

USING MARION COUNTY, INDIANA CORONER RECORDS AND DEPUTY
FIELD OFFICER REPORTS TO UNDERSTAND HEROIN AND PRESCRIPTION
PAINKILLER OVERDOSES

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Dedication

This work is dedicated to the 1174 people who lost their lives from an opiate-related overdose.

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I would like to thank my dissertation committee for their support throughout this entire process. Each of them have contributed to my development as a social worker, researcher, and human being. Literally, this dissertation topic would not exist without Dr. Gregory Zimet and introducing me to the life-saving antidote, naloxone. Dr. Devon Hensel was informative in my professional development. Words will never justify the dedication and support Dr. Margaret Adamak provides to each of her doctoral students. Dr. Kathy Lay was a pillar of support providing calmness and focus during time of tribulation. Dr. Jim Hall, whom I have known for many years, was at the very beginning and end of my doctoral studies that spanned three universities. His unwavering support and dedication to all of his students is a trait I inspire for during academic career.

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Deaths due to prescription painkillers and heroin have quickly become national, state, and local public health concerns. Studies using data from Medical Examiners or Coroner Offices throughout the United States have been conducted and are contributing to the understanding of this epidemic. However, the analysis of these fatalities are specific to the communities where the study was conducted and cannot be assumed that the decedents in one community are similar to decedents in another community. Many local governments and agencies throughout the U.S. are aware that this problem exists in their communities, but are not prepared to adequately respond to and intervene in these fatalities as an analysis of those who have died has rarely been conducted. This dissertation is a replication study of longitudinal epidemiological analyses of opiate-related fatalities that was implemented in a location where an analysis of opiate-related fatalities had not been conducted, Marion County, Indiana. The purpose of the dissertation was twofold: (1) to describe the demographic characteristics of the decedents using publicly available data from the Marion County Coroner's Office to be used in informing future preventative efforts to decrease opiate-related fatalities in Marion County and (2) to inform other communities on how to conduct a similar analysis in their own community.

This dissertation describes the methods of the replication study, provides descriptive results of the people who died from opiate-related overdoses, and: (a) Report

the types of opiates identified in blood toxicology reports and (b) Present the histories of opiate-related decedents as reported in the Deputy Coroner Field Officer's Reports (DCFOR). Additionally, analysis was conducted to determine if decedent characteristics differed depending on the type of opiate fatality based on the toxicology in 1) heroin alone, 2) painkillers alone, and 3) heroin and painkillers combined.

