmedical use. It is further expected that perceived harm will be inversely related to diversion likelihood.

Hypothesis 12: Perceptions relating to the harm caused by nonmedical use will mediate the relationship between positive messages and diversion.

Hypothesis 13: Perceptions relating to the harm caused by nonmedical use will mediate the relationship between negative messages and diversion.

Summary

The theoretical rationale of this study suggests hypotheses related to the specific aims of the project. Hypotheses draw from both Social Learning and Rational Choice Theories in order to predict the relationships between a series of malleable risk factors and diversion. It is expected that both peer-related factors (including perceived peer nonmedical use and perceived peer diversion) and exposure to information regarding nonmedical use and diversion (both positive and negative) will influence the likelihood of offending. It is possible that these relationships may not remain strong for everyone, especially those who are more impulsive. Further, additional variables, such as opportunity and individual perceptions are also expected to predict diversion, and may

mediate relationships between risk factors and diversion. Individuals with greater exposure to peers who use nonmedically and divert may have greater opportunity to engage in diversion, while exposure to positive and negative messages regarding nonmedical use and diversion may influence one's perceptions regarding diversion and nonmedical use. The following section discusses how these concepts will be measured and operationalized and outlines an analytic strategy to test the hypotheses.

Chapter 4: Methodology

This chapter discusses the source of the data used in the study, the operationalization of the variables, and the analytic strategy undertaken. Data from this study were taken from the College Life Study (CLS). There are several advantages to using this dataset. First, the study is prospective, measuring diversion over multiple years instead of only capturing one year worth of data or using a single, less reliable question retrospective over the participant's lifetime. This allows this study to be the first to examine diversion using longitudinal data. In addition, the dataset spans the breadth of the young adult years, the period in time in which nonmedical use of prescription medication is highest, and a prime time for diversion behavior. Third, the dataset covers the broad range of information needed for a study of this breadth and magnitude. The following sections will describe the structure of the study, the study sample, and outline how each concept will be measured using College Life Study variables.

Study Design

Data from this study was collected as part of the College Life Study, a prospective study of health related behaviors of young adults from a single cohort of students at a single mid-Atlantic university. First-time, first-year students in the 2004 incoming class between the ages of 17 and 19 were screened at Freshmen orientation on prior substance use. The response rate on the screener was 88.7%. Over 3,100 screened students were stratified by prior substance use, sex, and race. Prior users of alcohol and illicit drugs were deliberately oversampled in order to ensure a sufficient number of drug users for analysis.

Overall, 1,253 students selected for longitudinal follow-up completed the baseline (Wave 1) interview during their freshmen year of college (response rate=86.4%). Wave 1 interviews were conducted in person by trained interviewers. Participants were paid \$50 for participating. Similar assessments were conducted annually (Waves 2 through 7), regardless of continued college attendance. Follow-up rates for these interviews ranged from 91.1% (Wave 2) to 78.4% (Wave 7). Incentive payments continued to be \$50 with a monetary bonus for on-time completion (within 1 month of the anniversary date). Written informed consent and a Federal Certificate of Confidentiality were obtained. The university's Institutional Review Board approved this study.

Participants

Participants in this study were 502 students participating in the College Life Study who were prescribed at least one prescription drug during waves five, six, and/or seven. Individuals who participated in waves 5 through 7 but did not report having a prescription during this time ($n=531$) were excluded from the sample on the assumption that they had no medication to divert.¹ Participants were aged 17 to 19 at the Wave 1 assessment, and were between 24 and 26 years old at the time of the Wave 7 assessment. Missing data presented a limited problem in the sample. All 502 participants were retained in the descriptive analyses regarding diversion. However, six individuals were missing data on positive and negative messages, six were missing data on impulsivity, six were missing

¹ Of those who were excluded from the sample due to not having a prescription during the time period of interest, 21 reported diverting a prescription drug at least once during waves five through seven. Additional analysis revealed that the majority (16) also did not report being prescribed a drug in earlier waves, suggesting that they may have obtained the medication through other means. Given the possibility that individuals seeking out prescription drugs not prescribed to them may differ systematically from the sample of those with legitimate prescription, the decision was made to continue to exclude these individuals from analysis.

data on family income, and one was missing data on race reducing the sample size in the main effects chapter by nineteen cases ($n=483$).

Measures

Table 4.1 details annual assessments for each measure by study wave. Variables are divided in both the table and the text by their function in the analysis. The primary dependent variable is presented first, followed by independent variables, moderating variables, mediating variables, control variables, and finally descriptive variables. The research will primarily highlight the relationship between the independent variables and the dependent variable.² In addition, moderating and mediating factors are expected to influence these relationships. The control variables include both demographic characteristics and factors previously demonstrated to be associated with diversion. Finally, the descriptive variables listed below provide a more in-depth picture of diversion behavior, and will operate primarily to inform the reader. For several analyses, variations were made in how certain variables were measured in order to include all available information, or to accommodate temporal ordering concerns. Where this occurred, subsections in the text below describe the variations in operationalization.

Dependent Variable

The primary dependent variable is diversion. Although there are hypotheses suggesting relationships between independent variables and perceived legal risk, perceived harm, and opportunity, these later variables are meant to operate as mediators, and will be described in more detail below.

² Correlations of all predictive variables were examined. With the exception of the correlation between positive and negative messages (.43) and between perceived peer diversion and perceived peer nonmedical use (.44), correlation coefficients fell below .25, with the majority (73%) below .15.

Table 4.1: College Life Study measures used by study wave

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Dependent Variable							
Diversion			X	X	X	X	X
Independent Variables							
Perceived Peer Diversion			X	X			
Perceived Peer Nonmedical Use		X	X	X	X		
Positive Messages		X	X				
Negative Messages		X	X				
Moderating Variable							
Impulsivity	X						
Mediating Variables							
Diversion Opportunity				X			
Perceived Health Risk				X			
Perceived Legal Risk			X				
Control Variables							
Conduct Problems	X						
Lifetime Substance Use	X						
Gender	X						
Race	X						
Family Income	X						
Descriptive Variables							
Age at Diversion Initiation						X	
Frequency of Diversion					X	X	X
Quantity of Diversion						X	X
Number of Drugs Diverted					X	X	X
Money Made Diverting						X	X
Drugs Traded					X	X	X
Recipients of Diverted Drugs					X	X	X
Reasons for Diverting					X	X	X
Reasons for Not Diverting						X	X
Age at First Diversion Opportunity						X	
Frequency of Opportunity					X	X	X
Personal Experience w/ Sanctions						X	X
Vicarious Experience w/ Sanctions						X	X
Beliefs of Diversion						X	
Parental Approval							X

Diversions

During waves five through seven, participants were asked annually if they had shared for free, sold, or traded their prescription drugs with someone else in the past 12 months. Due to differences across waves in how trading was counted, and small cell sizes with regard to trading and selling, for the majority of analyses, responses were dichotomized into those who had diverted (either by sharing, selling, or trading) during waves five through seven ($n=119$; 23.7%) and those who had not ($n=383$, 76.3%).

Variations in the Measurement of the Dependent Variable

In investigating the main effects of the independent variables on the dependent variable, the dependent variable was re-computed to capture diversion only in waves six and seven, excluding diversion in wave five from the dependent variable. Thus, for a subsection of the analysis, diversion was dichotomized as diverted in any way (sharing, selling, or trading) in waves six or seven, versus not diverting in waves six or seven.

Independent Variables

The independent variables are intended to capture several peer behaviors and several aspects that influence rational choice. Their relationships with diversion are a main focus of the analysis.

Perceived peer nonmedical prescription drug use

In waves two through four, each year participants were asked in three separate questions, “How many of your close friends do you think have used [drug] nonmedically in the past 12 months” to ascertain the number of their close friends who had used prescription stimulants, analgesics, or tranquilizers nonmedically. For the current study, because the overall exposure to drug-using peers is more important than the type of drug

used nonmedically, the average annual number of close friends using a prescription drug nonmedically is operationalized as follows. First, for each year, the maximum number (of the three drugs ascertained) was gleaned. It was not possible to determine what degree of overlap, if any, exists among peers using different types of prescription drugs. It is possible that some individuals used more than one type of prescription drug nonmedically, while others did not. Consequently, the actual number of peers who used *any* prescription drug in the past year could not be determined. As a result, the maximum number of friends using a single drug was viewed as a conservative estimate that, according to the participant, at least that many peers used a prescription drug nonmedically in the previous year. Next, these maximums for each year were averaged over the number of years in which the question was asked. Responses ranged from 0 to 20 ($\bar{x} = 1.36$, $SD = 2.38$).

Perceived peer diversion

In waves three and four, participants were asked what percentage of their peers they thought had a) shared or b) sold each of three types of prescription drugs (stimulants, analgesics, tranquilizers) to someone else. Because the intention is to capture the overall representation of this behavior, responses were operationalized in the following manner. First, for each year in which the question was asked the maximum percentage of peers diverting a drug (whether it be stimulants, analgesics, or tranquilizers), regardless of diversion route, was ascertained. Because it was not possible to determine to what extent, if any, overlap in diversion behavior may occur among peers, these percentages represent a conservative estimate of perceived peer diversion (i.e., according to the participant, at least that percentage of peers diverted one type of prescription drug in one

way). Next, the maximum percentage was averaged over the two in years in which the question was asked. Responses ranged from 0 to 100. For ease of interpretation in the models, the percentage of peers perceived to divert was divided by 10. Consequently, results are measured in 10% increments ($\bar{x} = 2.29$, $SD = 2.12$).

Positive messages

In waves two and three, participants were asked a series of questions regarding whether or not they had ever heard various messages regarding nonmedical use (i.e. prescription drugs can help you get high, taking prescription drugs nonmedically relaxes you, etc.). Eighteen positive messages were presented to participants annually, with the opportunity for participants to report “other” positive messages that they had heard as well. For each year, the number of positive messages the participant had heard was summed. Next, the total number of positive messages heard in each year was averaged over the number of years in which the question was asked. Responses ranged from 0 to 13.5 ($\bar{x} = 7.60$, $SD = 3.09$).

Negative messages

In waves two and three, participants were also asked a series of question regarding negative messages they may have heard about prescription drugs used nonmedically (i.e. taking prescription drugs nonmedically can kill you, it is dangerous, etc.). In all, twenty negative messages were presented annually, with the opportunity for the participant to report “other” negative messages that they had heard about prescription drugs. Similar to the way positive messages was calculated, negative messages represents the average number of negative messages heard annually. Responses ranged from 0 to 18 ($\bar{x} = 11.09$, $SD = 3.90$).

Prior diversion

A dichotomous variable representing diversion prior to wave five was also examined. In the third wave, participants were asked if they had ever diverted a prescription drug. In the fourth wave, participants were asked if they had diverted a prescription drug in the past 12 months. Participants who responded that they had diverted in their lifetime (in wave 3) or in the past year (in wave 4) were considered prior diverters, while those who reported no diversion in both waves were considered to have no prior instances of diversion.

Variations in the Measurement of Independent Variables

In order to make use of all possible waves of data in subsequent analyses, several independent variables were re-calculated. During the examination of the main effects of the independent variables on the dependent variable, when the dependent variable was re-calculated to include only diversion in waves six and seven, both perceived peer nonmedical use and prior diversion were recalculated to make use of all available data (see Table 4.1). Because the dependent variable no longer included wave five, perceived peer nonmedical was recalculated in the same manner described above, to include peer nonmedical use in wave five as well (yielding the average number of peers perceived to use nonmedically in waves two through five). In addition, prior diversion was recalculated to include any diversion occurring prior to wave 6. Perceived peer diversion, positive messages and negative messages were not recalculated because no additional waves of data were available for these questions.

For Chapter 7 regarding the mediation analyses, several independent variables were recalculated again in order to establish proper temporal ordering of the independent,

mediating, and dependent variables (see Figures 4.2 and 4.3). Consequently, perceived peer nonmedical use was recalculated as the average perceived number of peers using annually in waves two and three (excluding wave four, in contrast to the way it was initially operationalized). Similarly, prior diversion was recalculated as diversion occurring prior to wave four (thus only lifetime diversion at wave three was considered an indicator of prior diversion). Perceived peer diversion was recalculated using only wave 3, and positive and negative messages were taken only from wave 2.

Moderating Variable

One variable is hypothesized to moderate the relationships between the independent variables and diversion.

Impulsivity

Impulsivity was measured through the 7-item impulsive sensation seeking subscale of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ).³ This scale asks participants to agree or disagree with questions regarding their personality and behavior, such as “I am an impulsive person” and “I often do things on impulse”. Its reliability and validity have been well-established (Ball, 1995; Zuckerman, 2002). Responses ranged from 0 to 7 ($\bar{x}=3.58$, $SD=2.13$). The scale showed good reliability in this sample $\alpha=0.826$.

Mediating Variables

There are three variables that act as mediating variables. Two of these measure perceptions (perceptions of legal risk and perception of harm), and one measures opportunity. These mediating variables act as both dependent variables (where various

³ Although the impulsive sensation seeking subscale of the ZKPQ was used as a proxy for impulsivity, the ZKPQ was designed to measure the degree of stimulation a person desires and the extent to which they crave or enjoy excitement.

independent variables are thought to be associated with them) and as independent variables (where these mediating variables are thought to be associated with diversion).

Opportunity to divert

In wave four, participants who reported having access to a prescription drug were asked how many times in the past year they had been approached to divert their prescription drugs to someone else. Responses ranged from 0 to 96 (\bar{x} = 4.18, SD = 15.14).

Perceptions of diversion

Perceptions about diversion were measured in two ways. First, in the third wave, participants were asked a series of three questions how much they thought people risk getting into trouble with the law by sharing prescription stimulants, analgesics, or tranquilizers occasionally?" Response options were *no risk*, *slight risk*, *moderate risk*, *great risk*, and *can't say/don't know*. Participants were considered to perceive great risk associated with diversion if they responded to any of the three questions with *great risk* (19.8% of participants). In contrast, if none of the questions were answered with *great risk*, the participant was coded as not perceiving great risk associated with diversion (80.2%). The response option can't say/don't know was group with the low risk group on the assumption that if the participant was not familiar with the risks, they had no reason to believe the behavior was particularly risky.

Another series of questions, asked in wave four, asked participants how much they think people risk harming another person (either physically or in other ways) by sharing, selling, or trading their prescription [stimulants, analgesics, tranquilizers] with that person. Response options were *no risk*, *slight risk*, *moderate risk*, *great risk*, and

can't say/don't know. Responses were again dichotomized into great risk (if the participant answered any of the three questions with *great risk*; 40.1%) and no great risk (if the participant answered none of the three questions with *great risk*; 59.9%), with *can't say/don't know* again grouped with the low risk category.

Control Variables

A series of control variables are employed in the analyses to account for both basic demographic factors, and factors previously shown to be associated with diversion. These controls will help to ensure the robustness of any relationships observed between the independent variables and diversion.

Conduct Problems

Conduct problems were assessed during the first wave 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 participants have ever engaged in 15 deviant behaviors, that correspond to the criteria for Conduct Disorder. If the behavior has occurred, participants are asked for the number of times they had engaged in this behavior and the age at which it first occurred. The options to measure lifetime incidence of conduct problems were *never, once, twice, three times, and more than three times*. A scale, adapted from Johnson et al. (1995) was created by summing the behaviors that had occurred a given number of times and had first occurred prior to age 13. Because of the age cutoff, these behaviors are best described as early conduct problems. Early conduct problems counted in the scale were hurt others physically, skip school, run away from home overnight, used a weapon in a fight, broke into someone's house, building or car, and set fires, force someone into sexual activity, cause physical harm to

an animal, steal something from somebody, and often stay out late without parental permission (occurring at least two times) and bully, threaten or intimidate others, take property belonging to others, shoplift, or forge a signature, damage someone else's property on purpose, lie to get something or avoid responsibility, start physical fights with other youths, and broke rules (occurring at least three times). Scores of conduct problems endorsed ranged from 0 to 13 ($\bar{x}=2.96$, $SD=2.26$).

Lifetime substance use

Lifetime substance use was measured in wave one as the sum of the number of illicit substances (including marijuana, inhalants, cocaine, hallucinogens, heroin, amphetamines, methamphetamine, and ecstasy) used in the participant's lifetime and the number of prescription drug classes (including prescription analgesics, sedatives, stimulants, and tranquilizers) used nonmedically in the participants lifetime. Results ranged from 0 to 9 ($\bar{x}=1.52$, $SD=1.64$).

Demographics

Gender was recorded as observed by the interviewer at the wave one assessment. Race was self-reported by the participant. Due to the high percentage of Whites in the sample (74%), race was dichotomized into White and non-White. Family income was operationalized as the average household income from the participant's zip code during their final year of high school and is measured in ten thousands (range: 2.03 to 28.97; $\bar{x}=7.57$, $SD=3.45$)

Descriptive Variables

In addition to the independent and dependent variables, the study also examines several facets of diversion a descriptive way.

Age at diversion initiation

During wave six, participants reported their age (in years) the first time they had shared, sold, or traded a medication with someone else. The average age of initiation was 19.51 ($SD=2.46$).

Frequency of diversion

During waves five through seven, participants who diverted in the past year were asked to report the number of times they had a) shared, b) sold, and c) traded each prescription drug in the past year. Annually, the frequency of each route of diversion was recorded separately. The total frequency of diversion was calculated annually as the sum of the number of times the participant had shared, sold and traded in the past year.

Average annual frequency of diversion varied by year, but ranged from one to 100 in wave five, one to 40 in wave six, and one to 60 in wave seven.

Quantity of diversion

Beginning in wave six, participants who had diverted also reported the average number of pills shared, sold, or traded at one time for each drug diverted. For each route of diversion (sharing, selling, trading) the average number of pills diverted at a time was calculated as the sum of the number of pills typically diverted by that route divided by the number of drugs diverted by that route. Overall quantity of diversion was calculated as the sum of the total number of pills typically diverted divided by the total number of drugs diverted. The average number of pills diverted ranged from one to 20 in wave six and one to 80 in wave seven.

Number of substances diverted

In waves five through seven, participants were required to list out the prescription drugs they had shared, sold or traded. The number of substances diverted was computed annually as the total number of prescription drugs diverted in any way in the past year, regardless of the route of diversion. Responses ranged from one to three in all three waves of measurement.

Money made selling prescription drugs

In waves six and seven, participants who reported selling prescription drugs were asked with regard to each prescription drug they had sold, how much money they typically made (in U.S. dollars). The amount of money was rounded up to the nearest dollar. For all but one participant, the amount of money made per pill was \$10 or less.

Substances traded for prescription drugs

In waves six and seven, participants who reported trading their prescription drugs were asked what they traded their prescriptions for. In both waves, all participants reported trading for another type of substance (either a different prescription drug, an illicit drug, or alcohol).

Recipients of diverted drugs

In waves five through seven, for each drug diverted, participants were also asked to specify their relationship(s) with the recipient(s) of their diverted medication. If multiple routes of diversion were used (i.e. sharing and selling) responses were recorded separately for each route of diversion. Response options were *friend*, *acquaintance*, *stranger*, *relative*, or *other*. An examination of the *other* category prompted a new categorization for *significant other*, as well. In combining the three waves of data, for

each route of diversion, if a given recipient category was endorsed by the participant in any wave, that category was considered a recipient of diverted medication. If that category was never endorsed, it was coded as a non-recipient.

Reasons for diverting

In waves five through seven, participants were asked, “What were the reasons you had for [sharing, selling or trading]?” Responses were recorded verbatim and coded by the interviewer. Response codes included to help someone with a medical problem, to help someone get high, to make money, to help someone study/concentrate, to help someone sleep/calm down, didn’t like/want/need my meds anyway, recipient was already taking medication, to trade for other medications the recipient asked for it, the recipient was already taking the same type of medication, or other reason. Other reasons typically involved a “why not?” Responses from the three waves of data were combined using similar techniques to those described above. If a participant ever endorsed one of the reasons, they were coded as having diverted for that reason.

Reasons for not diverting

Individuals who indicated refusing to divert in waves six and seven were asked to report their reasons for not diverting. Reasons for not diverting were recorded verbatim and coded by the interviewer. Codes fell into several categories: perceived harm, perceived formal sanctions, perceived informal sanctions, moral reasons, not having medication available to divert, and other. Responses from waves six and seven were combined as described in previous measures.

Age at first opportunity for diversion

In wave 6, any participant who reporting ever having had the opportunity to divert was prompted to report their age (in years) at which they had first been approached to divert a medication. Responses ranged from 13 to 24 ($\bar{x}=19.45$, $SD=2.25$).