Kathy Lay, PhD, Co-Chair

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Chapter 1 Introduction

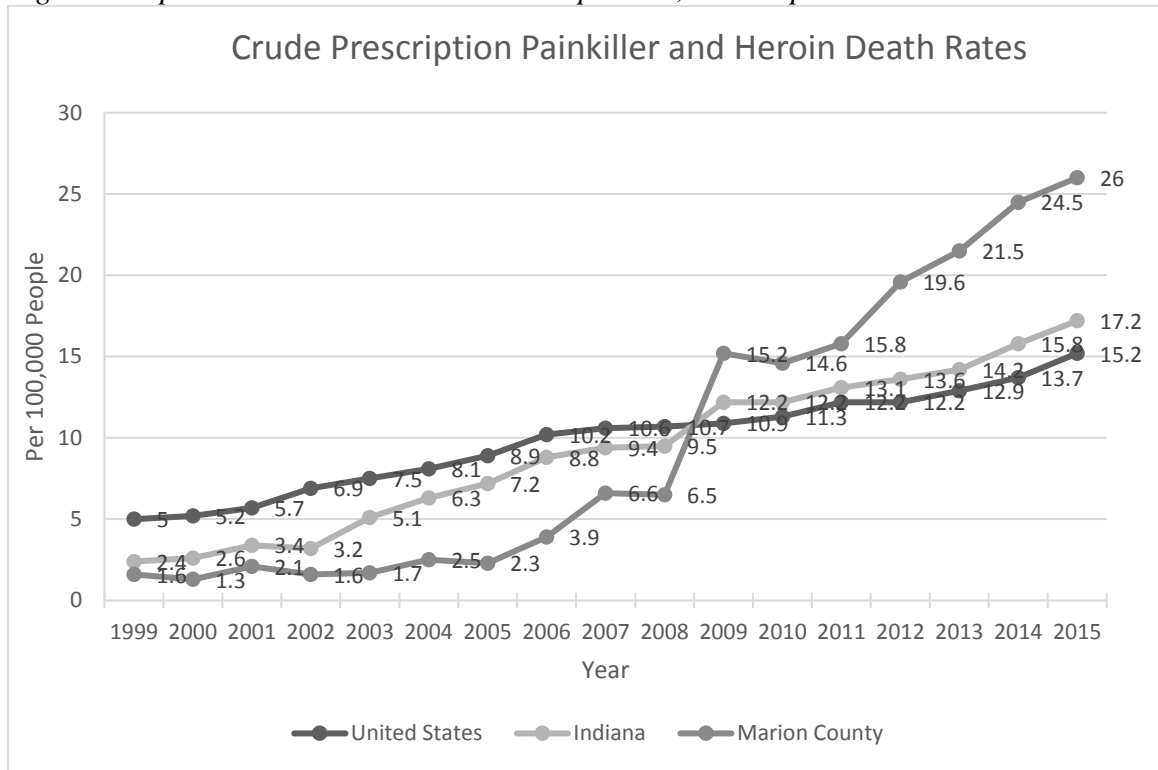
Deaths due to prescription painkillers and heroin have quickly become national, state, and local public health concerns. In the U.S., opiate overdose deaths have seen over a threefold increase from 1999 (13,995 deaths) to 2015 (48,987 deaths) (Centers for Disease Control and Prevention [CDC], 2016). Indiana reported 145 deaths related to opiate overdoses in 1999 and 1,140 deaths in 2015, almost an eight-fold increase (CDC, 2016). Marion County reported 14 deaths in 1999 and 244 deaths in 2015, over a seventeen-fold increase (CDC, 2016). In Table 1, the number of deaths and the crude death rate are displayed per 100,000 people for the US, Indiana, and Marion County for the years 1999 – 2015. Figure 1 is a comparative line graph reporting the crude death rate per 100,000 people for the US, Indiana, and Marion County.

Table 1: Opiate-related Fatalities: Number of Deaths and Crude Death Rate 1991-2015

Year	United States		Indiana		Marion County	
	# of deaths	Death Rate per 100,000	# of deaths	Death Rate per 100,000	# of deaths	Death Rate per 100,000
1999	13,995	5	145	2.4	14	1.6
2000	14,572	5.2	157	2.6	11	1.3
2001	16,170	5.7	207	3.4	19	2.1
2002	19,829	6.9	200	3.2	14	1.6
2003	21,732	7.5	314	5.1	15	1.7
2004	23,599	8.1	392	6.3	22	2.5
2005	26,219	8.9	449	7.2	20	2.3
2006	30,525	10.2	555	8.8	34	3.9
2007	31,915	10.6	598	9.4	58	6.6
2008	32,655	10.7	608	9.5	58	6.5
2009	33,379	10.9	786	12.2	137	15.2
2010	34,898	11.3	792	12.2	132	14.6
2011	37,982	12.2	854	13.1	144	15.8
2012	38,270	12.2	891	13.6	180	19.6
2013	40,714	12.9	931	14.2	200	21.5
2014	43,787	13.7	1,043	15.8	229	24.5
2015	48,987	15.2	1,140	17.2	244	26.0

Source: CDC WONDER website

Figure 1: Opiate Related Crude Death Rate per 100,000 People



Background on Prescription Painkiller and Heroin Use, Misuse, and Overdose

The misuse of prescription painkillers is a far-reaching public health concern. In 2015, 12.4 million people reported illicit misuse of prescription painkillers (i.e., opiates and opioids) (Substance Abuse and Mental Health Services Administration [SAMHSA], 2016). In 2010, prescription painkillers accounted for the majority of the 5.1 million drug-related emergency department (ED) visits (SAMHSA, 2013). Substance misuse treatment at inpatient and outpatient clinics for opiate misuse has risen from 17% of all types of substance misuse treatment episodes in 2000 to 28% in 2013. Opiates other than heroin accounted for 16% of all primary opiate admissions in 2003, but rose to 33% in 2013 (SAMHSA, 2015). Moreover, opiate overdose deaths have increased threefold from 1999 (13,995 deaths) to 2015 (48,987 deaths) (CDC, 2016).