Frequency of opportunity

Annually, in waves five through seven, participants who reported having access to a prescription drug were asked how many times in the past year they had been approached to divert their prescription drugs to someone else. Responses ranged from zero to 90 in wave five and from zero to 60 in waves six and seven. The number of times a participant was approached was averaged across all years in which they were approached in waves five through seven ($\bar{x}=1.55$, $SD=5.53$).

Personal experience with sanctions relating to diversion

In waves six and seven, participants were asked, “Have you ever experienced any problems or consequences with family, friends, or the law as a result of sharing, selling, or trading your prescription medications?” If participants responded *yes* in either wave, their response was coded as *yes* (0.6%). If participants responded *no* in both waves six and seven, their response was coded as *no*.

Vicarious experience with sanctions relating to diversion

Participants were asked in waves six and seven, “Have you ever heard of anyone experiencing any problems or consequences with family, friends, or the law as a result of sharing, selling, or trading their prescription medications?” If participants responded *yes* in either wave, their response was coded as *yes* (21.8%). If participants responded *no* in both waves six and seven, their response was coded as *no*.

Personal opinion

Participants were asked in wave 6 “What is your personal opinion about someone providing prescription medications for someone who does not have a prescription?”

Response options were *it’s not a problem*, *shouldn’t do it for legal reasons*, *shouldn’t do it for health reasons*, *shouldn’t do it for both health and legal reasons*, and *it depends on the circumstances*. Participants endorsing the last option were prompted to specify under what circumstances it was or was not acceptable. Because the desire is to capture whether or not participants believe it might be ok to divert, responses were collapsed into *it’s not a problem* (9.2%), *shouldn’t do it for health/legal reasons* (76%; created by combining all responses suggesting that diversion should not occur for health reasons, legal reasons, or both), and *depends on the circumstances* (14.9%).

Parental approval

Participants were asked, “To what extent do you believe your parents would approve or disapprove of you providing prescription medications to someone who does not have a prescription?” Response options fell on a five point Likert scale ranging from strongly disapprove to strongly approve, where 1 was *strongly disapprove* and 5 was *strongly approve*. For ease of interpretation, responses were dichotomized into disapprove (62%; coded as *strongly disapprove and disapprove*) and not disapprove (38%; coded as *strongly approve, approve, and neither approve nor disapprove*).

Analytic Plan

The analysis is conducted in three stages. First, descriptive data relating to diversion, refusal to divert, and comparison between diverters and non-diverters are explored. Next, main effects of peer behavior and messages regarding prescription drugs

on diversion are examined. Third, the role of opportunity and perceptions of legal risk and harm are examined as mediators of the relationship between rational choice and diversion. Analytic strategies for each stage are provided below. All analyses were conducted using Stata 12.0.

Descriptive Analyses

In the first stage of analysis, diversion behavior is described. The purpose of looking at diversion in a descriptive way is to illustrate the type of behavior the study is examining. Because for regression analyses, diversion will be dichotomized into diverted vs. not, presenting more information on diversion in a descriptive way illustrates the types of behavior captured in the summary measure of diversion. First, diversion is examined by wave and route of diversion (sharing, selling, or trading). Differences across waves were examined using a series of one-way analyses of variance (ANOVA). Recipients of diverted medication, reasons for diverting, and reasons for not diverting are described. In addition, comparisons are made between diverters and non-diverters on the basis of reasons for not diverting, opportunity, and experiences/opinions regarding diversion. Hypotheses 1 and 2 were tested using t-tests and chi-square tests examining the differences between diverters and non-diverters. A threshold of $p \leq 0.05$ was used to denote significant differences.

Main Effects

Analyses relating to the main effects of the independent variables on diversion begin by comparing diverters and non-diverters on the basis of hypothesized predictors of diversion. A series of t-tests and chi-square tests assess differences between these two groups at the bivariate level. Second, in order to test hypotheses 3 through 6, a series of

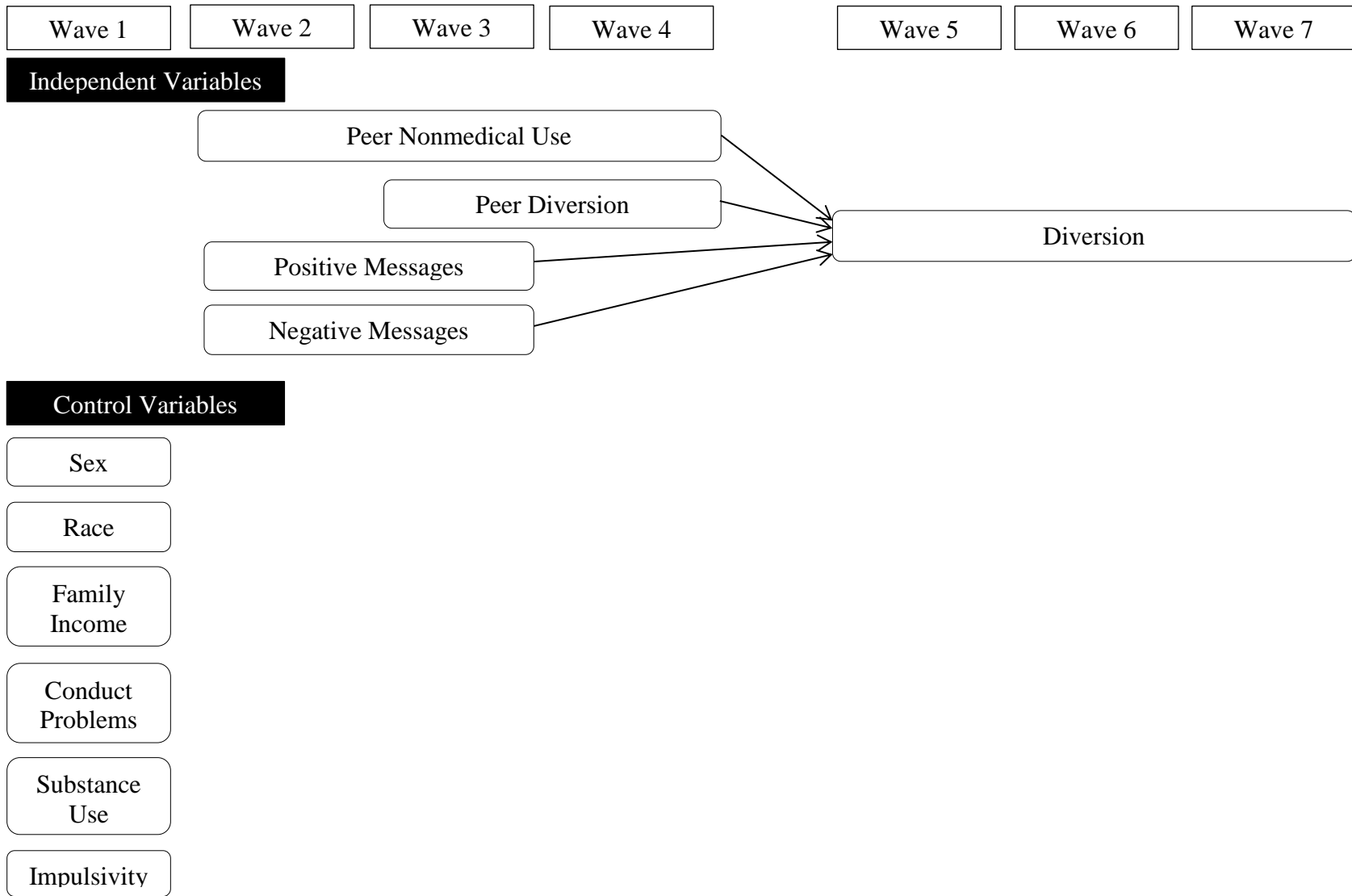
logistic regression models are run examining the associations between diversion of a prescription medication and predicted main effects. Multiple regression models hold constant the control variables listed in the measures section (sex, race, family income, conduct problems, substance use, impulsivity), which include basic demographics and factors found to be significantly associated with diversion in prior studies. The logistic models will follow this basic format: $Diversion = \beta_0 + \beta x_i + \varepsilon$ where βx_i is the vector of control variables and independent variables. Logistic regression models were selected due to the dichotomous nature of the dependent variable. For ease of interpretation, odds ratios are reported.

The main effects models are designed to preserve proper temporal ordering, where independent variables are taken from an earlier point in time compared to dependent variables. Figure 4.1 below illustrates each of the main effects to be examined based on the wave(s) from which the measure was drawn. Control variables were taken from Wave 1 and are held constant in all models.

The multivariate model used to estimate the effects of all independent and control variables is illustrated below.

$$\log \frac{p(Diversion)}{1 - p(Diversion)} = \beta_0 + \beta_1 peernonmedicaluse + \beta_2 peerdiversion + \beta_3 positivemessages + \beta_4 negativemessages + \beta_5 sex + \beta_6 race + \beta_7 familyincome + \beta_8 conductproblems + \beta_9 druguse + \beta_{10} impulsivity + \varepsilon_i$$

Figure 4.1: Main effects of independent variables on diversion



In order to test the 7th hypothesis, a series of regression models are estimated examining the role of impulsivity as a moderating variable. Moderation occurs when the relationship between an independent variable and a dependent variable is thought to depend on a third variable (Baron & Kenny, 1986). There is reason to believe that individuals who are more impulsive may be less susceptible to the peer and rational choice influences hypothesized to have main effects on diversion, namely because there may be a subset of individuals who are impulsive enough that outside influences have little impact on their behavior.

In order to examine this hypothesis, a series of logistic regression models examine the IV*impulsivity interactions one at a time for each independent variable. In this series of regression models, each independent variable, in turn, is entered into a model with all other independent and control variables and the IV*impulsivity interaction term in question. Each logistic regression model in the series will be estimated using Huber-White robust standard errors to partially account for potential correlation (Huber, 1967; White, 1980; White, 1982).

Mediating Effects

The third stage of the analysis examines two concepts (opportunity and perceptions) as mediators of the relationships between independent variables and diversion. Differences between diverters and non-diverters on the basis of the proposed mediators were evaluated at the bivariate level through a series of t-tests and chi-square tests. Proper temporal ordering for mediation models was established as illustrated in the figures below. Wherever possible, main effects preceded mediation variables, which preceded the dependent variable.

All models illustrated below hold constant the control variables outlined in the methods section and illustrated in Figure 4.1. All control variables are drawn from Wave 1. Figure 4.2 illustrates the proposed mediation effect of opportunity on the relationship between peer behavior (peer nonmedical use and peer diversion) and diversion as hypothesized previously (see hypotheses 8 and 9). Figure 4.3 illustrates the roles of personal opinions (namely perceived harm and perceived legal risk associated with nonmedical use and diversion of prescription drugs) in mediating the relationships between positive/negative messages and diversion (see hypotheses 10 through 13).

There are several ways to examine a mediation effect. The traditional approach involves meeting four criteria (Baron & Kenny, 1986). First, a relationship between the independent variables and the dependent variable must be established. Next, a relationship between the mediating variable and the dependent variable must be found. Then, a relationship between the independent variables and the mediating variable must be established. Finally, the relationship between the independent variables and the dependent variable must be partially or wholly dissolved when the mediating variable is added to the model with the independent variables. More contemporary approaches acknowledge the limitations of these criteria, especially using dichotomous variables, and incorporate better mechanisms to examine partial mediation.

Figure 4.2: Mediation effects of opportunity on the relationship between hypothesized peer variables and diversion

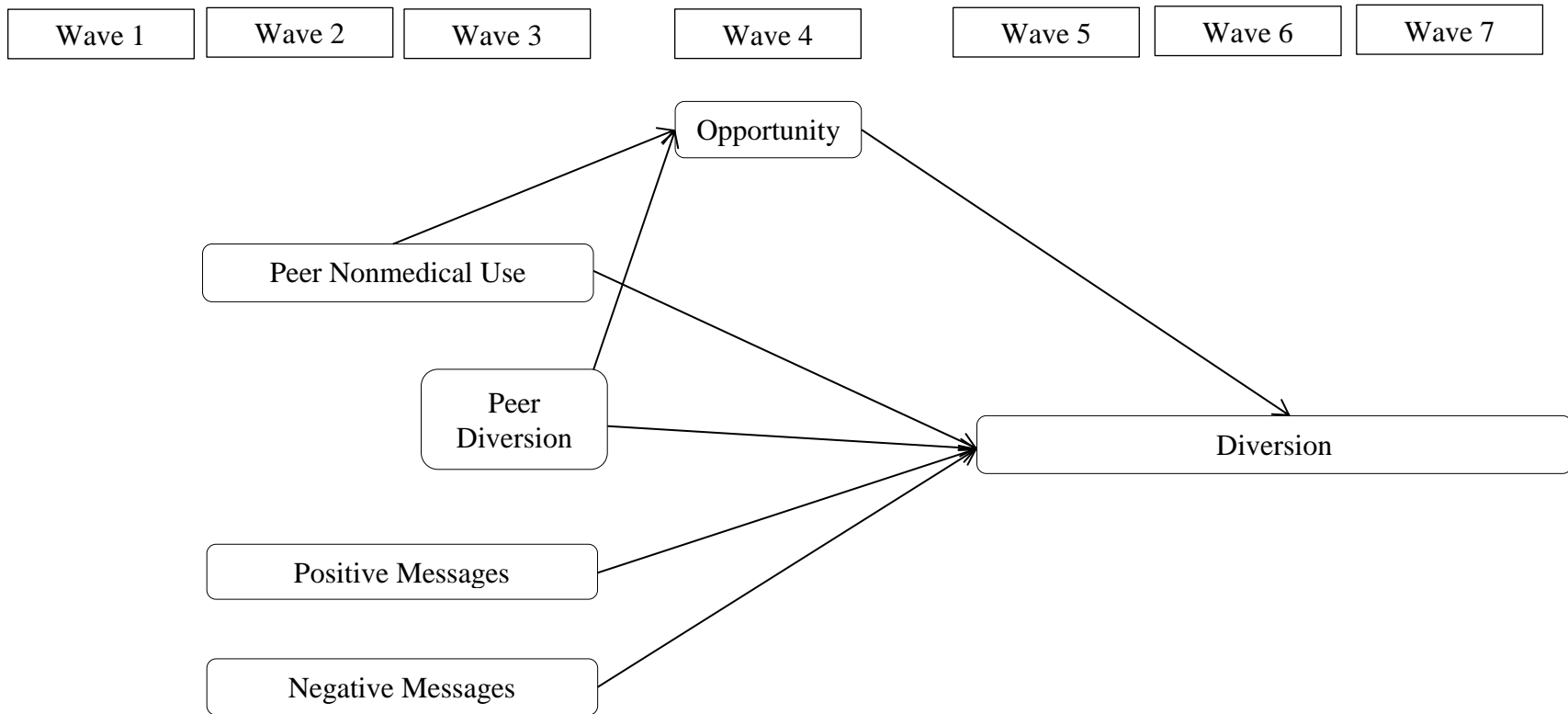
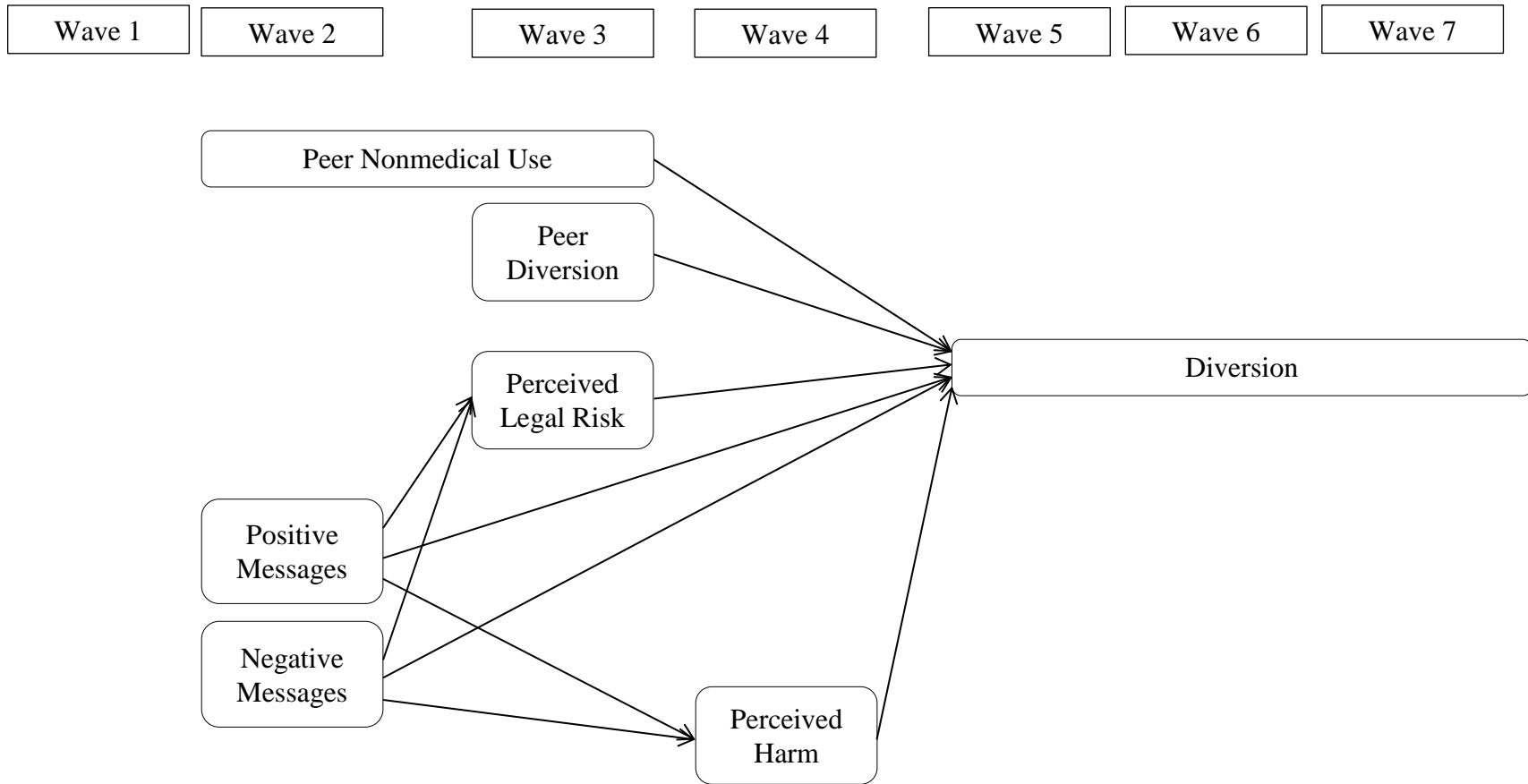


Figure 4.3: Mediation effects of perceptions on the relationship between hypothesized rational choice variables and diversion



Because the dependent variable and two of the three mediating variables are dichotomous, the “binary_mediation” command was used in Stata to estimate the indirect effects of the independent variables on the dependent variable. The advantage of this approach is in its ability to standardize coefficients across models. Since computing indirect effects involves multiple models, some of which are logistic, rescaling or standardizing the coefficients is recommended when examining mediation effects (Kenny, 2008; MacKinnon & Dwyer, 1993). The standard Sobel (1982) test is not recommended in this situation because the use of logistic regression analyses violates assumptions of this approach (namely the assumption of independent coefficients) (Imai, Keele & Tingley, 2010). This approach estimates three models controlling for all relevant variables: a) the effect of the independent variable on the dependent variable in the absence of the mediator, b) the effect of the independent variable on the mediator, and c) the effect of the independent variable and the mediator on the dependent variable. Upon rescaling the coefficients for these models, mediation effects are computed as the product of the coefficients relating the mediator to the dependent variable and the independent variable to the mediator (MacKinnon, Warsi & Dwyer, 1995). Using this approach, bootstrapping can be employed to obtain standard errors and 95% confidence intervals for the indirect effect of the independent variable on the dependent variable.

Summary

In summary, this study uses a sample of young adults to provide a comprehensive look at diversion by describing the breadth and scope of the behavior. It is among the first to attempt to tabulate the quantity of diversion occurring among any sample of individuals with legitimate prescriptions. Using a theoretical framework, the analyses

inform why diversion occurs, and what factors influence whether or not diversion takes place. These analyses fill many gaps in the knowledge relating to prescription drug diversion.

Chapter 5: Diversion

This chapter describes diversion-related behavior in the sample. It begins by outlining the routes of diversion (sharing, selling, or trading) and the quantity of diversion among the 119 diverters in the sample, providing much-needed detail on this understudied practice. Next, it documents who diverters are distributing their medication to and why. Third, reasons for refusing to divert prescription drugs when asked (among a subset of 95 individuals who refuse to divert) are summarized. Finally, diverters are compared to non-diverters on the basis of a variety of factors that could influence or be influenced by diversion (namely opportunity, prior experiences with diversion, and personal feelings about the practice).

Describing Diversion

Among the 502 participants in the study who were prescribed a controlled substance at some point during waves 5 through 7, 119 (23.7%) diverted a prescription drug at least once during the same time period. Sharing prescription drugs was the most common form of diversion ($n=109$, 21.7%) with 91.6% of diverters engaging in this type of distribution. Selling and trading of prescription drugs occurred at similar rates, with 4.8% ($n=24$) and 5.0% ($n=25$) of the sample (20.2% and 21.0% of diverters) selling and trading, respectively. Analgesics were the most common class of prescription drug diverted (Table 5.1), with 44.5% of diverters diverting a prescription analgesic at least once in waves 5 through 7.⁴ Stimulants were also a frequent target of diversion, with almost one third of diverters having shared, sold, or traded a stimulant.

⁴ Because participants may have diverted more than one class of prescription drug during waves 5 through 7, percentages may not add up to 100%.

Table 5.1: Diversion by drug type among diverters (*n* =119)

	Total <i>n</i> =119 %
Analgesic	44.5
Stimulant	31.1
Tranquilizer	17.6
Sedative	4.2

Table 5.2 summarizes the frequency and quantity of diversion among diverters (*n*=119) by study wave.⁵ For each wave, first total diversion (sharing, selling, and trading combined) is summarized, followed by additional descriptive data on each route of diversion separately.⁶ Unsurprisingly, later waves contain fewer diverters (*n*=40 in wave 7 as opposed to *n*=71 in wave 5) despite having a similar or higher number of individuals holding a prescription, likely because some participants age out of diversion. Diversion was infrequent, occurring fewer than 10 times per year, on average, in every wave. An analysis of variance (ANOVA) revealed that frequency of diversion did not differ significantly by wave (*p*=0.194).

On average, the number of pills typically distributed in a diversion encounter was fairly low (fewer than 10 pills diverted at a time in both waves for which data is available). Interestingly, the quantity of pills typically diverted at once appears almost twice as high in wave 7 as in wave 6.⁷ This difference is, in part, driven by the high quantity of pills sold in wave 7 by the few individuals who reported selling their prescriptions at that time. In combination with the frequency data, the total number of

⁵ The quantity of pills typically diverted at once and the amount of money made selling prescription drugs was unavailable for wave 5.

⁶ Because diverters could divert by multiple routes (e.g. both sharing and selling) in the same wave, a sum of individuals sharing, selling, and trading may exceed the number of total diverters in that wave. Additionally, because individuals could divert in more than one wave, a sum of individuals diverting from each wave will exceed 119.

⁷ Analyses revealed that this difference is not significant (*p*=0.192).

pills, on average, diverted per year is not negligible. For example, if in wave 6 the average diverter distributes a medication roughly five times, and distributes approximately three pills each time, this would total roughly 15 pills distributed by an average diverter per year. Depending on the amount of medication prescribed and the presence/absence of available refills, this could represent a substantial proportion of the medication prescribed to these individuals. Separate questions asked in waves 5 through 7 addressed only to participants who were prescribed a stimulant or analgesic in the past year investigated what percentage of the pills contained in their *most recent* prescription were diverted. Among those who diverted out of their most recent prescription for stimulants, the average percentage of pills diverted ranged from roughly 17% in wave 5 to 10% in wave 7.⁸ The average proportion of pills diverted from an analgesic prescription was higher, ranging from 13% in wave 5 to 26% in wave 6.⁹

Table 5.2 further demonstrates that the number of drugs diverted among diverters showed little variation. The majority of those who diverted distributed only a single drug. This may be due to limited opportunity (i.e. they only had one drug to divert) or to low demand (given the infrequency of diversion).

The majority of diverters in each wave reported sharing their medication, making sharing the most common route of diversion for all waves. Sharing behavior differed little by wave, suggesting a consistency among diversion behavior in waves 5 through 7 that justifies grouping these waves together for analysis.

⁸ For wave 5, among those who diverted out of their most recent stimulant prescription, the percentage of pills diverted ranged from 1% to 90% ($n=19$; $m=17.16$, $SD=22.49$). For wave 6, the percentage ranged from 1% to 50% ($n=11$; $m=13.91$, $SD=13.83$). For wave 7, the percentage ranged from 1% to 40% ($n=12$; $m=9.75$, $SD=12.92$).

⁹ For wave 5, among those who diverted out of their most recent analgesic prescription, the percentage of pills diverted ranged from 1% to 100% ($n=36$; $m=12.97$, $SD=19.92$). For wave 6, the percentage ranged from 1% to 90% ($n=14$; $m=25.71$, $SD=25.00$). For wave 7, the percentage ranged from 3% to 90% ($n=14$; $m=22.64$, $SD=30.55$).

Table 5.2: Descriptive statistics of diversion behavior among 119 young adult diverters

	Wave 5		Wave 6		Wave 7	
Total Diversion	<i>n</i> = 71		<i>n</i> = 56		<i>n</i> = 40	
	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)
Frequency of diversion		9.18 (16.83)		4.88 (7.96)		6.85 (12.05)
Quantity of pills diverted		-		3.02 (3.69)		6.01 (13.91)
Number of drugs diverted		1.14 (0.39)		1.14 (0.40)		1.13 (0.40)
Sharing	<i>n</i> = 67		<i>n</i> = 47		<i>n</i> = 35	
	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)
Frequency of sharing		6.03 (10.25)		4.62 (7.22)		4.91 (8.34)
Quantity of pills shared		-		3.01 (4.51)		3.79 (5.81)
Number of drugs shared		1.10 (0.35)		1.17 (0.43)		1.11 (0.43)
Selling	<i>n</i> = 17		<i>n</i> = 8		<i>n</i> = 5	
	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)
Frequency of selling		12.47 (22.61)		3.88 (5.46)		3.80 (3.11)
Quantity of pills sold		-		4.94 (3.34)		19.00 (34.23)
Number of drugs sold		1.24 (0.56)		1.13 (0.35)		1.20 (0.45)
Amount of money made		-		5.38 (3.11)		14.00 (20.21)
Trading	<i>n</i> = 17		<i>n</i> = 10		<i>n</i> = 4	
	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)
Frequency of trading		2.11 (2.23)		2.10 (1.60)		1.67 (1.15)
Quantity of pills traded		-		1.50 (0.97)		4.00 (5.20)
Number of drugs traded		1.06 (0.24)		1.00 (0.00)		1.25 (0.50)
Traded drugs for...						
Prescription Stimulant	47.1		10.0		25.0	
Prescription Analgesic	5.9		20.0		0.0	
Prescription Tranquilizer	35.3		10.0		75.0	
Prescription Sedative	11.8		10.0		0.0	
Illegal Drug	5.9		10.0		0.0	
Alcohol	0.0		20.0		0.0	

Small cell sizes with regard to selling and trading of prescription medication make detecting differences by wave impractical. However, despite the small sample sizes among traders of prescription drugs, it is interesting to note which medications were most in demand. In wave 5, prescription stimulants are the most common medication sought by diverters, perhaps because a higher proportion of individuals are in college or graduate school during this wave compared to other waves. A school environment may make prescription stimulants an attractive target due to the common practice among

nonmedical users of using stimulants as a study aid. Prescription tranquilizers also appear to be sought after, with both waves 5 and 7 showing a demand for this type of medication.

Table 5.3 describes the relationship between diverters and the individuals they were sharing, selling or trading to.¹⁰ For all routes of diversion (sharing, selling and trading), the majority of diverters diverted at least once to friends (84.4% of diverters who shared, 79.2% of those who sold, and 92% of those who traded medication). Additionally, over 10% of diverters who shared their medication and 8% of those who traded did so with relatives.¹¹ Unsurprisingly, transactions with acquaintances or strangers were rare when sharing or trading a medication, but much more common for selling prescription drugs (20.8% of those who sold medication did so to acquaintances, and 12.5% sold to strangers). This may be related to differing motivations on the part of diverters depending on the route of diversion. If the motivation for selling a prescription drug is to make money, sellers may be more inclined to sell to whoever will pay the price. Additionally diverters may vary their routes of diversion depending on the recipient; therefore it is possible that someone who would be willing to share a prescription drug with a friend would charge an acquaintance for the same substance. Other relationships between diverters and recipients are captured in the “other” category and seem to fall mostly in a relationship somewhere between friend and acquaintance.¹²

¹⁰ Because diverters could divert by multiple routes, the number of individuals sharing, selling and trading will not add up to 119. Percentages in Table 5.2 represent the percentage of diverters who have transacted with each type of recipient (friends, acquaintances, etc.). Because diverters could share, sell, or trade with multiple people, column percentages will not add up to 100%.

¹¹ The most common relative receiving diverted medication was a sibling.

¹² “Other” recipients of diverted medication included a variety of relationships including teammates, sorority/fraternity members (past and current), and former romantic partners.

Table 5.3: Relationship between diverters and recipients of diverted medication (*n* =119)

	Sharing <i>n</i> =109 %	Selling <i>n</i> =24 %	Trading <i>n</i> =25 %
Friend	84.4	79.2	92.0
Relative	12.8	0.0	8.0
Significant other	6.4	0.0	4.0
Acquaintance	2.8	20.8	0.0
Stranger	0.9	12.5	0.0
Other	6.4	8.3	0.0

Table 5.4: Percent of young adult diverters endorsing reasons for diverting their prescription drugs (*n* =119)

	Total <i>n</i> =119 %
Help someone get high	37.0
Help with a medical problem	29.4
Help someone study/concentrate	26.1
Help someone sleep/calm down	15.1
Didn't want/need medication	10.1
To make money	8.4
Recipient was already taking the medication	7.6
Recipient asked for it/generosity	5.9
To trade for other meds	2.5
Other	10.9

Given the importance of disrupting diversion behavior, Table 5.4 examines the reasons diverters give for distributing prescription drugs.¹³ Among the 119 individuals who engaged in diversion in waves 5 through 7, 37% reported at least once that they diverted a medication to someone so that the recipient could use it to get high. The prevalence of this motivation suggests that many nonmedical users do so for recreational

¹³ Because diverters could cite multiple reasons for diversion, percentages do not add up to 100.

reasons, and diverters may feel they are being helpful by providing substances for these purposes. Interestingly, several additional prevalent reasons for diversion include motivations that appear to be “helpful” in nature. Almost 30% of participants reported diverting a medication to help someone treat a medical problem. Although this remains problematic from a public health perspective given the absence of a clear diagnosis by a physician and an analysis of the safety and efficacy of using the medication diverted to treat the supposed illness, this suggests that some diverters may be operating under the assumption that they are doing a good deed. Additionally, over 26% reported diverting to help someone study or concentrate, and over 15% reported diverting to help someone sleep or calm down, again suggesting that nonmedical users may seek these substances to self-treat, and diverters may believe they are aiding recipients.

Other, more instrumental, concerns were also represented in diversion motivation. Although not among the most common reasons, a minority of diverters reported wanting to make money, or diverting because the other person involved in the transaction had a substance that the diverter wanted. What is concerning, however, is the casual nature of some of the responses given by diverters with regard to motivation. Over 10% reported that they diverted simply because they didn’t need the medication, and almost 6% diverted because the recipient asked them to. Such casual reasons demonstrate how normative diversion has become among some populations. In addition, 11% diverted for other reasons.¹⁴

¹⁴ “Other” reasons for diverting included evidence of peer pressure and special circumstances in which the individual opted to divert their medication.

Descriptive Statistics Regarding Refusal to Divert

In waves 6 and 7, individuals who were prescribed a medication were asked if they had ever refused to divert their medication when they were asked. Those who refused at least once (although they may or may not have diverted on other occasions) provided reasons for their refusal. Among the 95 participants who refused to divert in waves 6 and 7, 49 diverted at another point in time during the time frame in question, while 46 did not. Their reasons for declining to divert appear in Table 5.5. Efforts to itemize motivations demonstrated the variety of scenarios that emerge in the world of diversion. “Other” reasons for refusing to divert were largely situational, where specific factors of a given situation caused the participant to refuse to divert in that particular instance. Situational factors included not being offered enough money or not liking what the potential recipient had to trade, not knowing the potential recipient well enough or not liking the potential recipient, not being in the mood to divert, not thinking the potential recipient needed the medication, and self-described “laziness” where it would have required too much effort on the part of the diverter.

Table 5.5: Reasons given for not diverting by individuals who declined to divert (*n* =95)

	Total <i>n</i> =95 %
Didn't have meds to give	31.6
Perceived formal sanctions	30.5
Moral reasons	23.2
Perceived harm	19.0
Perceived informal sanctions	2.1
Other	37.9

Not having the medication readily available or not having enough medication to spare was the most commonly provided reason for refusing to divert, aside from

situational factors, with almost a third of those who refused to divert noting that it was a consideration. Interestingly, those who diverted on other occasions were more likely than those who did not divert to provide this reason (42.9% vs. 19.6%; $p=0.015$).

Additionally, almost one third (30.5%) of those who refused reported that they did not divert because they knew it was illegal and they did not want to get into trouble with the law. The difference between the prevalence of diverters and non-diverters reporting this concern approached significance, with 39.1% of non-diverters citing legal concerns, and 22.5% of diverters doing so ($p=0.078$). Moral reasons and concern about causing harm were also commonly provided reasons for refusing to divert.

These findings provide some support for hypothesis 1, predicting differences in reasons between diverters and non-diverters. Although small cell sizes hindered comparisons in some categories, the most commonly endorsed reasons (not having medication available or fearing formal sanctions) did indicate that diverters and non-diverters have different concerns about the process of diversion. It is unclear whether the marginal difference between the proportion of diverters and non-diverters citing perceived formal sanctions as a reason for refusal is due to differing beliefs regarding the legality of diversion or differing perceptions regarding the likelihood or severity of consequences resulting from diversion. There may be an experiential effect at work, with diverters, having successfully gotten away with the behavior previously, readjusting their perceived formal sanctions down.

Comparing Diverters to Non-Diverters

In order to better understand diversion behavior, the 119 diverters in the sample were compared to 383 non-diverters on the basis of several factors related to diversion.

Results are summarized in Table 5.5. Overall, over one third of individuals prescribed a drug during waves 5 through 7 had ever been approached to divert. Those who diverted in waves 5 through 7 were more likely to have been approached at some point to divert their medication, compared to those who did not divert (72.0% vs. 23.9%; $p < 0.001$). The overall frequency of opportunity during this time frame was low, with individuals being approached an average of fewer than two times per year. Unsurprisingly, those who diverted during this time were approached to divert on a significantly greater number of occasions than those who did not divert (5.42 vs. 0.23; $p < 0.001$). Additionally, the average age at which individuals were first approached to divert was 0.7 years older for diverters as opposed to non-diverters. This was surprising given that typically, early exposure increases one's risk for deviant behavior.

With regard to experiences or beliefs relating to diversion, only a small minority (less than 1% of the sample) reported ever personally experiencing sanctions as a result of their diversion. For those who did experience sanctions, they typically took the form of punishment by parents, rather than formal sanctions. However, over one-fifth of the sample had heard of others experiencing sanctions as a result of diversion, with individuals reporting a variety of consequences ranging from arrest to problems with friends and family.

Less than 10% of the sample overall felt that diversion was simply not a problem. However, in support of hypothesis 2, the percentage of diverters who felt it wasn't a problem was more than twice as high as the percentage of non-diverters who thought so. The majority of individuals noted that one should not divert for health and/or legal reasons, with approximately half of diverters endorsing this option, and over three-

Table 5.6: Descriptive statistics of opportunity and diversion perceptions for individuals who did and did not divert in waves 5 through 7

	Total <i>n</i> =502		Non-Divertter <i>n</i> =383		Divertter <i>n</i> =119		<i>p</i>
	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	
Opportunity							
Ever asked to divert	35.4		23.9		72.0		<0.001
Age at first opportunity		19.45 (2.25)		19.11 (2.31)		19.81 (2.14)	0.039
Frequency of opportunity in waves 5-7		1.55 (5.53)		0.23 (0.84)		5.42 (9.94)	<0.001
Perceptions							
Personal sanctions (% experiencing sanctions)	0.6		0.6		0.8		0.736
Vicarious sanctions (% hearing of sanctions)	21.8		20.7		25.2		0.297
Personal opinion							<0.001
It's not a problem	9.2		7.2		15.5		
Shouldn't do it for health/legal reasons	76.0		83.5		51.7		
Depends on circumstances	14.9		9.3		32.8		
Parental disapproval (% disapprove)	62.0		64.4		54.3		0.050

quarters of non-diverters saying so. Additionally, almost one-third of diverters noted that their opinion relating to diversion was dependent on the circumstances, while less than 10% of non-diverters thought so. Finally, a greater proportion of non-diverters than diverters felt that their parents would not approve of them diverting their prescriptions, suggesting that parental influences may be felt even in young adulthood.

Summary

In summary, these data suggest several things. First, diversion behavior is fairly consistent across time in waves 5 through 7. Diversion varied little by wave, giving no evidence of an escalation in behavior over time. In contrast, much of the data seems to suggest either consistency or a de-escalation in subsequent waves. Second, the vast majority of diverters appear to distribute their prescription drugs at least partially in an attempt to be “helpful.” This may suggest that many are unaware or unconcerned about potential consequences and may point to a potential target for prevention efforts. Third, when choosing not to divert, many do so not out of concerns regarding sanctions or harm, but due to more immediate factors regarding availability of medication or their personal feelings in the situation, which indicates that little deterrence exists with regard to this behavior. Finally, diverters and non-diverters differed predictably on diversion-related factors with diverters on average having greater exposure to opportunities and being less inclined to think of diversion as a problematic behavior, compared to non-diverters. In combination, these conclusions point to several factors that might influence the decision of whether or not to divert, including peer environment and what types of messages individuals have been exposed to regarding diversion. The following chapter explores

risk factors for diversion controlling for demographic factors and characteristics previously found to be associated with diversion behavior.

Chapter 6: Main Effects

This chapter explores the relationships between hypothesized risk factors and diversion. Analyses in this chapter are limited to those for whom no data are missing ($n=483$ in most cases). These results address hypotheses three through seven (aims 3 and 4) regarding main effects of risk factors on diversion and moderation of these factors. First, bivariate differences between diverters and non-diverters on the basis of risk and control variables are explored. Next, a series of logistic regressions examine the effects of risk factors on diversion, controlling for demographics and other variables previously associated with diversion. These analyses are repeated using additional variables and in different samples in order to determine how robust they are. Finally, one of the control variables, impulsivity, is examined as a potential moderator of the relationships between risk factors and diversion.

Bivariate Differences

Table 6.1 illustrates the sample characteristics of 483 individuals prescribed at least one drug in Waves 5 through 7 on the basis of risk and control factors. The differences between individuals who diverted at least once in Waves 5 through 7 ($n=113$) and individuals who did not ($n=370$) are also shown. On average, diverters had a greater average number of peers perceived to use prescription drugs nonmedically compared to non-diverters ($m=2.62$, $SD=3.71$ vs. $m=1.01$, $SD=1.67$; $p<0.001$). Additionally, the average percentage (in increments of 10) of peers who were thought to divert annually was considerably higher for diverters than non-diverters ($m=3.38$, $SD=2.54$ vs. $m=1.95$, $SD=1.85$; $p<0.001$). Interestingly, on average diverters were exposed to both a greater

Table 6.1: Sample characteristics of 483 individuals prescribed at least one drug in waves 5 through 7 by diversion status

	Total <i>n</i> =483		Non-Diverter <i>n</i> =370		Diverter <i>n</i> =113		<i>p</i>
	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	%	<i>m</i> (<i>SD</i>)	
Independent Variables							
Perceived peer nonmedical use		1.39 (2.41)		1.01 (1.67)		2.62 (3.71)	<0.001
Perceived peer diversion		2.29 (2.12)		1.95 (1.85)		3.38 (2.54)	<0.001
Positive messages		7.64 (3.06)		7.20 (3.00)		9.06 (2.80)	<0.001
Negative messages		11.11 (3.92)		10.82 (3.91)		12.06 (3.83)	0.003
Control Variables							
Male	38.5		36.5		45.1		0.098
White	74.5		73.2		78.8		0.239
Family income		7.58 (3.46)		7.72 (3.58)		7.09 (3.01)	0.087
Early conduct problems		2.97 (2.29)		2.77 (2.19)		3.63 (2.48)	<0.001
Lifetime substances used at baseline		1.52 (1.65)		1.29 (1.41)		2.28 (2.08)	<0.001
Impulsive sensation seeking		3.60 (2.13)		3.52 (2.09)		3.88 (2.25)	0.110

number of positive messages regarding nonmedical use and a greater number of negative messages regarding nonmedical use. This may indicate that diverters are more likely to seek out information on nonmedical use in general, thus exposing them to both positive and negative messages regarding nonmedical use. It is also possible, given the differences in peer nonmedical use and diversion that diverters are more likely to interact with individuals who engage in nonmedical use and diversion, and are consequently more likely to be exposed to messages about this topic whether or not they deliberately seek it.