Alarming, these trends continue to rise as the use of prescription painkillers has also increased. Retail sales of prescription painkiller medications in the U.S. increased 149% from 1997 to 2007 and account for 80% of global painkiller consumption (Manchikanti, Fellows, Ailinani, & Pampati, 2010). A proportion of the use of prescription painkillers may be warranted as the Institute of Medicine (2011) estimates 100 million U.S. adults suffer from chronic pain. The source of this pain is far-reaching and touches all areas and communities of the U.S. Chronic severe pain is prevalent in diseases, such as cancer (Deandrea, Montanari, Moja, & Apolone, 2008), diabetes (Krein, Heisler, Piette, Makki, & Kerr, 2005), HIV/AIDS (Tsao, Stein, & Dobalian, 2010), sickle-cell disease (Elander, Lusher, Bevan, Telfer, & Burton, 2004), and gastro-intestinal issues (Bruce & Krukowski, 2006). Specific populations have been identified as especially challenged by pain, such as children (Finley, Kristjansdottir, & Forgeron, 2010), older adults (Reisner, 2011), people from racial and ethnic minorities (Anderson, Green, & Payne, 2009), military personnel and veterans (Kerns & Dobscha, 2009), and recently released prisoners (Andrews & Kinner, 2012; Binswanger, Blatchford, Lindsay, & Stern, 2011; Wakeman, Bowman, McKenzie, Jeronimo, & Rich, 2009).

Special Population: Military Personnel and Veterans

Prescription painkiller use among active duty U.S. military personnel and veterans is receiving much attention due to the increased use of prescription painkillers that are attributed to service-related injuries and disabilities among this population (Bennett, Elliott, & Golub, 2013; Goebel et al., 2011; Golub & Bennett, 2013; Morasco & Dobscha, 2008; Seal et al., 2012). The Department of Defense (DoD) has been monitoring health-related behaviors among active duty military personnel for over three

decades with the use of the DoD Surveys of Health Related Behaviors Among Active Military Personnel and using these findings to improve policies and services for military personnel (Barlas, Higgins, Pflieger, & Diecker, 2013). Indeed, beginning in 2011, the survey instrument was adjusted to account for current issues such as, prescription painkiller misuse, traumatic brain injuries, and multiple deployments (Barlas et al., 2013). Due to these changes, trends in prescription painkiller misuse through survey iterations is unable to be determined (Barlas et al., 2013). Nonetheless, researchers are concerned with the increased use of prescription painkillers among military personnel and veterans and have begun to monitor the spreading use, misuse, and overdoses of prescription painkillers (Barry et al., 2011; Bennett et al, 2013; Goebel et al., 2011; Golub & Bennett, 2013, 2014; Morasco & Dobscha, 2008; Seal et al., 2012; Wu, Lang, Hasson, Linder, & Clark, 2010).

In a New York City sample of U.S. veterans of the Iraq and Afghanistan wars, researchers found that misuse of prescription painkillers was not present before deployment and that misuse began after being treated with painkillers for active duty and combat-related injuries. Additionally, current and future misuses of painkillers are associated with a history of alcohol and drug use disorders, traumatic brain injury, homelessness, and unemployment (Golub & Bennett, 2013). A qualitative study using the same New York City sample reported that experiences with overdoses from prescription painkillers are common among returning war veterans (Bennett et al., 2013). Seal and colleagues (2012) found that veterans with a PTSD diagnosis were at increased risk for being prescribed and misusing painkillers, while Goebel and associates (2011)

and Morasco and Dobscha (2008) both report that military personnel and veterans with previous substance use disorders were more likely to misuse prescription painkillers.