Unsurprisingly, diverters also used more substances on average ($p < 0.001$), and experienced a greater number of early conduct problems ($p < 0.001$) compared to non-diverters. These data support prior research demonstrating that diversion is part of a greater pattern of deviant behavior. Interestingly, although prior research found sex differences, the difference between diverters and non-diverters on the basis of sex was only marginally significant ($p = 0.098$), although the direction was consistent with prior research (where a greater percentage of males divert). The difference in family income was also marginally significant, with diverters reporting a lower family income, on average, than non-diverters. These findings of marginal significance may be related problems with statistical power, given that there are only 113 diverters in the sample.

Main Effects of Risk Factors on Diversion

Logistic regression analyses were undertaken to test main effects of perceived peer behavior and exposure to messages on the likelihood of young adult diversion. These results are summarized in Table 6.2. Hypotheses 3 through 6 are tested by examining the effects of perceived peer nonmedical use, perceived peer diversion, exposure to positive messages relating to prescription drugs and exposure to negative

messages relating to prescription drugs on diversion, controlling for demographics and other factors previously found to be associated with diversion behavior. Model 1 in Table 6.2 examines these variables.¹⁵

Controlling for sex, race, family income, conduct problems and substance use, support was found for hypothesis 3 examining the effects of perceived peer nonmedical use on diversion. The number of close friends perceived to use a prescription drug nonmedically is positively associated with diversion, such that each additional nonmedically using peer increases the likelihood of diversion by approximately 12% ($OR=1.12$, $95\%CI=1.01-1.24$, $p=0.029$). Furthermore, consistent with hypothesis 4, the perceived percentage of peers who divert a prescription drug was positively associated with diversion likelihood ($p=0.001$), such that as the percentage of peers perceived to divert increased by 10%, the likelihood of diversion increased by 21%.¹⁶ Finally, exposure to positive messages regarding nonmedical use is significantly associated with an increased likelihood of diversion ($p=0.008$) where each additional positive message heard on average increased the likelihood of diversion by 13%, providing support for hypothesis 5 regarding the relationship between positive messages and diversion. Little support was found for hypothesis 6 regarding the relationship between negative messages

¹⁵ Tests were run to examine the risk of multicollinearity, but results suggest no cause for concern, with variance inflation factors (VIFs) ranging from 1.01 to 1.55.

¹⁶ Because Model 1 was limited to individuals who were prescribed a substance in waves 5, 6, or 7 (the waves from which the dependent variable was drawn), several individuals ($n=21$) who diverted a drug for which they did not have a current prescription were excluded from the model. It is likely that those who divert who were not currently prescribed a substance may differ systematically from those who were prescribed a substance since by definition the latter group must have already sought out a drug from some source in order to have the substance to divert. When Model 1 is re-estimated to include individuals who were not prescribed a substance in the given time frame (model $n=503$), peer nonmedical use and peer diversion retain their positive associations with diversion, with little change in effect sizes ($B=0.10$, $SE=0.05$, $OR=1.11$, $p=0.046$ and $B=0.20$, $SE=0.06$, $OR=1.22$, $p<0.001$) while the effect size for positive messages decreases and becomes only marginally significant ($B=0.08$, $SE=0.05$, $OR=1.08$, $p=0.078$). It is possible diverters who seek out drugs to divert are less susceptible to messaging than diverters with a prescription who may be less likely to engage in diversion overall.

and diversion, given that exposure to negative messages was unrelated to diversion in the multivariate analysis, despite its significant bivariate relationship. Interestingly, although the relationship is not significant, the effect size is positive. It is possible that diverters are more likely to be exposed to information regarding nonmedical use (both positive and negative) in general, either because they seek it out or because they find themselves in positions or peer groups where such topics are frequently discussed. If this is the case, given the modest, positive relationship between exposure to positive messages and exposure to negative messages ($r=0.45$), it is unsurprising that subsequent analyses revealed that the exclusion of positive messages from the model results in a significant effect of exposure to negative messages on diversion.

Among the demographic factors, only family income was associated with diversion, such that participants from a family of a lower socio-economic status were more likely to divert. Sex was unrelated to diversion in this model, although prior research in younger samples has demonstrated sex differences, and a marginally significant difference was found at the bivariate level. It is possible that trends in prescription diversion may be changing such that sex differences are narrowing across the board, or that less of a sex gap appears among young adult samples compared to adolescent or college student samples. However, given the limited number of diverters in the sample, the absence of a sex difference may be due to lack of statistical power. Among control variables, consistent with prior research, the number of substances used in their baseline interview was positively associated with diversion. Again, interestingly,

Table 6.2: Logistic regression analyses examining the main effects of perceived peer behavior and positive and negative messages on young adult diversion

	Model 1 <i>n</i> = 483			Model 2 <i>n</i> = 435		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Independent Variables						
Perceived peer nonmedical use	0.11	0.05	1.12*	0.13	0.06	1.14*
Perceived peer diversion	0.19	0.06	1.21***	0.18	0.07	1.20**
Positive messages	0.14	0.05	1.15**	0.12	0.06	1.13*
Negative messages	0.03	0.04	1.03	0.05	0.04	1.05
Prior diversion				1.35	0.28	3.87***
Control Variables						
Male	0.18	0.26	1.20	0.25	0.28	1.28
White	0.16	0.29	1.18	0.16	0.32	1.18
Family income	-0.11	0.04	0.89**	-0.11	0.04	0.90*
Early conduct problems	0.08	0.06	1.09	0.06	0.06	1.06
Lifetime substances used at baseline	0.15	0.07	1.16*	0.14	0.08	1.15
Impulsive sensation seeking	-0.07	0.06	0.93	-0.10	0.07	0.90

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

early conduct problems did not predict diversion among young adults, although it was significantly related at the bivariate level.¹⁷

Because it was assumed that prior diversion behavior would be the strongest predictor of future diversion and could potentially mediate the effects of other variables on diversion, the initial model was estimated without controlling for prior diversion. Model 2 in Table 6.2 replicates the main effects model with the inclusion of prior diversion.¹⁸ Unsurprisingly, engaging in diversion prior to wave five increased the likelihood of diverting in later years by a factor of almost 4 ($p < 0.001$). Additionally, inclusion of this variable improves the model fit considerably ($AIC = 413.859$ in Model 2 vs. $AIC = 472.589$ in Model 1).

Although the two models may not be completely comparable given the sample size reduction, results show that the inclusion of this variable in Model 2 changes little with regard to support for hypotheses 3 through 6. Perceived peer nonmedical use remained positively and significantly associated with diversion when controlling for prior diversion ($p = 0.023$), as did the perceived percentage of peers who divert ($p = 0.005$). Additionally, the main effect of positive messages on young adult diversion remained significant with the inclusion of prior diversion ($p = 0.029$). These findings demonstrate consistent support for hypotheses 3, 4 and 5, even after accounting for prior diversionary behavior. Effect sizes remained largely unchanged. The effect size of perceived peer nonmedical use increases slightly (from 1.12 to 1.14) with the inclusion of prior

¹⁷ Subsequent analyses revealed that the inclusion of lifetime substance use renders the effect of early conduct problems on diversion not significant. This is likely due to the fact that early conduct problems are associated with lifetime substance use. Although the conduct problems and substance use variable were only modestly correlated ($r = .29$), they are likely both representing the same realm of early delinquent or problematic behavior.

¹⁸ These analyses are limited to those for whom prior diversion behavior is available ($n = 435$).

diversion, while those of perceived peer diversion and positive messages decreases slightly (from 1.21 to 1.20 and from 1.15 to 1.13). These differences may be due to the differences in sample size between the two models. The inclusion of prior diversion also lends stronger support to the observed peer effects. It is often difficult to determine whether the correlation between peer behavior and offender behavior is due to peer behavior influencing offender behavior or offenders choosing to associate with like-minded peers. Here, peer nonmedical use and peer diversion precede the dependent variable in time, and controlling for prior diversion behavior helps to illustrate that to an extent peer behavior does appear to have some influence on whether or not an individual engages in offending during young adulthood, regardless of other factors.

Moderation Effects of Impulsivity

The fourth aim of the study, relating to hypothesis 7 predicting a moderating effect of impulsivity on the relationships between risk factors and diversion was also explored. Given that prior literature has shown that some individuals are less prone to be influenced by external factors such as messaging or peer behavior because they are highly impulsive (Gardner, Dishion & Connell, 2008; Nagin & Pogarsky, 2003) additional analyses examined whether impulsivity interacted with any of the observed main effects (peer nonmedical use, peer diversion, and exposure to positive messages). For each interaction effect of interest, Model 2 was re-estimated to include impulsivity and the interactive term of interest and run with robust standard errors (Huber-White correction) to partially relax the assumption of independent standard errors. No interaction effect was found with exposure to positive messages or peer nonmedical use; however, interestingly, an interaction exists between impulsivity and peer diversion

($B=0.08$, $SE=0.03$, $OR=1.08$, $p=0.008$; Table 6.3). Post-estimation examination of predicted probabilities (Table 6.4) suggests that among individuals who perceive peer diversion to be low, highly impulsive individuals are less than half as likely to divert as individuals with low impulsivity. This may indicate that for individuals with little exposure to diversion (i.e., those who report a smaller percentage of peers diverting) diversion is based more on a conscious choice rather than an impulsive decision. The likelihood of diversion was statistically similar for individuals with low peer diversion and low impulsivity, high peer diversion and low impulsivity and high peer diversion and high impulsivity.

Table 6.3: Logistic regression analysis examining the moderating effect of impulsivity on the relationship between perceived peer diversion and young adult diversion ($n = 435$)

	<i>B</i>	<i>SE</i>	<i>OR</i>
Independent Variables			
Perceived peer nonmedical use	0.14	0.06	1.15*
Perceived peer diversion	-0.11	0.13	0.90
Positive messages	0.13	0.05	1.13*
Negative messages	0.06	0.04	1.06
Prior diversion	1.31	0.29	3.70***
Control Variables			
Male	0.32	0.28	1.37
White	0.01	0.32	1.01
Family income	-0.12	0.05	0.89**
Early conduct problems	0.04	0.06	1.04
Lifetime substances used at baseline	0.15	0.08	1.16
Impulsive sensation seeking	-0.31	0.10	0.73***
Interaction Variables			
Impulsive sensation seeking * Perceived peer diversion	0.08	0.03	1.08**

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 6.4: Predicted probabilities of diversion based on levels of impulsivity and perceived peer diversion (*n* =435)

		Perceived peer diversion			
		Low		High	
		<i>Predicted probability</i>	<i>95% Confidence Interval</i>	<i>Predicted probability</i>	<i>95% Confidence Interval</i>
Impulsivity	Low	0.254	0.160-0.348	0.2370	0.143-0.332
	High	0.107	0.059-0.155	0.209	0.149-0.269

Additional Models to Examine Main Effects

Because many college students may graduate during or after wave 5, rather than wave 4, as a traditional college trajectory would expect, supplemental analyses examined the main effects of the hypothesized independent variables on diversion limiting the diversion outcome to waves 6 and 7 in order to ensure the robustness of the findings.¹⁹ Given the transitional nature of wave 5 for many participants, grouping the data in this way was a logical extension of earlier models. While a typical college trajectory usually culminates after four years, many students do not graduate until year 5, suggesting that a portion of individuals may still be enrolled in college at wave 5. Since a college environment includes a great deal of interaction with same-age peers and a high demand for certain types of prescription drugs, such as stimulants, one would expect diversion to be more likely to occur among those still in college. Although it is not possible to definitively determine when/if all participants graduated from college, condensing the time frame of the dependent variable to waves 6 and 7 reduces the likelihood that

¹⁹ Small cell sizes made it unreasonable to predict diversion in each year individually, especially controlling for prior diversion (with one wave containing as few as 37 diverters, only 12 of whom had not previously diverted).

participants have not yet graduated from college and makes the sample more representative of a working/graduate school attending young adult population, rather than a college-attending population. To that end, the models were re-estimated to examine if limiting diversion to waves 6 and 7 would change the results in any meaningful way, which might indicate some type of lifestyle change.²⁰

Results were similar to those in Table 6.2 with one notable exception. As illustrated in Model 3 presented in Table 6.5, similar to earlier models, perceived peer nonmedical use of prescription drugs and perceived peer diversion are significantly associated with diversion in waves six and seven. Effect sizes were similar to those observed in earlier models, given the differences in sample size. Level of exposure to positive messages is not significantly associated with diversion, nor is exposure to negative messages. The finding that positive messages are no longer associated with diversion could be related to the years of measurement for the variables in question. Among the main effect variables, positive and negative messages were measured only in waves 2 and 3, resulting in at least a three year time lag between the measured exposure to these messages and the diversion behavior being studied. It is possible that the effect of exposure to positive messages decays after a period of time, resulting in the difference between the models. Both perceived peer nonmedical use and perceived peer diversion were last measured in a wave more proximal to the outcome (wave 5 for peer nonmedical use and wave 4 for peer diversion). However, given the difference in sample size between the two models, it is also possible that the failure of positive messages to achieve

²⁰ For these supplemental analyses, the sample was limited to those who had been prescribed a medication in waves 6 or 7. All variables were recalculated using the most proximal measures available. To this end, both perceived nonmedical use by peers and prior diversion were recalculated as described in the methods section to incorporate data collected in wave 5.

significance is related to statistical power. Among control variables, only family income predicted diversion.

Table 6.5: Logistic regression analyses examining the main effects of perceived peer behavior and positive and negative messages on diversion occurring in waves 6 or 7

	Model 3 <i>n</i> = 448			Model 4 <i>n</i> = 428		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Independent Variables						
Perceived peer nonmedical use	0.12	0.06	1.13*	0.13	0.06	1.14*
Perceived peer diversion	0.17	0.07	1.19*	0.18	0.07	1.19*
Positive messages	0.11	0.06	1.11	0.06	0.06	1.07
Negative messages	0.01	0.04	1.00	-0.01	0.04	0.99
Prior diversion				1.21	0.31	3.35***
Control Variables						
Male	0.37	0.30	1.44	0.47	0.31	1.60
White	0.59	0.37	1.81	0.73	0.39	2.07
Family income	-0.09	0.05	0.91*	-0.07	0.05	0.93
Early conduct problems	0.08	0.06	1.09	0.05	0.07	1.05
Lifetime substances used at baseline	0.12	0.08	1.13	0.12	0.09	1.12
Impulsive sensation seeking	-0.04	0.07	0.96	-0.05	0.07	0.95

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Model 4 in Table 6.5 illustrates that controlling for prior diversion behavior (diversion occurring prior to wave 6) does little to change the model. Perceived peer nonmedical use and perceived peer diversion remain positively related to diversion while positive and negative messages remained unrelated to wave 6 and 7 diversion. Effect sizes of perceived peer nonmedical use and diversion were largely consistent with the previous model. Unsurprisingly, and consistent with earlier models, prior diversion behavior was strongly associated with diversion during this time period, with previous diverters almost 3.5 times as likely to divert during waves 6 and 7 as individuals who had not previously engaged in diversion.

Summary

The consistent findings of relationships between perceived peer nonmedical use and diversion as well as perceived peer diversion and diversion support hypotheses 3 and 4 and lend credence to the connection between perceived peer behavior and offending, even in young adults. It is possible that these relationships are more representative of simple opportunity than any sort of peer influences or peer pressure. Being surrounded by individuals who use prescription drugs nonmedically would logically increase the likelihood of a friend asking for a medication that is prescribed to you. In order to explore this possibility, the following chapter will examine opportunity as mediating the relationship between peer-related variables and diversion.

Similarly, support was found for hypothesis 5 relating exposure to positive messages regarding nonmedical use to the decision to divert. This may indicate that diverters think they are being helpful, or at the very least do not feel that they are causing harm. It is interesting that when limiting the analysis to only look at diversion in later

waves (Table 6.3), exposure to positive messages is no longer significantly related to diversion. It is possible, given the time elapsed between exposure to messages and diversion, that the effects of these messages can decay over time. Interestingly, no support was found for the hypothesized relationship between exposure to negative messages and diversion. As a next step, the following chapter will explore the possibility that exposure to these types of messages impact diversion indirectly by informing and individual's own perceptions regarding the wisdom of nonmedical use and diversion.

Finally, with regard to hypothesis 7 examining the role of impulsivity as moderating the relationships between proposed independent variables and diversion, it was expected that the impact of peer- and choice-related variables may not be similar for individuals with different levels of impulsivity. Analyses revealed that perceived peer diversion, specifically, was moderated by impulsivity, while the other independent variables (perceived peer nonmedical use, and messages) were not. Interestingly, perceiving a low percentage of peers who divert appears to be a protective factor for individuals with high impulsivity, but not individuals with low impulsivity, perhaps suggesting that less impulsive individuals are diverting for reasons other than simple exposure to the practice.

The following chapter extends the current analyses by examining variables that possibly mediate the relationships observed above. It is possible that some of the above independent variables operate indirectly on diversion through other means not accounted for in the above models. Chapter 7 explores this possibility with three hypothesized mediating variables: opportunity, perceived legal risks of diversion, and perceived health risks of nonmedical use.

Chapter 7: Mediation Analyses

This chapter examines possible mediators of the relationships observed in the previous chapter. Two concepts are proposed as potential mediators. The first is the idea of opportunity. It is possible that the peer-related variables found to be associated with diversion (perceived peer nonmedical use and perceived peer diversion) may have an indirect relationship on diversion by influencing the likelihood that a demand for prescription drugs exists among the potential diverter's peers. An individual holding a prescription in a peer group where there is a strong demand for diverted medication may be more likely to distribute their medication than someone who faces little demand among their peer group. The second mediating concept is that of one's own personal perceptions regarding nonmedical use and diversion. This chapter will explore whether or not the positive and negative messages heard by participants regarding prescription drugs may have an indirect effect on diversion by helping to influence perceptions held by participants regarding the potential legal risk and physical harm associated with diverting. It is possible that hearing a variety of positive messages about prescription drugs may decrease one's perception of any risk or harm associated with their distribution and use, while hearing a large number of negative messages would have the opposite effect, increasing one's perception that diverting is legally risky and potentially dangerous to the recipient. The first section in the chapter addresses the role of opportunity as discussed in hypotheses 8 and 9.²¹ The second section of the chapter focuses on analyses regarding the role of individual perceptions predicted in hypotheses

²¹ For all mediation analyses examining opportunity, variables for perceived peer nonmedical use and perceived peer diversion were recalculated as illustrated by Figure 4.2 in the analysis section to accommodate temporal ordering concerns. In addition, analyses were limited to those for whom opportunity data in wave 4 were available. (Model $n=329$.)

10 through 13.²² The chapter concludes with a final model predicting diversion that includes all main effects and all the proposed mediators discussed in the current chapter. Reductions in sample size for these mediation models resulted in decreased statistical power. Consequently, results found to be marginally significant ($p \leq 0.10$) are noted and discussed.

Opportunity

Two hypotheses explore the potential mediating effect of opportunity on the relationship between peer-related diversion behavior and diversion. The two hypotheses are illustrated below in Figures 7.1 and 7.2. Hypothesis 8 predicts that the relationship between perceived peer nonmedical use and young adult diversion is mediated by opportunity. Similarly, hypothesis 9 predicts that perceived peer diversion has an indirect effect on young adult diversion, operating through opportunity. Prior research has highlighted the importance of opportunity in crime commission. However, these specific effects are hypothesized because earlier research has speculated that associations with deviant others (in this case, those who are perceived to use prescription drugs nonmedically or divert prescription drugs) may impact opportunity for law-breaking behavior (Sutherland, 1944).

²² For all mediation analyses examining perceptions, variables for perceived peer nonmedical use, perceived peer diversion, positive messages and negative messages were recalculated as illustrated by Figure 4.3 in the analysis section to accommodate temporal ordering concerns. Additionally, analyses involving perceived legal risk were limited to those for whom data on perceived legal risk was available (model $n=445$) and analyses involving perceived harm were limited to those for whom data on perceived harm was available (model $n=444$).

Figure 7.1: Illustration of the proposed mediating effect of opportunity on the relationship between perceived peer nonmedical use and young adult diversion

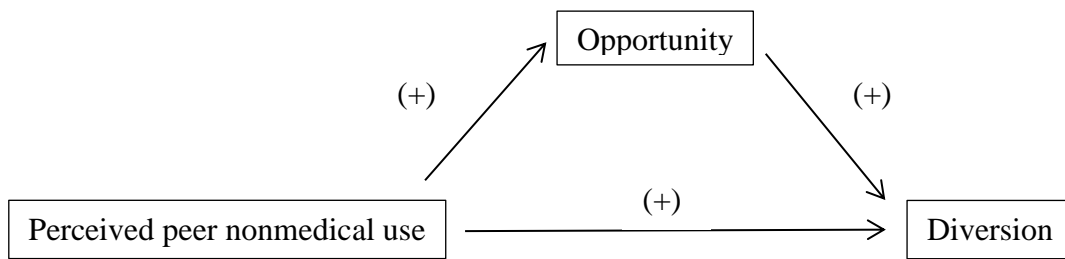
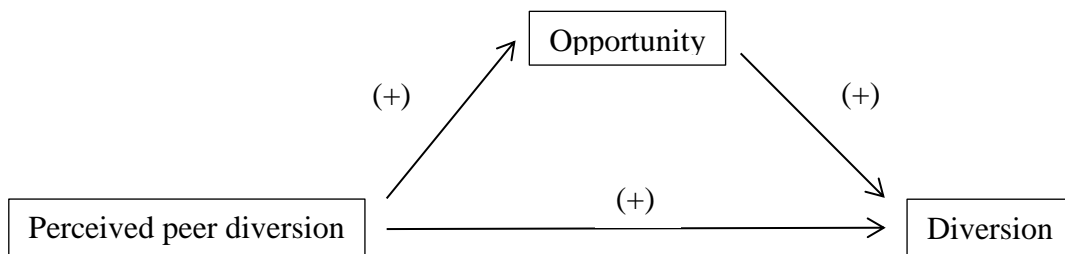


Figure 7.2: Illustration of the proposed mediating effect of opportunity on the relationship between perceived peer diversion and young adult diversion



Because the focus on the role of opportunity has to do with demand for prescription drugs, opportunity was operationalized as the number of times in the fourth wave the potential diverter was approached by peers asking them to share, sell, or trade their prescription drugs. This question was only asked of those who reported having a prescription in the fourth wave; thus, analyses for this relationship were limited to these individuals ($n=329$; 89 diverters and 240 non-diverters).

As expected, on average diverters had a significantly greater number of opportunities for diversion compared to non-diverters ($m=10.70$, $SD=2.45$ vs. $m=1.68$, $SD=0.60$; $p<0.001$). Results from the series of regression analyses examining the mediating effect of opportunity are shown in Table 7.1. The first model in the table estimates the direct effects of perceived peer nonmedical use and perceived peer diversion on young adult diversion. Among this subsample of individuals, perceived peer

nonmedical use is marginally associated with diversion ($p=0.09$). Although it is possible for mediation to exist in the absence of a significant relationship between the independent and dependent variable or with only a marginally significant relationship (Judd and Kenny, 1981; McFatter, 1979; Rucker, Preacher, Tormala & Petty, 2011), it is unlikely in this situation given the predicted directionality of relationships. However, the second model illustrates that perceived peer nonmedical use was significantly related to opportunity. When, in the third model, opportunity and perceived peer nonmedical use were simultaneously entered into a model predicting diversion, opportunity was significantly associated with diversion, but perceived peer nonmedical use was not. The effect size of perceived peer nonmedical use did change marginally with the inclusion of opportunity in the model.

As previously observed in other models, perceived peer diversion is significantly and positively associated with diversion, although the effect size is reduced from that observed in earlier models in Chapter 6. The second model estimates the effects of the independent variables on opportunity. Perceived peer diversion is significantly and positively associated with opportunity. The third model estimates the effects of both opportunity and perceived peer diversion on diversion. A greater number of diversion opportunities are significantly associated with a greater likelihood of diversion. Additionally, perceived peer diversion is still significantly associated with young adult diversion.

With regard to hypothesis 8 predicting that opportunity mediates the relationship between peer nonmedical use and diversion, the marginal direct relationship between perceived peer nonmedical use and diversion suggests that it may be difficult to detect

Table 7.1: Regression analyses examining the mediating effects of opportunity on young adult diversion ($n=329$)

	Logistic Regression DV: Diversion			Linear Regression DV: Opportunity			Logistic Regression DV: Diversion		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	
Mediator Variables									
Opportunity						0.03	0.01	1.03*	
Independent Variables									
Perceived peer nonmedical use	0.10	0.06	1.11†	0.89*	0.37	0.09	0.07	1.09	
Perceived peer diversion	0.14	0.05	1.15**	1.08***	0.03	0.12	0.06	1.13*	
Positive messages	0.15	0.06	1.16*	-0.03	0.33	0.15	0.06	1.17*	
Negative messages	0.06	0.04	1.06	0.25	0.24	0.05	0.04	1.06	
Control Variables									
Male	-0.07	0.30	0.93	0.93	1.72	-0.10	0.31	0.90	
White	-0.02	0.37	0.98	-2.11	1.99	0.02	0.38	1.02	
Family income	-0.14	0.05	0.87**	-0.46*	0.22	-0.13	0.05	0.88**	
Early conduct problems	0.05	0.07	1.05	1.11**	0.37	0.02	0.07	1.02	
Lifetime substances used at baseline	0.16	0.09	1.17	0.10†	0.54	0.15	0.09	1.17†	
Impulsive sensation seeking	-0.09	0.07	0.92	0.21	0.40	-0.10	0.07	0.91	

† $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

evidence of a mediating relationship. Bootstrapped results for this model yielded 95% confidence intervals that crossed zero, indicating that no indirect effect was present. It is possible that the reduced sample size of these models inhibits the ability to detect a mediating effect. However, hypothesis 9 predicting the mediating role of opportunity on the relationship between perceived peer diversion was better supported. Although the main effect of perceived peer diversion decreased only slightly with the inclusion of opportunity, bias-corrected bootstrap 95% confidence intervals of the observed effects demonstrate a significant indirect effect of peer diversion on diversion ($B=0.04$, $95\%CI=0.01-0.22$), a significant direct effect of peer diversion on diversion ($B=0.16$, $95\%CI=0.01-0.34$), and a significant total effect ($B=0.20$, $95\%CI=0.02-0.34$). Using standardized coefficients, the proportion of the total effect mediated by opportunity is estimated as 0.21.

Perception

Individual perceptions were also predicted to mediate the relationships between diversion and messages heard regarding prescription medication. For the purpose of these analyses, two types of perceptions are examined. First is the perceived legal risk associated with diverting prescription drugs, and second is the perceived harm that could result from using prescription drugs nonmedically. Hypothesis 10 predicts that hearing a greater number of positive messages about prescription drugs will result in a low perception of legal risk which in turn will be associated with a greater likelihood of diversion. Hypothesis 11 predicts that perceived legal risk mediates the relationship between negative messages and diversion. The direction of relationships in these hypotheses are illustrated below in Figures 7.3 and 7.4.

Figure 7.3: Illustration of the proposed mediating effect of perceived legal risk on the relationship between positive messages heard and young adult diversion

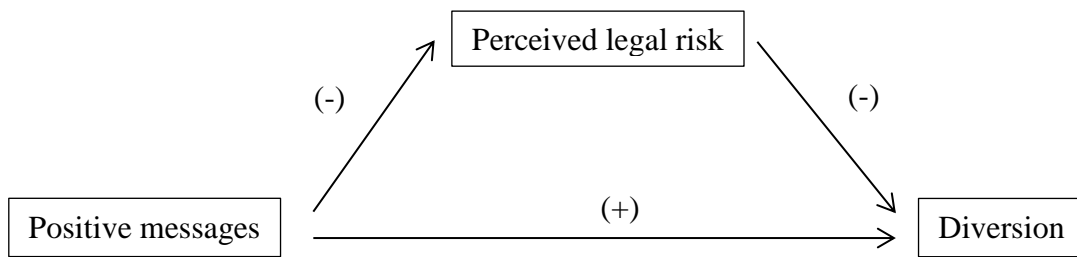
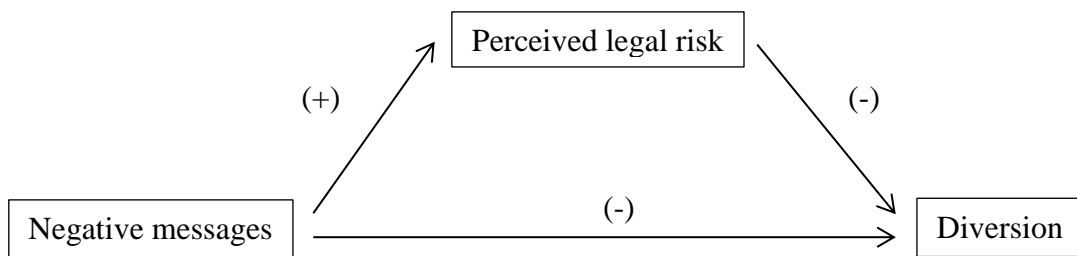


Figure 7.4: Illustration of the proposed mediating effect of perceived legal risk on the relationship between negative messages heard and young adult diversion



Analyses regarding perceived risk are limited to those for whom these data are available ($n=445$). Examination of the perceived legal risk variable revealed that approximately 20% of participants felt that diverting prescription drugs entailed “great risk.” The proportion of those who felt this way did not differ by diversion status ($\chi^2=0.67, p=0.413$). Analyses examining the potential mediating effect of perceived legal risk are presented in Table 7.2. The first model of the table illustrates that consistent with the main effects models presented in Chapter 6, among this subsample of individuals, positive messages are significantly and positively associated with diversion, while negative messages are not related. The second model in the table shows only a marginally significant relationship between positive messages and perceived legal risk ($p=0.07$), and fails to show a relationship between negative messages and perceived legal

Table 7.2: Regression analyses examining the mediating effects of perceived legal risk on young adult diversion ($n = 445$)

	Logistic Regression DV: Diversion			Logistic Regression DV: Perceived Legal Risk			Logistic Regression DV: Diversion		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Mediator Variables									
Perceived legal risk							-0.19	0.33	0.83
Independent Variables									
Perceived peer nonmedical use	0.13	0.05	1.13*	-0.09	0.08	0.91	0.12	0.05	1.13*
Perceived peer diversion	0.14	0.05	1.15**	-0.01	0.05	1.00	0.14	0.05	1.16**
Positive messages	0.11	0.05	1.12*	-0.08	0.04	0.93†	0.11	0.05	1.12*
Negative messages	0.03	0.03	1.03	0.03	0.03	1.03	0.03	0.03	1.03
Control Variables									
Male	0.22	0.27	1.25	-0.44	0.28	0.64	0.21	0.27	1.24
White	0.14	0.31	1.15	-0.40	0.27	0.67	0.13	0.31	1.14
Family income	-0.12	0.04	0.89**	-0.07	0.04	0.93†	-0.12	0.04	0.89**
Early conduct problems	0.06	0.06	1.06	0.06	0.06	1.07	0.06	0.06	1.06
Lifetime substances used at baseline	0.19	0.08	1.21*	-0.09	0.10	0.92	0.19	0.08	1.21*
Impulsive sensation seeking	-0.09	0.06	0.91	0.08	0.06	1.09	-0.09	0.06	0.91

† $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

risk. Additionally, positive messages continues to have a significant effect on diversion, even controlling for perceived legal risk, although perceived legal risk was not significantly associated with diversion.

Analyses testing hypothesis 10 regarding the mediating effect of perceived legal risk on the relationship between positive messages and diversion failed to find an indirect effect of positive messages on the dependent variable, suggesting a lack of support for this hypothesis. Additionally, given the lack of significant relationships between negative messages and diversion, negative messages and perceived risk, and perceived risk and diversion, there is no support for hypothesis 11, which suggested that perceived legal risk mediated the relationship between negative messages and diversion.

Perceived harm resulting from nonmedical use was examined to test hypotheses 12 and 13. Hypothesis 12, illustrated in Figure 7.5, predicts that perceived harm mediates the relationship between positive messages and diversion. Additionally, hypothesis 13 predicts that the level of perceived harm mediates the relationship between negative messages and diversion, as illustrated in Figure 7.6. It was expected that being exposed to both positive and negative information regarding nonmedical use could color an individual's perception regarding the safety of using prescription drugs nonmedically. These perceptions would then weigh into the decision of whether or not to engage in diversion.

Figure 7.5: Illustration of the proposed mediating effect of perceived harm on the relationship between positive messages heard and young adult diversion

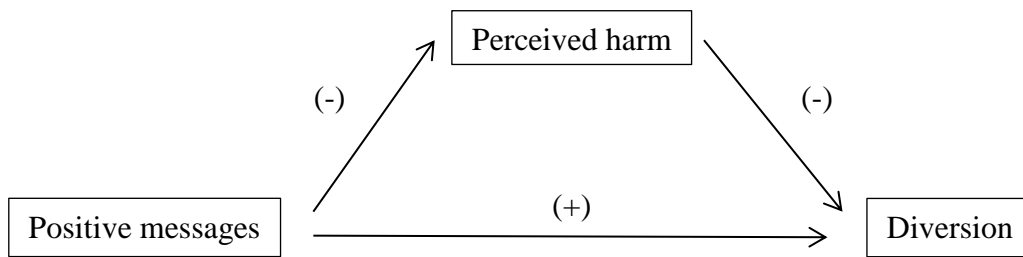
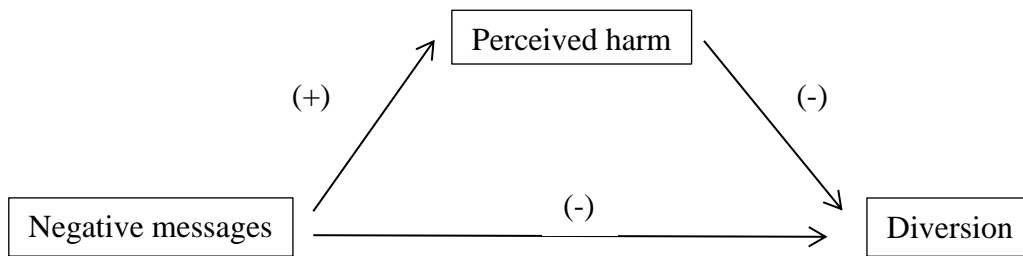


Figure 7.6: Illustration of the proposed mediating effect of perceived harm on the relationship between negative messages heard and young adult diversion



Analyses examining perceived harm as a possible mediator were limited to individuals for whom data on perceived harm were available ($n=444$). A chi-square test revealed that the proportion of diverters who feared great harm would result from nonmedical use (28.6%) was significantly lower than the proportion of non-diverters with this concern (43.7%; $p=0.003$).

Table 7.3 examines the effect of perceived harm as a possible mediator for the relationships between diversion and positive or negative messages. Consistent with main effects findings in the broader sample presented in the previous chapter, the first model in the table demonstrates that positive messages are significantly and positively associated with diversion while negative messages are not associated with diversion. In addition, as expected, hearing a greater number of positive messages was negatively associated with

Table 7.3: Regression analyses examining the mediating effects of perceived harm on young adult diversion ($n = 444$)

	Logistic Regression DV: Diversion			Logistic Regression DV: Perceived Harm			Logistic Regression DV: Diversion		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Mediator Variables									
Perceived harm							-0.34	0.28	0.71
Independent Variables									
Perceived peer nonmedical use	0.13	0.05	1.13*	-0.06	0.05	0.95	0.12	0.05	1.13*
Perceived peer diversion	0.14	0.05	1.15**	-0.05	0.05	0.95	0.14	0.05	1.15**
Positive messages	0.11	0.05	1.12*	-0.08	0.04	0.93*	0.11	0.05	1.11*
Negative messages	0.03	0.03	1.03	0.04	0.03	1.03	0.03	0.03	1.03
Control Variables									
Male	0.21	0.27	1.23	-0.19	0.23	0.83	0.19	0.27	1.21
White	0.14	0.31	1.15	-0.51	0.03	0.60*	0.10	0.31	1.11
Family income	-0.12	0.04	0.89**	-0.02	0.05	0.98	-0.12	0.04	0.89**
Early conduct problems	0.06	0.06	1.06	-0.04	0.08	0.96	0.06	0.06	1.06
Lifetime substances used at baseline	0.20	0.08	1.22*	-0.18	0.08	0.84*	0.19	0.08	1.21*
Impulsive sensation seeking	-0.10	0.06	0.91	-0.03	0.05	0.97	-0.10	0.06	0.90

† < 0.10, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

perceived harm. However, the inclusion of perceived harm in a model predicting diversion fails to yield a significant relationship between perceived harm and diversion, controlling for other covariates, and does not alter the effect size of positive messages on diversion.

With regard to hypothesis 12, predicting that perceived harm mediates the relationship between positive messages and diversion, examination of the bias-corrected bootstrap confidence intervals reveal no significant indirect effect of positive messages on diversion (95% $CI=-0.01-0.05$), providing no support for hypothesis 12. Additionally, given the absence of significant relationships between diversion and negative messages or perceived harm, there is no support for hypothesis 13 predicting that perceived harm mediates a relationship between negative messages and diversion.

Final Model

The final model, presented in Table 7.4, estimates the effects of all independent variables from chapter 6 and all mediating variables from chapter 7 on diversion. The model is limited to cases for which all data are available ($n=310$). In the table below, the proposed mediator of opportunity remains significantly and positively associated with diversion, even in the presence of the other mediating variables. Neither of the other two mediating variables were significantly associated with diversion, as observed in earlier models presented in the current chapter.

With regard to independent variables, perceived peer nonmedical use was not significantly associated with diversion in this model, as it was in the previous chapter examining main effects. Given the substantial difference in sample size between this model and previous models, it is possible this finding is due to problems with statistical

Table 7.4: Logistic regression analysis examining the effects of all independent and mediating variables on diversion ($n=310$)

	B	SE	OR	B	SE	OR
Mediator Variables						
Opportunity	0.03	0.01	1.03*	0.03	0.01	1.03*
Perceived legal risk	-0.15	0.38	0.86	-0.16	0.38	0.85
Perceived harm	-0.05	0.32	0.94	-0.05	0.32	0.95
Independent Variables						
Perceived peer nonmedical use	0.08	0.06	1.08	0.08	0.08	1.09
Perceived peer diversion	0.12	0.06	1.12*	0.12	0.06	1.12*
Positive messages	0.12	0.05	1.12*	0.12	0.12	1.12*
Negative messages	0.02	0.04	1.02	0.02	0.02	1.02
Prior diversion				0.31	0.38	1.36
Control Variables						
Male	-0.20	0.32	0.82	-0.22	0.32	0.80
White	-0.01	0.38	0.99	-0.04	0.39	0.96
Family income	-0.11	0.05	0.90*	-0.11	0.05	0.90*
Early conduct problems	0.02	0.07	1.02	0.01	0.07	1.01
Lifetime substances used at baseline	0.16	0.09	1.17†	0.15	0.09	1.16
Impulsive sensation seeking	-0.10	0.07	0.91	-0.10	0.07	0.91

†<=0.10, * $p <=0.05$, ** $p <=0.01$, *** $p <=0.001$

power, especially given the marginally significant and significant effects of this variable on diversion in earlier mediation models in the current chapter. Perceived peer diversion is significantly associated with diversion with a similar effect size compared to earlier

models examining mediating effects of opportunity.²³ The same is true of the effect of positive messages on diversion, which retains significance in the final model.

The inclusion of prior diversion, measured in this model as diversion occurring prior to wave 4, did little to change the model. Interestingly, prior diversion did not significantly predict young adult diversion in this final model as it did in earlier models presented in Chapter 6. It is possible that this effect, again, is the result of the lower sample size; however, examination of the model reveals that in the absence of opportunity, the effect of prior diversion is marginally significant ($p=0.06$) but the presence of the opportunity variable renders it insignificant ($p=0.42$). Given the relationship between prior opportunity and current diversion, it is very likely that prior opportunity and prior diversion are related. A Kruskal-Wallis test confirms that opportunity differs significantly depending on whether or not college diversion occurred ($p<0.001$).

Summary

This chapter examined potential mediating effects of opportunity, perceived legal risk and perceived harm on the relationships between a series of independent variables and diversion. The results of this chapter demonstrate the small but consistent mediating effect of opportunity on the relationship between perceived peer diversion and young adult diversion, suggesting support for hypothesis 9. However, opportunity did not conclusively mediate the relationship between peer nonmedical use and diversion, failing to support hypothesis 8. Additionally, neither perceived legal risk nor perceived harm had any mediating effect relating to diversion providing no support for hypotheses 10

²³ Examination of whether or not opportunity continued to mediate the relationship between perceived peer diversion and young adult diversion in the final model yielded a significant indirect effect of peer diversion on young adult diversion ($B=0.05$, $95\%CI=0.01-0.22$), with 24% of the total effect mediated.

through 13 predicting these mediation effects. The final model estimated in this chapter was largely consistent with earlier findings in Chapters 6 and 7. Both perceived peer diversion and positive messages continue to be associated with diversion in all models, suggesting that these two concepts represent the most consistent predictors of diversion. Implications of these findings are discussed in the following chapter.

Chapter 8: Discussion

Drug-related crime has long been a focus of prevention and law enforcement efforts. The effects of drug use and drug-related crime in the United States have serious implications for healthcare, the criminal justice system, and the economy. Staying abreast of the emerging trends in drug-related crime is an important goal of the criminal justice system, without which there is little hope of addressing one of the largest categories of offenses in this country. To this end, this study examined one of the most prominent and growing new trends in drug crime – prescription drug diversion. Prescription drug diversion involves moving substances only available by prescription out of licit channels and onto the illicit market. Although a few studies have examined this practice at the distributor- and practitioner-level, evidence suggests that individuals with legitimate prescriptions are the most common sources of diverted medication (Chandra & Ozturk, 2004; Joranson & Gilson, 2005; Monte, Mandell, Wilford, Tennyson, & Boyer, 2009), prompting this particular study. Because little work has been done in this area, the current study was designed to provide an in-depth look at the array of diversion behaviors enacted by individuals with legitimate prescriptions and to identify potential risk factors that increase the likelihood of diversion among those with prescribed medication.

This study represents the first study to take a comprehensive look at prescription drug diversion and to use a theoretical rationale to examine why or under what circumstances diversion occurs. Prescription drug diversion is a growing problem in the United States, and it can have profound impacts on safety, productivity, crime, and the

use of criminal justice resources. The better informed the field of criminal justice is regarding this trend, the better equipped it will be to take steps to combat the problem.

The discussion is organized into a summary of results, limitations of current research, implications, and directions for future research. The conclusions summarize the findings of the current study and discuss how they fit in with prior research. The limitations discuss any factors that temper the conclusions that can be drawn from the current study. In light of the limitations, the broader implications of the findings for practice, theory, and the field of criminal justice are then discussed. Finally, the section on directions for future research highlights the gaps in the literature and suggests additional areas of study to address these gaps.

Conclusions

The study predictions and outcomes are summarized in Table 8.1 below. This study was the first of its kind to comprehensively describe prescription diversion behavior. The first aim of the study involved describing the practice of diversion. Results suggest that among this sample of diverters, diversion is typically infrequent, is conducted in small quantities, and drugs are distributed largely among friendship networks rather than strangers. The relatively low frequency of diversion is consistent with prior literature (Garnier et al., 2010). Prior studies have typically not examined the question of quantity; however, the relatively low number of pills typically diverted in any given diversionary encounter (fewer than 10 pills at a time, on average), is not unexpected. Similarly, given how common sharing appears to be compared to other routes of diversion, it is not surprising that friends were the most common recipients of diverted medication. Prior literature examining nonmedical use has identified friends as

the most common suppliers of prescription medication used nonmedically (Barrett et al., 2005; McCabe & Boyd, 2005; McCabe, Teter & Boyd, 2006 a; McCabe et al., 2007).

These findings suggest that while diversion is not an epidemic, a sufficient amount of diversion is occurring to be a cause for concern. While neither the frequency nor the quantity of diversion appear particularly high in isolation, if we combine the frequency of diversion encounters and the typical quantity of pills diverted per encounter, we find that, on average, a typical diverter is distributing between 14.7 and 41.2 pills per year. Given the relatively high prevalence of diversion among young adults documented in previous studies (Darredeau, Barret, Jardin & Pihl, 2007; Garnier et al., 2010) this could represent a sizable portion of diverted medication. Earlier research has suggested that individuals with legitimate prescriptions are the source of a large proportion of drugs diverted onto the illicit market (Chandra & Ozturk, 2004; Joranson & Gilson, 2005; Monte, Mandell, Wilford, Tennyson, & Boyer, 2009). In combination with these earlier studies, this research confirms that diversion among those with legitimate prescriptions is a problem.

The second aim of the study was to explore diversion-related decision making. To this end, the study also examined reasons why diversion occurred and is the first to examine reasons for refusing to divert and beliefs regarding diversion behavior. Although some studies have explored the demand side of the equation by asking participants about their reasons for nonmedical use, this study documents reasons for supplying the medication. Results suggest some consistency between why individuals want the medication (demand) and why individuals are supplying the medication.

Table 8.1: Summary of study predictions and outcomes

Hypothesis	Prediction	Outcome
1	Non-diverters and diverters who have had the opportunity to divert and refused to do so will differ on their reasons for refusal.	Supported
2	Diverters will be more likely than non-diverters to believe that diversion is not a problem.	Supported
3	The perceived number of close friends who use prescription drugs nonmedically will be positively associated with the likelihood of diversion.	Supported
4	Perceiving a greater percentage of peers engaging in diversion will increase the likelihood of diversion.	Supported
5	Hearing a greater number of positive messages relating to prescription drugs will increase the likelihood of diversion.	Supported
6	Hearing a greater number of negative messages relating to prescription drugs will decrease the likelihood of diversion.	Not Supported
7	Less impulsive individuals will be less susceptible to the influence of the independent variables on diversion.	Not Supported
8	Opportunity to divert will mediate the relationship between perceived peer nonmedical use and diversion.	Not Supported
9	Opportunity to divert will mediate the relationship between perceived peer diversion and diversion.	Supported
10	Perceptions relating to the legal risk associated with diversion will mediate the relationship between positive messages and diversion.	Not Supported
11	Perceptions relating to the legal risk associated with diversion will mediate the relationship between negative messages and diversion.	Not Supported
12	Perceptions relating to the harm caused by nonmedical use will mediate the relationship between positive messages and diversion.	Not Supported
13	Perceptions relating to the harm caused by nonmedical use will mediate the relationship between negative messages and diversion.	Not Supported

For example, helping someone get high and helping someone concentrate were two of the three most prevalent reasons for diverting; wanting to get high and wanting to study are also frequently cited reasons for nonmedical use (Barrett, Darredeau, Bordy, & Pihl, 2005; Carroll, McLaughlin, & Blake, 2006; DeSantis, Noar, & Webb, 2010; DuPont et al., 2008; Teter et al., 2006). This agreement suggests that diverters are largely aware of what their medications are being used for and appear to have no objection to the nonmedical use.

The first hypothesis predicted a difference between diverters and non-diverters on the basis of reasons for refusing to divert medication. The high prevalence of specific situational factors cited as reasons why individuals refused to divert suggests that, for many, diversion may be viewed as normative behavior and that the diverter's feelings at the time of opportunity may be the best indicator of whether or not diversion will occur. With regard to prevention of diversion, both unavailability of medication and perceived formal sanctions were frequently cited reasons for refusing to divert. Support was found for hypothesis 1, in that diverters were more likely to cite situational factors, while non-diverters were more likely to identify concerns about potential consequences in their reasons for refusal. Support was also found for the second hypothesis, predicting a difference between diverters and non-diverters on the basis of beliefs regarding diversion, with diverters more likely than non-diverters to believe that diversion is not a problem. These findings may suggest that diverters do not see anything wrong with their behavior, morally or legally.

The third aim of the study sought to explore risk factors related to diversion. To that end, hypotheses three through six were tested. With regard to predicting diversion,

analytically, previous work on this topic has been extremely weak. Most studies are descriptive in nature, and if correlates were examined they were limited primarily to demographics and no controls were used. One previous study has examined correlates of diversion controlling for demographic factors (Garnier et al., 2010); however, a systematic theoretical approach has never been undertaken. Additionally, examination of correlates has typically been limited to cross-sectional studies rather than adopting a longitudinal approach. This study is the first of its kind to take a longitudinal approach to examine prescription drug diversion.

Some limited initial support for both Social Learning Theory and Rational Choice Theory were found with support for hypotheses three, four, and five. Hypothesis three explored the effects of perceived peer nonmedical use on diversion. Believing that a greater number of peers use prescription drugs nonmedically is associated with an increased likelihood of diversion. Additionally, the fourth hypothesis predicted a positive relationship between perceived peer diversion and diversion. Results indicate that individuals who believe a greater percentage of their peers divert prescription drugs are more likely to divert in subsequent years. The relationship between peer behavior and diversion was not unexpected given prior literature linking workgroup norms to the likelihood of diversion (Dabney, 1995); however, this study is the first to specifically examine the influence of peers on diversion. These findings suggest that perceived peer behavior influences decisions regarding diversion, providing some support for a Social Learning approach, although it is unclear if these relationships are due to imitation of perceived peer behavior, exposure to an excess of definitions favorable to diversion, or other factors. The relationships between peer-related factors and diversion are consistent

with prior research suggesting an association between perceived peer behavior and deviant behavior including crime and substance use (Aseltine, 1995; Iannotti & Bush, 1992; Neff & Waite, 2007).

To explore the Rational Choice perspective, hypotheses five and six examined the effects of exposure to positive and negative messages regarding prescription drugs on diversion. It was expected that being exposed to information that implied, among other things, that prescription drugs were safe, that using them nonmedically was fun, and that getting caught was unlikely, would increase the perceived benefits while decreasing the perceived risks of diversion, resulting in a greater likelihood of diverting. In contrast, the opposite effect was expected if participants were exposed to information suggesting that prescription drugs were dangerous or had unpleasant side effects, that they were not effective, or that diverting/using nonmedically could result in legal and health-related consequences. Prior research has indicated that hearing information from others can help form perceptions that would factor into a rational decision (Stafford & Warr, 1993). In support of hypothesis 5, hearing a greater number of positive messages regarding prescription drugs and nonmedical use predicted subsequent diversion. Hearing negative messages on the same subject had no effect, controlling for other factors, resulting in a lack of support for hypothesis six. This could indicate that perceived benefits hold heavier weight than perceived costs. However, given that on average diverters heard a greater number of both positive and negative messages than non-diverters, it is more likely that people who are considering diversion are simply exposed to more information, both positive and negative, regarding prescription drugs overall, suggesting that Rational Choice Theory may not be the best explanation for this relationship. Instead, it may be

that spending more time around individuals who use nonmedically and divert (as indicated by the peer-related risk factors) both increases one's likelihood of hearing positive and negative messages regarding prescription drugs and one's likelihood of later engaging in diversion.

In most models, prior diversion strongly predicted subsequent diversion. The exception to this, namely a model that included a control for opportunity, was likely due to collinearity. The relationship between prior and subsequent diversion is consistent with earlier research showing relationships between other types and indicators of delinquent behavior (conduct problems, substance use) and diversion (Garnier et al., 2010; Wilens et al., 2006). Interestingly, although prior literature found an association between conduct problems and diversion (Garnier et al., 2010; Wilens et al., 2006), early conduct problems did not predict diversion behavior in this study. Additionally, other demographic factors previously found to correlate with diversion, such as sex, were also unrelated. This may be due to the inclusion of theoretically-driven risk factors, or it may be an artifact of a limited sample size.

Hypothesis seven, examining the moderating effects of impulsivity on the relationships between the independent variables and diversion was proposed to address Aim 4. The expectation that more impulsive individuals would be less susceptible to the influence of the independent variables was not supported. However, perceived peer diversion was partially moderated by impulsivity. The likelihood of diversion was lowest for individuals with high impulsivity and low perceived peer diversion. Individuals with low impulsivity (regardless of perceived peer diversion) and individuals with high impulsivity and high perceived peer diversion did not differ significantly with regard to

the predicted probability of diversion. Although this finding was not in the expected direction, but may suggest that peer effects may differ for those with low self-control compared to those with high self-control (Gardner, Dishion & Connell, 2008; Urberg, Luo, Pilgrim & Degirmencioglu, 2003).

The fifth and final aim of the study sought to identify factors that could mediate the effects of the independent variables on the dependent variables. This study is the first to examine mediators. Opportunity was expected to mediate the relationships between peer-related variables and diversion, while perceived legal risk and perceived harm associated with diversion/nonmedical use were expected to mediate the relationships between exposure to messages and diversion.

With regard to opportunity as a mediator, no conclusive support was found for hypothesis eight examining opportunity as mediating the effect of peer nonmedical use on diversion. Results did find a relationship between perceived peer nonmedical use and opportunity and a marginally significant effect of perceived peer nonmedical use on diversion (which disappeared with the inclusion of opportunity in the model. Opportunity was significantly associated with diversion. By earlier standards of analysis (Baron & Kenny, 1986), this evidence might suggest that a mediating effect exists. However bootstrapped 95% confidence intervals of the indirect effect of perceived peer nonmedical use on diversion failed to show a significant result. Because the mediation model included only a marginally significant effect of perceived peer nonmedical use on diversion (while earlier models had shown an effect with $p \leq 0.05$) and the sample size of the mediation model was substantially smaller than that of earlier models ($n=329$ vs. $n=483$), it is possible that the lack of a conclusive mediation finding is due to limited

statistical power resulting from the small sample size. Since a strict conclusion cannot be drawn one way or another, further analysis on this topic in later studies is recommended.

Support for hypothesis nine regarding the mediating effect of opportunity on the relationship between perceived peer diversion and diversion was found. Although prior research has examined the frequency of opportunities to divert, no prior studies have associated opportunity with actual diversion. The current study links the frequency of opportunity to the likelihood of engaging in diversion. It further finds that opportunity explains the relationship between perceived peer diversion and diverting prescription drugs. There is some support for the idea of the role of opportunity in a Social Learning perspective (Sutherland, 1944); however, Social Learning Theory does not specifically address opportunity or describe it specifically as a mediating factor on the relationship between peer-related behavior and crime/delinquency. Given these findings, it is possible that diversion may be more situational than a Social Learning approach would suggest. Additional support for the situational nature of diversion can be found in the reasons for not diverting, which were largely situational in nature.

Finally, hypotheses 10 through 13 predicted that perceived legal risk of diversion and perceived harm of nonmedical use would mediate the relationships between positive/negative messages and diversion. No support was found for these hypotheses. Perceptions regarding harm resulting from nonmedical use and legal risks associated with diversion were unrelated to the likelihood of diverting. These findings stand in contrast to earlier research on rational choice suggesting that perceptions can have a deterrent effect (Jensen, Erickson & Gibbs, 1978; Waldo & Chiricos, 1972). Positive messages

remained significantly associated with diversion in the presence of perceptions with no differences in effect sizes.

Taken together, the breadth of findings provides some limited support for both social learning and rational choice perspectives. With regard to rational choice, reasons provided for refusing to divert appeared largely situational in nature, suggesting that circumstances play a substantial role in the decision of whether or not to engage in diversion in any given situation. However, individual perceptions were unrelated to diversion, in contrast to what one would expect from a rational choice model. Additionally, peer-related variables consistently predicted diversion, suggesting some support for a social learning perspective. However, one of the peer-related variables was mediated by opportunity, a factor that social learning theory acknowledges but does not fully incorporate into its theoretical structure. It may be that diversion is more situational than a social learning approach would suggest.

Limitations

Although the study is the first of its kind to examine theoretically-driven predictors and identify several factors related to diversion, there are several limitations that bear mentioning. Limitations exist relating to the study, the data, and the analytic strategy. First, interviews were primarily conducted in a face-to-face setting, however where this was not possible due to geographic distance, they were conducted over the phone. It is possible that mode of interview may play a role in how forthcoming participants are about their behavior; however an analysis of the variables did not reveal any significant differences in behavior between the two groups, making it unlikely that these differences have a major effect on the analyses. In addition, as with any self-report

measure, the quality and accuracy of responses depends largely on participants' memories, and may suffer from issues of telescoping, exaggeration, or other problems relating to the fallacy of human memory (Sudman & Bradburn, 1973). This problem has been minimized as much as possible by asking about the dependent variable annually, referencing the past year. In this manner, participants were only responsible for describing their behavior over the past year, rather than describing something retrospective over their lifetime. Additionally, the data comes from a single cohort of young adults, and may not be generalizable to other populations. The limited sample size also affects generalizability. Attrition posed limited concern with follow-up rates for each wave ranging from 91.1% to 78.4%, but with a relatively uncommon behavior (i.e., diversion) any attrition or missing data that reduces the sample size poses a problem.

With regard to data, several variables, including the dependent variable were dichotomized from count variables. Although this approach was appropriate given that the analytic question focused on whether or not diversion occurred rather than the frequency of diversion, this does inhibit the study's ability to fully examine the range of diversion behavior. This limitation was partially offset by the attempt to better describe diversion through the descriptive analysis in Chapter 5. It should also be noted that peer nonmedical use and peer diversion were calculated from multiple variables and that it was unclear to what extent these variables may overlap (for example, peer nonmedical use was calculated from the number of peers who diverted a) stimulants, b) analgesics, and c) tranquilizers, and it is unclear if these peers represent different friends who used only one substance, or the same friends who used multiple substances). As a result, only the number of peers using the most common substance or the percentage diverting the

most commonly diverted drug was used, resulting in a conservative estimate of these variables (i.e. at least this many or this percentage of individuals used nonmedically/diverted, but possibly more). Consequently, the effect of these variables may be underestimated in the models.

The estimated models may be limited by omitted variables, such as social bonds or other theoretically-relevant factors. Although controlling for prior diversion in several models may capture an underlying propensity for the behavior that omitted variables would address, additional analyses should account for additional variables. Additionally, sample size presents several challenges for analysis. First, in some models, statistical power may be an issue, resulting in a failure to find significant effects where some may exist. Additionally, because many of the models, especially in Chapter 7, use substantially smaller sample sizes than the initial models in Chapter 6, results may not be comparable across models. This makes it difficult to generalize findings.

Implications

Despite the limitations, the findings of this study have broader implications for the prevention of diversion, the field of criminal justice, and the theoretical literature. First, these findings confirm that a substantial portion of pills from legitimate prescriptions are being diverted. This suggests that altering prescribing practices by physicians to better reflect true need of patients may be an effective method of curtailing diversion. This is especially true given the reasons for refusing to divert, which suggest that individuals will be more hesitant to divert a medication that they feel they may need. Mechanisms already in place, such as prescription drug monitoring programs, could

potentially be leveraged to investigate prescribing practices and determine when medication is overprescribed.

Additionally, since personal opinions regarding diversion differed between diverters and non-diverters with diverters being more likely to feel that diversion is not a problem, it is possible that attempts to change these opinions could have an impact on diversion. This idea is further supported by the differences between diverters and non-diverters in terms of other perceptions held. Initiatives aimed at increasing awareness regarding the potential dangers of diversion could reduce diversion behavior. Perceived peer behavior also has a substantial impact on diversion. It is possible that believing the behavior is more normative increases the likelihood of engaging in diversion. Previous research has consistently found that perceived norms can influence young adult behavior (Clapp & McDonnell, 2000; Perkins & Wechsler, 1996). It is possible that initiatives using a social norms approach to prevention could be utilized to address these perceptions. The idea is that given the link between perceived norms and the outcome behavior, designing an intervention that provides accurate information would result in less exaggerated perceptions of normal behavior and less deviance, overall (Barnett, Far, Mauss & Miller, 1996; Perkins, 2003).

Within the broader context of drug-related crime and criminal justice, this study confirms earlier research suggesting that a substantial amount of prescription drug diversion is occurring, and that individuals with legitimate prescriptions are supplying a not-insignificant amount of medication for diversion (Chandra & Ozturk, 2004; Joranson & Gilson, 2007; Monte et al, 2009). Given that nonmedical use of prescription drugs is the fastest growing type of drug abuse (Substance Abuse and Mental Health Services

Administration, 2001; Substance Abuse and Mental Health Services Administration, 2010b), and that it is second in prevalence only to marijuana (Substance Abuse and Mental Health Services Administration, 2010b), it is clear that this is an issue that needs to be better addressed. The linkage between prescription drugs and crime (National Prescription Drug Threat Assessment, 2009; U.S. Department of Justice, 2009) suggests that these substances differ little from illicit drugs with regard to their impact on society, and curtailing their distribution and use are important goals in the interest of both criminal justice and public health.

Finally, these findings point to a need for additional research in this field. The relevance of theoretical predictors for diversion were mixed, suggesting that additional theoretical models should be explored. The possibility that peer-related variables operate through opportunity especially invites further scrutiny. It is possible that peer-related variables act as a marker for differential access to illegitimate opportunity structures (Cloward & Ohlin, 1960).

Directions for Future Research

This study was the first of its kind to embark on a comprehensive study of prescription diversion behavior. It has expanded the field's knowledge in relation to this new type of drug crime by helping to identify the magnitude of the problem among young adults, documenting reasons provided for diverting and not diverting prescription drugs in an effort to better understand factors contributing to the behavior, exploring theoretical explanations for diversion, and attempting to explain the mechanisms through which these predictors operate on diversion. It is also the first study of diversion of take a longitudinal approach to the problem.

Additional research should take into account the limitations of the current study and improve and expand upon several themes. First, larger sample sizes are needed to better understand diversion among broader groups of people. Beyond suffering from limited statistical power, this study focused on a single cohort of young adults. Future studies should examine more generalizable samples in order to better understand what factors may contribute to diversion among the population at large. One possible strategy may be to study patients from doctors' offices (psychiatrists, physicians, physical therapists, etc.) in order to obtain sizable samples for analysis.

Additionally, subgroups of diverters should be examined. For example, examining diversion by substance type (i.e. stimulants vs. analgesics vs. tranquilizers) may yield results suggesting that diversion behaviors differ depending on the drug in question. There is reason to believe that diversion may differ by drug type. For example, stimulants are prescribed to individuals with ADHD, a diagnosis often connected with impulsivity. These individuals may differ with regard to diversion compared to those prescribed other types of drugs, such as analgesics. Future research should also continue previous work (Garnier et al., 2010) involving diversion of other classes of medication, such as asthma medications and antibiotics. Prior work (Garnier et al., 2010) has examined rates of diversion by drug type; however, little is known regarding whether predictive factors for diversion differ based on drug type. Factors that predict diversion may also differ by route of diversion (i.e. sharing vs. selling vs. trading). Sample size limited the ability of the current study to fully examine all subgroups of diverters; however, future studies with larger samples could examine this.

Future studies should also examine changes in diversion behavior over time (for example, trajectories, changes in reasons for diversion, etc.). The prevalence of diversion dropped in each subsequent wave in the current study. It is likely that individuals age out of diversion in a similar manner to aging out of other types of deviance. However, it is possible that this sample is not representative of diverters in general. Those who engage in diversion in their mid-twenties, such as these individuals, may differ systematically from people who divert only in adolescence or early young adulthood. This study also excluded a subset of individuals who diverted a medication that was not prescribed to them. Future research with larger samples should investigate the origin of these medications and whether individuals who divert medication not prescribed to them differ systematically from other diverters who do not necessarily seek out medication to divert.

It would also be interesting to track national rates of diversion over time. The rising prevalence of the nonmedical use of prescription drugs (Substance Abuse and Mental Health Services Administration, 2001; Substance Abuse and Mental Health Services Administration, 2010b) suggests that the amount of diversion occurring may also be on the rise. Identifying the primary sources of these drugs on the illicit market, be they doctor shopping, theft, or, as is suspected, diversion from individuals with legitimate prescription, better equips law enforcement agencies to combat the problem.

Finally, although some hypothesized factors relating to diversion did indeed predict the dependent variable, more research is needed to understand the mechanisms through which this occurs. The role of opportunity in explaining the relationship between perceived peer diversion and diversion suggests that opportunity should be investigated further, especially models based on theories that better incorporate opportunity.

Opportunity should also continue to be examined in reference to other peer-related factors, given the findings regarding peer nonmedical use and opportunity as they relate to diversion. Aside from additional research on existing findings, there were many factors that the current analyses did not examine that could be related to diversion, such as social bonds. Additional research should examine other theoretical predictors of diversion. Some literature suggests that learning better explains crime than control-related variables (Matsueda, 1982; Matsueda & Heimer, 1987); however, the omission of additional theory-driven factors that could serve as risk or protective factors for diversion need to be explored. The role of moral beliefs should be examined, given that earlier research by Pogarsky and others has suggested that some individuals are simply not likely to engage in deviance regardless of other factors given their moral code (Pogarsky, 2002). The role of factors that increase social bonds, such as religiosity, employment, attachment to parents and peers, etc. should also be explored. This may be especially interesting, in light of the peer-related findings of the current study. It would be of interest to study diversion networks and chains of diversion as well. For example, some individuals may receive diverted medication and, in turn, divert it rather than using it themselves. The current study omitted individuals who diverted a substance not initially prescribed to them on the assumption that these participants may differ systematically from other diverters; however, future research should investigate this assumption.

Summary

Ultimately this study suggests that a substantial portion of medication that is prescribed to individuals is diverted illicitly. Reasons for diversion suggest a desire on the part of diverters to be helpful, and situational factors appear to play a role. Both peer

behavior and things heard about prescription drugs influence the likelihood of diversion, and simple opportunity plays an important role in determining whether or not diversion will occur. This study represents the first attempt at a theoretically-driven explanation of prescription drug diversion in the field of criminology. Results suggest that future research is warranted, both to better understand the breadth and scope of diversion, and to examine the role of other theoretically relevant factors on diversion behavior.

Although this study extends current knowledge regarding diversion behavior, questions remain about this relatively new trend in drug crime. Prescription drugs are a new face on a drug problem that has existed for decades, and early research indicates that many of the observed consequences of illicit substance use (crime, victimization, etc.) apply to prescription drugs as well (Garnier et al., 2012; U.S. Department of Justice, 2009). Given these indicators and the concerning rise in nonmedical prescription drug use (Substance Abuse and Mental Health Services Administration, 2001; Substance Abuse and Mental Health Services Administration, 2010b), more attention to this topic is warranted. Prescription drug diversion has serious implications for both criminal justice and public health. Emergency department visits and overdose deaths represent a growing problem in the face of increasing nonmedical use of prescription drugs (Cai, Crane, Poneleit & Paulozzi, 2010; Warner, Chen & Makuc, 2009). Economically, drug diversion costs insurance companies billions each year (U.S. Department of Justice, 2009), and Medicare recognizes the cost of diversion to taxpayers within its own system (U.S. Department of Health and Human Services, 2012). Associations between prescription drug diversion and crime put added pressure on already overburdened criminal justice resources (U.S. Department of Justice, 2009). Recent interviews with

drug dealers have also suggested that in addition to other techniques such as doctor shopping, drug dealers are starting to purchase medication from individuals with legitimate prescriptions in order to re-sell these drugs (Rigg, Kurtz & Surratt, 2012), suggesting that the problem is only going to get worse. Ultimately, this new and growing trend in drug crime represents the most recent iteration of the ongoing problem of drug use and drug-related crime in the U.S., and just as patterns of substance use change over time, the ability to recognize and track these patterns and adjust resources accordingly affords the greatest chance of minimizing the damage to society in whatever form it may take.

References

- 1st Circuit: Sharing Medicaid pills is same as drug dealing. (2004). *Juvenile Justice Digest*, 32(10), 2-3.
- Akers, R.L. (1985). *Deviant behavior: A social learning approach* (3rd ed.). New York, NY: Wadsworth.
- Akers, R. L. (1990). Rational choice, deterrence, and Social Learning Theory in criminology: The path not taken. *Journal of Criminal Law & Criminology*, 81(3), 653-676.
- Akers, R.L. (1998). *Social learning and social structure: A general theory of crime and deviance*. Boston, MA: Northeastern University Press.
- Akers, R.L. (2009). Social learning and social structure: Reply to Sampson, Morash, and Krohn. *Theoretical Criminology*, 3, 477-493.
- Akers, R., Krohn, M., Lanza-Kaduce, L. & Radosevich, M. (1979). Social learning and deviant behavior: A specific test of a general theory. *American Sociological Review*, 44, 636-655.
- Alarid, L.F., Burton, V.S. & Cullen, F.T. (2000). Gender and crime among felony offenders: Assessing the generality of social control and differential association theories. *Journal of Research in Crime and Delinquency*, 37(2), 171-199.
- Anderson, L. S., Chiricos, T. G., & Waldo, G. P. (1977). Formal and informal sanctions: A comparison of deterrent effects. *Social Problems*, 25(1), 103.
- Appleby, J. (2005). Stolen, counterfeit drug problems rise, *USA Today*, March 5, 2005.
- Arria, A. M., Caldeira, K. M., O'Grady, K. E., Vincent, K. B., Fitzelle, D. B., Johnson, E. P., & Wish, E. D. (2008a). Drug exposure opportunities and use patterns among college students: Results of a longitudinal prospective cohort study. *Substance Abuse*, 29(4), 19-38.
- Arria, A. M., Caldeira, K. M., Vincent, K. B., O'Grady, K. E., & Wish, E. D. (2008b). Perceived harmfulness predicts nonmedical use of prescription drugs among college students: Interactions with sensation-seeking. *Prevention Science*, 9(3), 191-201.
- Arria, A. M., O'Grady, K. E., Caldeira, K. M., Vincent, K. B., & Wish, E. D. (2008c). Nonmedical use of prescription stimulants and analgesics: Associations with social and academic behaviors among college students. *Journal of Drug Issues*, 38(4), 1045-1060.

- Aseltine Jr., R. (1995). A reconsideration of parental and peer influences on adolescent deviance. *Journal of Health and Social Behaviors*, 36(2), 103-121.
- Bachman, R., Paternoster, R., & Ward, S. (1992). The Rationality of Sexual Offending: Testing a Deterrence/Rational Choice Conception of Sexual Assault. *Law & Society Review*, 26(2), 343-372.
- Bahr, S. J., Hoffmann, J. P., & Yang, X. (2005). Parental and peer influences on the risk of adolescent drug use. *Journal of Primary Prevention*, 26(6), 529-551.
- Ball, S. A. (1995). The validity of an alternative five-factor measure of personality in cocaine abusers. *Psychological Assessment*, 7(2), 148-154.
- Barnett, L.A., Far, J.M., Mauss, A.L. & Miller, J.A. (1996). Changing perceptions of peer norms as a drinking reduction program for college students. *Journal of Alcohol and Drug Education*, 41(2), 39-62.
- Baron, S. W. (2003). Self-control, social consequences, and criminal behavior: Street youth and the general theory of crime. *Journal of Research in Crime and Delinquency*, 40, 403–425.
- Baron, R.M. and Kenny, D.A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic and statistical Considerations', *Journal of Personality and Social Psychology* 51(6), 1173–82.
- Barrett, S. P., Darredeau, C., Bordy, L. E., & Pihl, R. O. (2005). Characteristics of methylphenidate misuse in a university student sample. *Canadian Journal of Psychiatry*, 50(8), 457-461.
- Baum, D. (2004). *Smoke and mirrors: The war on drugs and the politics of failure*. New York, NY: Little, Brown & Company.
- Boyd, C. J., McCabe, S. E., Cranford, J. A., & Young, A. (2007). Prescription drug abuse and diversion among adolescents in a Southeast Michigan school district. *Archives of Pediatrics and Adolescent Medicine*, 161(3), 276-281.
- Boyum, D., & Reuter, P. (2005). *An analytic assessment of U.S. drug policy*. Washington, D.C.: American Enterprise Institute for Public Policy Research.
- Cai, R., Crane, E., Poneleit, K., & Paulozzi, L. (2010). Emergency Department Visits Involving Nonmedical Use of Selected Prescription Drugs in the United States, 2004-2008. *Journal of Pain & Palliative Care Pharmacotherapy*, 24(3), 293-297.
- Carroll, B. C., McLaughlin, T. J., & Blake, D. R. (2006). Patterns and knowledge of nonmedical use of stimulants among college students. *Archives of Pediatrics and Adolescent Medicine*, 160(5), 481-485.

- Chambers, C. D., Taylor, W. J., & Moffet, A. D. (1972). The incidence of cocaine abuse among methadone maintenance patients. *International Journal of Addictions*, 7(3), 427-441.
- Chambers, C. D., & Brill, L. (Eds.). (1973). *Methadone: Experiences and issues*. New York: Behavioral Publications.
- Chandra, A., & Ozturk, A. (2004). Health professionals beware of prescription pain medication abuse and diversion. *Hospital Topics*, 82(4), 34-37.
- Chapple, C.L. (2005). Self-control, peer relations, and delinquency. *Justice Quarterly*, 22(1), 89-106.
- Cicero, T. J., Adams, E. H., Geller, A., Inciardi, J. A., Munoz, A., Schnoll, S. H., Senay, E. C., & Woody, G. E. (1999). A postmarketing surveillance program to monitor Ultram (tramadol hydrochloride) abuse in the United States. *Drug and Alcohol Dependence*, 57(1), 7-22.
- Clapp, J. & McDonnell, A.L. (2000). The relationship of perceptions of alcohol promotion and peer drinking norms to alcohol problems reported by college students. *Journal of College Student Development*, 41, 19-26.
- Cloward, R. A. & Ohlin, L.E. (1960). *Delinquency and opportunity: a theory of delinquent gangs*. New York: Free Press.
- Collins, G. B., & McAllister, M. S. (2006). Combating Abuse and Diversion of Prescription Opiate Medications. *Psychiatric Annals*, 36(6), 410-416.
- Compton, W. M., & Volkow, N. D. (2006a). Abuse of prescription drugs and the risk of addiction. *Drug and Alcohol Dependence*, 83, S4-S7.
- Compton, W. M., & Volkow, N. D. (2006b). Major increases in opioid analgesic abuse in the United States: Concerns and strategies. *Drug and Alcohol Dependence*, 81(2), 103-107.
- Costello, B. J., & Vowell, P. R. (1999). Testing control theory and differential association: A reanalysis of the Richmond Youth Project data. *Criminology*, 37(4), 815-842.
- Crosse, M. (2004). Prescription drugs: State monitoring programs may help to reduce illegal diversion: GAO-04-524T. *GAO Reports*, 1.
- Dabney, D. (1995). Workplace deviance among nurses: the influence of work group norms on drug diversion and/or use. *Journal of Nursing Administration*, 25(3), 48-55.

- Daniel, K. L., Honein, M. A., & Moore, C. A. (2003). Sharing prescription medication among teenage girls: potential danger to unplanned/undiagnosed pregnancies. *Pediatrics*, *111*(5), 1167.
- Darredeau, C., Barrett, S. P., Jardin, B., & Pihl, R. O. (2007). Patterns and predictors of medication compliance, diversion, and misuse in adult prescribed methylphenidate users. *Human Psychopharmacology: Clinical and Experimental*, *22*(8), 529-536.
- Davis, W. R., & Johnson, B. D. (2008). Prescription opioid use, misuse, and diversion among street drug users in New York City. *Drug & Alcohol Dependence*, *92*(1-3), 267-276.
- Degenhardt, L., Chiu, W. T., Sampson, N., Kessler, R. C., Anthony, J. C., Angermeyer, M., Bruffaerts, R., Girolamo, G. d., Gureje, O., Huang, Y., Karam, A., Kostyuchenko, S., Lepine, J. P., Mora, M. E. M., Neumark, Y., Ormel, J. H., Pinto-Meza, A., Posada-Villa, J., Stein, D. J., Takeshima, T., & Wells, J. E. (2008). Toward a global view of alcohol, tobacco, cannabis, and cocaine use: Findings from the WHO World Mental Health Surveys. *PLoS Medicine*, *5*(7), e141- e141.
- Denton, B., & O'Malley, P. (2001). Property crime and women drug dealers in Australia. *Journal of Drug Issues*, *31*(2), 465-486.
- DeSantis, A., Noar, S. M., & Webb, E. M. (2010). Speeding through the frat house: A qualitative exploration of nonmedical ADHD stimulant use in fraternities. *Journal of Drug Education*, *40*(2), 157-171.
- Drug Enforcement Administration. Drug theft & loss. Retrieved October 26, 2010, from <http://www.aatod.org/pdfs/methadone-theft.pdf>
- Drug Enforcement Administration. (2005a). The Controlled Substances Act. In D. E. Joseph (Ed.), *Drugs of Abuse: Drug Enforcement Administration*.
- Drug Enforcement Administration. (2005b). *Drugs of Abuse: Drug Enforcement Administration*.
- Drug Enforcement Administration. (2007a). Fact sheet: Prescription drug abuse: A DEA focus. Retrieved June 14, 2008, from www.usdoj.gov/dea/concern/prescription_drug_fact_sheet.html
- Drug Enforcement Administration. (2007b, August 2007). Hydrocodone. Retrieved September 4, 2009, from <http://www.usdoj.gov/dea/concern/hydrocodone.html>
- DuPont, R. L., Coleman, J. J., Bucher, R. H., & Wilford, B. B. (2008). Characteristics and motives of college students who engage in nonmedical use of methylphenidate. *American Journal on Addictions*, *17*(3), 167-171.

- El-Aneed, A., Alaghebandan, R., Gladney, N., Collins, K., MacDonald, D., & Fischer, B. (2009). Prescription drug abuse and methods of diversion: the potential role of a pharmacy network. *Journal of Substance Use, 14*(2), 75-83.
- Elliott, D.S & Menard, S. (1992). Delinquent friends and delinquent behavior: Temporal and developmental patterns. In D. Hawkins (ed.), *Some current theories of crime and deviance*. Newbury Park, CA: Sage Publications.
- Fergusson, D. M., & Lynskey, M. T. (1998). Conduct problems in childhood and psychosocial outcomes in young adulthood: A prospective study. *Journal of Emotional and Behavioral Disorders, 6*(1), 2-18.
- Fergusson, D. M., Horwood, L. J., & Nagin, D. S. (2000). Offending trajectories in a New Zealand birth cohort. *Criminology, 38*(2), 525-551.
- Fergusson, D.M., Swain-Campbell, N.R. & Horwood, L.J. (2002). Deviant peer affiliations, crime and substance use: A fixed effects regression analysis. *Journal of Abnormal Child Psychology, 30*(4), 419-30.
- Fink, K. S., & Byrns, P. J. (2004). Changing prescribing patterns and increasing prescription expenditures in Medicaid. *Annals of Family Medicine, 2*(5), 488-493.
- Flory, K., Milich, R., Lynam, D. R., Leukefeld, C., & Clayton, R. (2003). Relation between childhood disruptive behavior disorders and substance use and dependence symptoms in young adulthood: Individuals with symptoms of attention-deficit/hyperactivity disorder and conduct disorder are uniquely at risk. *Psychology of Addictive Behaviors, 17*(2), 151-158.
- Ford, J. A., & Schroeder, R. D. (2009). Academic strain and non-medical use of prescription stimulants among college students. *Deviant Behavior, 30*(1), 26-53.
- Forgione, D. A., Neuenschwander, P., & Vermeer, T. E. (2001). Diversion of prescription drugs to the black market: what the states are doing to curb the tide. *Journal of Health Care Finance, 27*(4), 65-78.
- Fountain, J., Strang, J., Gossop, M., Farrell, M., & Griffiths, P. (2000). Diversion of prescribed drugs by drug users in treatment: Analysis of the UK market and new data from London. *Addiction, 95*(3), 393-406.
- French, M. T., McCollister, K. E., Alexandre, P. K., Chitwood, D. D., & McCoy, C. B. (2004). Revolving roles in drug-related crime: The cost of chronic drug users as victims and perpetrators. *Journal of Quantitative Criminology, 20*(3), 217-241.
- Friedman, R. A. (2006). The changing face of teenage drug abuse--The trend toward prescription drugs. *New England Journal of Medicine, 354*(14), 1448-1450.

- Gardner, T.W., Dishion, T.J. & Connell, A.M. (2008). Adolescent self-regulation as resilience: Resistance to antisocial behavior within the deviant peer context. *Journal of Abnormal Child Psychology*, 36, 273-284.
- Garnier, L. M., Arria, A. M., Caldeira, K. M., Vincent, K. B., O'Grady, K. E., & Wish, E. D. (2010). Sharing and selling of prescription medications in a college student sample. *The Journal of Clinical Psychiatry*, 71(3), 262-269.
- Goldman, B. (1998). The news on the street: Prescription drugs on the black market. *Canadian Medical Association Journal*, 159(2), 149-150.
- Gottfredson, D. C., & Exum, M. L. (2002). The Baltimore City drug treatment court: One-year results from a randomized study. *Journal of Research in Crime & Delinquency*, 39(3), 337-356.
- Gottfredson, D. G., Najaka, S. S., & Kearley, B. (2003). Effectiveness of drug treatment courts: Evidence from a randomized trial. *Criminology & Public Policy*, 2(2), 171-197.
- Grasmick, H. G., Tittle, C. R., Bursik Jr., R. J., & Arneklev, B. J. (1993). Testing the core empirical implications of Gottfredson and Hirschi's General Theory of Crime. *Journal of Research in Crime and Delinquency*, 30, 5-29.
- Hall, K. M., Irwin, M. M., Bowman, K. A., Frankenberger, W., & Jewett, D. C. (2005). Illicit use of prescribed stimulant medication among college students. *Journal of American College Health*, 53(4), 167-174.
- Hall, W., & Degenhardt, L. (2007). Regulating opioid prescribing to provide access to effective treatment while minimizing diversion: an overdue topic for research. *Addiction*, 102(11), 1685-1688.
- Harrell, A., Mitchell, O., Hirst, A., Marlowe, D., & Merrill, J. (2002). Breaking the cycle of drugs and crime: Findings from the Birmingham BTC demonstration. *Criminology & Public Policy*, 1(2), 187-214.
- Haynie, D.L. (2001). Delinquent peers revisited: Does network structure matter? *American Journal of Sociology*, 106(4), 1013-1057.
- Haynie, D.L. (2002). Friendship networks and delinquency: The relative nature of peer delinquency. *Journal of Quantitative Criminology*, 18(2), 99-134.
- Haynie, D.L. & Osgood, D.W. (2005). Reconsidering peers and delinquency: How do peers matter? *Social Forces*, 84, 1109-1130.

- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*, *112*(1), 64-105.
- Hobbs, T. R. (1998). Drug diversion and prescription drug abuse--Part I. *Pennsylvania Medicine*, *101*(10), 15-15.
- Hochstetler, A., Copes, H. & DeLisi, M. (2002). Differential association in group and solo offending. *Journal of Criminal Justice*, *30*(6), 559-566.
- Hser, Y.-I., Hoffman, V., Grella, C. E., & Anglin, M. D. (2001). A 33-year follow-up of narcotics addicts. *Archives of General Psychiatry*, *58*(5), 503-508.
- Huber, P.J. (1967). The behavior of maximum likelihood estimates under non-standard conditions. *Proceedings of the fifth Berkeley symposium on mathematical statistics and probability*, *1*, 221-223.
- Hunt, D. E. (1990). Drugs and consensual crimes: Drug dealing and prostitution. *Crime and Justice*, *13*, 159-202.
- Hurwitz, W. (2005). The challenge of prescription drug misuse: A review and commentary. *Pain Medicine*, *6*(2), 152-161.
- Iannotti, R.J. & Bush, P.J. (1992). Perceived vs. actual friends' use of alcohol, cigarettes, marijuana and cocaine: Which has the most influence? *Journal of Youth and Adolescence*, *21*(3), 375-389.
- Imai, K., Keele, L., & Tingley, D. (2010). A general approach to causal mediation analysis. *Psychological Methods*, *15*, 309-334.
- Inciardi, J. A., Surratt, H. L., Kurtz, S. P., & Cicero, T. J. (2007). Mechanisms of prescription drug diversion among drug-involved club- and street-based populations. *Pain Medicine*, *8*(2), 171-183.
- Inciardi, J. A., Cicero, T. J., Munoz, A., Adams, E. H., Geller, A., Senay, E. C., & Woody, G. E. (2006a). The diversion of Ultram, Ultracet, and generic tramadol HCl. *Journal of Addictive Diseases*, *25*(2), 53-58.
- Inciardi, J. A., Surratt, H. L., Kurtz, S. P., & Burke, J. J. (2006b). The diversion of prescription drugs by health care workers in Cincinnati, Ohio. *Substance Use and Misuse*, *41*(2), 255-264.
- Inciardi, J. A., & Cicero, T. J. (2009). Black beauties, gorilla pills, footballs, and hillbilly heroin: Some reflections on prescription drug abuse and diversion research over the past 40 years. *Journal of Drug Issues*, *39*(1), 101.

- Jensen, G. F. (1972). Parents, peers, and delinquent action: A test of the differential association perspective. *American Journal of Sociology*, 78, 562-575.
- Jensen, G. F., Erickson, M. L., & Gibbs, J. P. (1978). Perceived Risk of Punishment and Self-Reported Delinquency. *Social Forces*, 57(1), 57-78.
- Jofre-Bonet, M., & Sindelar, J. L. (2002). *Drug treatment as a crime fighting tool*. Unpublished manuscript, Cambridge, MA.
- Johnson, E. O., Arria, A. M., Borges, G., & Ialongo, N. (1995). The growth of conduct problem behaviors from middle childhood to early adolescence: Sex differences and the suspected influence of early alcohol use. *Journal of Studies on Alcohol*, 56(6), 661-671.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2009). *Monitoring the Future: National survey results on drug use, 1975-2008. Volume II: College students and adults ages 19-50*. Bethesda, MD: National Institute on Drug Abuse.
- Joranson, D. E., & Gilson, A. M. (2005). Drug crime is a source of abused pain medications in the United States. *Journal of Pain and Symptom Management*, 30(4), 299-301.
- Joranson, D. E., & Gilson, A. M. (2007). A much-needed window on opioid diversion. *Pain Medicine*, 8(2), 128-129.
- Kenny, D. A. (2008). Mediation with Dichotomous Outcomes. Retrieved December 17, 2012 from <http://davidakenny.net/doc/dichmed.pdf> .
- Kleiman, M. A. (2001). Controlling drug use and crime with testing, sanctions, and treatment. In P. Heymann & W. N. Brownsberger (Eds.), *Drug addiction and drug policy: The struggle to control dependence*. Cambridge, MA: Harvard University Press.
- Kuehn, B. M. (2007). Opioid prescriptions soar: Increase in legitimate use as well as abuse. *Journal of the American Medical Association*, 297(3), 249-251.
- Longshore, D. (1998). Self-control and criminal opportunity: A prospective test of the General Theory of Crime. *Social Problems*, 45(1), 102-113.
- MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies. *Evaluation Review*, 17, 144-158.
- MacKinnon DP, Warsi G, Dwyer JH. (1995). A simulation study of mediated effect measures. *Multivariate Behavioral Research*, 30(1), 41-62.

- Matsueda, R. L., & Anderson, K. (1998). The dynamics of delinquent peers and delinquent behavior. *Criminology*, 36(2), 269-308.
- Matsueda, R. L., Kreager, D. A., & Huizinga, D. (2006). Detering delinquents: A rational choice model of theft and violence. *American Sociological Review*, 71(1), 95-122.
- McBride, D. C., & McCoy, C. B. (1993). The drugs-crime relationship: An analytic framework. *The Prison Journal*, 73(3), 257-278.
- McCabe, S. E., & Boyd, C. J. (2005). Sources of prescription drugs for illicit use. *Addictive Behaviors*, 30(7), 1342-1350.
- McCabe, S. E., Cranford, J. A., Boyd, C. J., & Teter, C. J. (2007). Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. *Addictive Behaviors*, 32(3), 562-575.
- McCabe, S. E., Knight, J. R., Teter, C. J., & Wechsler, H. (2005). Non-medical use of prescription stimulants among US college students: Prevalence and correlates from a national survey. *Addiction*, 99, 96-106.
- McCabe, S. E., Teter, C. J., & Boyd, C. J. (2004). The use, misuse and diversion of prescription stimulants among middle and high school students. *Substance Use and Misuse*, 39(7), 1095-1116.
- McCabe, S. E., Teter, C. J., & Boyd, C. J. (2006a). Medical use, illicit use and diversion of prescription stimulant medication. *Journal of Psychoactive Drugs*, 38(1), 43-56.
- McCabe, S. E., Teter, C. J., & Boyd, C. J. (2006b). Medical use, illicit use, and diversion of abusable prescription drugs. *Journal of American College Health*, 54(5), 269-278.
- McLellan, A. T., & Turner, B. J. (2010). Chronic noncancer pain management and opioid overdose: Time to change prescribing practices. *Annals of Internal Medicine*, 152(2), 123-124.
- Moline, S., & Frankenberger, W. (2001). Use of stimulant medication for treatment of Attention-Deficit/Hyperactivity Disorder: A survey of middle and high school students' attitudes. *Psychology in the Schools*, 38(6), 569-584.
- Monte, A. A., Mandell, T., Wilford, B. B., Tennyson, J., & Boyer, E. W. (2009). Diversion of buprenorphine/naloxone coformulated tablets in a region with high prescribing prevalence. *Journal of Addictive Diseases*, 28(3), 226-231.

- Nagin, D. S. (1998). Criminal deterrence research at the outset of the twenty-first century. *Crime and Justice*, 23(1), 1-42.
- Nagin, D. S., & Paternoster, R. (1991). The preventive effects of the perceived risk of arrest: Testing an expanded conception of deterrence. *Criminology*, 29(4), 561-587.
- Nagin, D. S., & Paternoster, R. (1993a). Enduring individual differences and rational choice theories of crime. *Law & Society Review*, 27(3), 467-496.
- Nagin, D. S., & Paternoster, R. (1993b). Enduring individual differences and rational choice theories of crime. *Law & Society Review*, 27(4), 469-498.
- Nagin, D. S., & Paternoster, R. (1994). Personal capital and social control: The deterrence implications of a theory of individual differences in criminal offending. *Criminology*, 32(4), 581-606.
- Nagin, D. S., & Pogarsky, G. (2001). Integrating celerity, impulsivity, and extralegal sanction threats into a model of general deterrence: Theory and evidence. *Criminology*, 39(4), 865-891.
- National Center on Addiction and Substance Abuse at Columbia University. (2005). *Under the counter: The diversion and abuse of controlled prescription drugs in the U.S.* New York, NY.
- Neff, J.L. & Waite, D.E. (2007). Male versus female substance abuse patterns among incarcerated juvenile offenders: Comparing strain and social learning variables. *Justice Quarterly*, 24(1), 106-132.
- Ousey, G. C., & Lee, M. R. (2002). Examining the conditional nature of the illicit drug market-homicide relationship: A partial test of the theory of contingent causation. *Criminology*, 40(1), 73-102.
- Paternoster, R., Saltzman, L. E., Waldo, G. P., & Chiricos, T. G. (1983). Perceived risk and social control: Do sanctions really deter? *Law & Society Review*, 17(3), 457-479.
- Paternoster, R., & Piquero, A. (1995). Reconceptualizing deterrence: An empirical test of personal and vicarious experiences. *Journal of Research in Crime & Delinquency*, 32(3), 251-286.
- Paternoster, R., & Simpson, S. (1993). Rational Choice Theory of corporate crime. In R. V. Clarke & M. Felson (Eds.), *Routine Activity & Rational Choice: Advances in Criminological Theory, Volume 5* (pp. 37-58). Boston, MA: Transaction Publishers.

- Paternoster, R., & Simpson, S. (1996). Sanction Threats and Appeals to Morality: Testing a Rational Choice Model of Corporate Crime. *Law & Society Review, 30*(3), 549-583.
- Perkins, H.W. (Eds). (2003). *The social norms approach to preventing school and college age substance abuse: A handbook for educators, counselors and clinicians*. San Francisco: Jossey-Bass.
- Perkins, H.W. & Wechsler, H. (1996). Variation in perceived college drinking norms and its impact on alcohol abuse: A nationwide study. *Journal of Drug Issues, 26*, 961-974.
- Peters, R. H., & Murrin, M. R. (2000). Effectiveness of treatment-based drug courts in reducing criminal recidivism. *Criminal Justice & Behavior, 27*(1), 72-96.
- Piliavin, I., Thornton, C., Gartner, R., & Matsueda, R. L. (1986). Crime, deterrence and rational choice. *American Sociological Review, 51*(1), 101-119.
- Piquero, A., & Paternoster, R. (1998). An application of Stafford and Warr's reconceptualization of deterrence to drinking and driving. *Journal of Research in Crime & Delinquency, 35*(1), 3-39.
- Piquero, A. R., & Pogarsky, G. (2002). Beyond Stafford and Warr's reconceptualization of deterrence: Personal and vicarious experiences, impulsivity, and offending behavior. *Journal of Research in Crime & Delinquency, 39*(2), 153-186.
- Piquero, A., & Tibbetts, S. (1996). Specifying the direct and indirect effects of low self-control and situational factors in offenders' decision making: Toward a more complete model of rational offending. *Justice Quarterly, 13*(3), 481-510.
- Pogarsky, G. (2002). Identifying 'deterable' offenders: Implications for research on deterrence. *Justice Quarterly, 19*(3), 431.
- Poulin, C. (2001). Medical and nonmedical stimulant use among adolescents: From sanctioned to unsanctioned use. *Canadian Medical Association Journal, 165*(8), 1039-1044.
- Poulin, C. (2007). From attention-deficit/hyperactivity disorder to medical stimulant use to the diversion of prescribed stimulants to non-medical stimulant use: Connecting the dots. *Addiction, 102*, 740-751.
- Pratt, T. C., Cullen, F. T., Blevins, K. R., Daigle, L. E., & Madensen, T. D. (2008). The empirical status of Deterrence Theory: A meta-analysis. In F. T. Cullen, J. P. Wright & K. R. Blevins (Eds.), *Taking Stock: The Status of Criminological Theory* (Vol. Advances in Criminological Theory, Volume 15, pp. 367-383). New Brunswick, NJ: Transaction Publishers.

- Prescription drug diversion. (1996). *Virginia Medical Quarterly*, 123(2), 132.
- Reifman, A., Barnes, G. M., Dintcheff, B. A., Farrell, M. P., & Uhteg, L. (1998). Parental and peer influences on the onset of heavier drinking among adolescents. *Journal of Studies on Alcohol*, 59(3), 311-317.
- Rigg, K.K., Kurtz, S.P. & Surratt, H.L. (2012). Patterns of prescription medication diversion among drug dealers. *Drugs: Education, Prevention & Policy*, 19(2), 144-155.
- Rucker, D.D., Preacher, K.J., Tormala, Z.L. & Petty, R.E. (2011). Mediation analysis in social psychology: Current practices and new recommendations. *Social and Personality Psychology Compass*, 5/6, 359-371.
- Sapienza, F. L. (2006). Abuse deterrent formulations and the Controlled Substances Act (CSA). *Drug and Alcohol Dependence*, 83(Suppl 1), S23-30.
- Simoni-Wastila, L., & Tompkins, C. (2001). Balancing diversion control and medical necessity: The case of prescription drugs with abuse potential. *Substance Use & Misuse*, 36(9 & 10), 1275-1296.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological Methodology* (pp. 290-312). Washington DC: American Sociological Association.
- Stafford, M. C., & Warr, M. (1993). A reconceptualization of general and specific deterrence. *Journal of Research in Crime and Delinquency*, 30(2), 123-135.
- Stagnitti, M. N. (2009). *Trends in outpatient prescription analgesics utilization and expenditures for the U.S. civilian noninstitutionalized population, 1996 and 2006*. Rockville, MD: Agency for Healthcare Research and Quality.
- Substance Abuse and Mental Health Services Administration. (1995). *Office of Applied Studies, National Household Survey on Drug Abuse Advance Report #18*. Rockville, MD: Office of Applied Studies.
- Substance Abuse and Mental Health Services Administration. (2001). *Results from the 2000 National Household Survey on Abuse: Volume 1. Summary of National Findings*. Rockville, MD.
- Substance Abuse and Mental Health Services Administration. (2002). *Results from the 2001 National Household Survey on Abuse: Volume I. Summary of national findings*. Rockville, MD.
- Substance Abuse and Mental Health Services Administration. (2007). *Treatment Episode Data Set (TEDS): 1995-2005: National admissions to substance abuse treatment services*. Rockville, MD.

- Substance Abuse and Mental Health Services Administration. (2010a). *The DAWN report: Trends in emergency department visits involving nonmedical use of narcotic pain relievers*. Retrieved 10/16/2011 from <http://www.samhsa.gov/data/2k10/dawn016/opioided.htm>.
- Substance Abuse and Mental Health Services Administration. (2010b). *Results from the 2009 National Survey on Drug Use and Health: Volume I. Summary of National Findings*. Rockville, MD: Office of Applied Studies.
- Substance Abuse and Mental Health Services Administration . (2011). *Results from the 2010 National Survey on Drug Use and Health: Volume I. Summary of National Findings*. Rockville, MD: Office of Applied Studies.
- Substance Abuse and Mental Health Services Administration . (2012). *Results from the 2011 National Survey on Drug Use and Health: Volume I. Summary of National Findings*. Rockville, MD: Office of Applied Studies.
- Sudman, S. & Bradburn, N.M. (1973). Effects of time and memory factors on response in surveys. *Journal of the American Statistical Association*, 68(344), 805-815.
- Sutherland, E.H. (1944). Critique of the theory. Private paper published posthumously in K. Schuessler (ed.) *Edwin Sutherland on Analyzing Crime* (pp. 13-29). Chicago: University of Chicago Press.
- Sutherland, E.H. (1947). *Principles of criminology (4th ed.)*. Philadelphia, PA: Lippencott.
- Taylor, B. G., Fitzgerald, N., Hunt, D., Reardon, J. A., & Brownstein, H. H. (2001). *ADAM preliminary 2000 findings on drug use and drug markets--Adult male arrestees*. Washington, D.C. : Arrestee Drug Abuse Monitoring Program.
- Teter, C. J., McCabe, S. E., LaGrange, K., Cranford, J. A., & Boyd, C. J. (2006). Illicit use of specific prescription stimulants among college students: Prevalence, motives, and routes of administration. *Pharmacotherapy*, 26(10), 1501-1510.
- U.S. Department of Health and Human Services (2012). Prescription drug monitoring programs: A resource to help address prescription drug abuse and diversion. Medicare Learning Network (MLN) Matters, SE1250. Washington DC: U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services. Retrieved 3/25/13 from <http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/Downloads/SE1250.pdf>.
- U.S. Department of Justice. (2009). *National prescription drug threat assessment*. Retrieved 9/29/2011 from <http://www.justice.gov/archive/ndic/pubs33/33775/33775p.pdf>.

- U.S. Department of Justice. (2010). *National Drug Threat Assessment*. Retrieved 9/29/2011 from <http://www.justice.gov/archive/ndic/pubs38/38661/38661p.pdf>.
- U.S. Department of Justice. (2011). *National Drug Threat Assessment*. Retrieved 2/14/2013 from <http://www.justice.gov/archive/ndic/pubs44/44849/44849p.pdf>.
- United States General Accounting Office. (2002). *Prescription drugs: State monitoring programs provide useful tool to reduce diversion*. Washington D.C.
- Urberg, K.A., Luo, Q., Pilgrim, C. & Degirmencioglu, S.M. (2003). A two-stage model of peer influence in adolescent substance use: Individual and relationship-specific differences in susceptibility to influence. *Addictive Behaviors*, 28(7), 1243-1256.
- Volkow, N.D. (2010). *Testimony on Prescription Drug Abuse*. Congressional Caucus on Prescription Drug Abuse, 110th Congress, Session II.
- von Hirsch, A., Bottoms, A. E., Burney, E., & Wikstrom, P.O. (1999). *Criminal deterrence and sentence severity: An analysis of recent research*. Oxford: Hart Publishing.
- Waldo, G. P., & Chiricos, T. G. (1972). Perceived penal sanction and self-reported criminality: A neglected approach to deterrence research. *Social Problems*, 19(4), 522-540.
- Warner, M., Chen, L. J., & Makuc, D. M. (2009). *Increase in fatal poisonings involving opioid analgesics in the United States, 1999-2006*. Hyattsville, MD: National Center for Health Statistics.
- Warr, M., & Stafford, M. (1991). The influence of delinquent peers: What they think or what they do? *Criminology*, 29.
- West, H., Sabol, W., & Greenman, S. (2010). *Prisoners in 2009* (No. NCJ231675). Washington, DC: United States Department of Justice.
- White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, 48, 817-838.
- White, H. 1982. Maximum likelihood estimation of misspecified models. *Econometrica*, 50, 1-25.
- Wilens, T. E., Gignac, M., Swezey, A., Monuteaux, M. C., & Biederman, J. (2006). Characteristics of adolescents and young adults with ADHD who divert or misuse their prescribed medications. *Journal of the American Academy of Child and Adolescent Psychiatry*, 45(4), 408-414.

- Wish, E. D., & Johnson, B. D. (1986). The impact of substance abuse on criminal careers. In A. Blumstein (Ed.), *Criminal careers and "career criminals"* (Vol. Volume I, pp. 52-63). Washington, D.C.: National Academy Press.
- Woodworth, T. (2000). *DEA Congressional Testimony*. Retrieved from <http://www.dea.gov/pubs/cngrttest/ct051600.htm>.
- Wright, B. R. E., Caspi, A., Moffitt, T. E., & Paternoster, R. (2004). Does the perceived risk of punishment deter criminally prone individuals? Rational choice, self-control and crime. *Journal of Research in Crime and Delinquency*, *41*(2), 180-213.
- Wright, B.R.E., Caspi, A., Moffitt, T.E. & Silva, P.A. (2001). The effects of social ties on crime vary by criminal propensity: A life- course model of interdependence. *Criminology* 39:321-352.
- Zuckerman, M. (2002). Zuckerman-Kuhlman Personality Questionnaire (ZKPQ): An alternative five-factorial model. In B. de Raad & M. Perugini (Eds.), *Big Five Assessment* (pp. 377-396). Seattle: Hogrefe & Huber.