Active duty military personnel self-reported use of illicit drugs, and prescription drug misuse increased from 5% in 2005 to 12% in 2008 (Jeffery, Babeu, Nelson, Kloc, & Klette, 2013), prompting the U.S. Congress to review prescription drug misuse among military personnel (U.S. Senate, March 24, 2010). Furthermore, 47% of returning Iraq and Afghanistan soldiers report experiencing pain and discomfort and 14% of U.S. soldiers have been prescribed a prescription painkiller (U.S. Army, 2012). Prescription painkillers were involved in 312 overdose deaths among active-duty Army Personnel from 2006-2011 (U.S. Army, 2012).

Clinical and Policy Responses to Overdoses

Clinical and policy responses aimed at addressing the misuse of prescription painkillers typically include opiate specific treatment centers, increased enforcement, implementation of prescription drug monitoring programs (PDMP) (Gugelmann & Perrone, 2011), and reduction in prescribing opioids (Dowell, Haegerich, & Chou, 2016). Although PDMPs can decrease the amount of diverted prescription drugs in the community, they have had limited success with decreasing use of prescription drugs and have little to no effect on the number of overdose mortalities (Paulozzi, Kilbourne, & Desai, 2011). Additionally, despite recent reports on the decline in opiates being prescribed by physicians, opioid-related overdose fatality rates continue to rise (Schuchat, Houry, & Guy, Jr., 2017).

To address the increasing fatality rates, an alternative approach has been proposed; namely, to ensure more widespread dissemination of the opiate antidote,

naloxone. Naloxone is an opiate antagonist that safely and effectively reverses the often-fatal respiratory depression effects caused by an opiate overdose (Chamberlain & Klein, 1994; Sporer, 2003). Naloxone only works with opiates and has no similar antidote properties for any other illicit or licit drug, including alcohol (Chamberlain & Klein, 1994; Sporer, 2003) and has been clinically available since 1962 (Baselt, 2000). Naloxone has been routinely used by paramedics, emergency departments, and other medical services to reverse the otherwise fatal effects of a heroin or prescription painkiller overdose (Sporer, 2003; Strang, Kelleher, Best, Mayet, & Manning, 2006). Despite its extensive clinical history and efficacious nature, it is relatively unknown to the general community and has limited use due to federal and state administrative restrictions (Beletsky, Burris, & Kral, 2009; Burris, Norland, & Edlin, 2001; Davis, Webb, & Burris, 2013; Green et al., 2013).

An overdose occurs when opiate molecules bind to opiate specific receptors, Mu_2 receptors, in the brain that are responsible for detecting carbon dioxide levels in the bloodstream and controlling the channel of communication needed for breathing. As opiate molecules begin to attach to Mu_2 receptors, the breathing rate decreases and breaths of air become shallower. Eventually, as more opiate molecules bind to Mu_2 receptors, the communication between the brain and lungs stops, thus leading to respiratory failure, and if no intervention, then death (Sporer, 1999; White & Irvine, 1999). When naloxone is introduced into the body, it causes the opiate molecules to release from the Mu_2 receptors almost immediately and communication between the brain and lungs is restored, allowing the body to breathe.

Therefore, naloxone has the potential to save individuals' lives quickly. Despite having no euphoric properties or potential for abuse or overdose (Chamberlain & Klein, 1994; Sporer, 2003), naloxone is a controlled substance that must be prescribed by a physician, typically limiting immediate access to emergency responders and EDs (Burriss et al., 2009). These restrictions greatly limit individual access to naloxone, which can result in otherwise avoidable deaths (Zador, Sunjic, & Darke, 1996). The process from overdose to death can take several hours, but irreversible brain damage may result if someone is revived only after long periods of slow and shallow breathing (O'Brien & Todd, 2009). In many cases, death occurs before emergency responders can respond (Sanford, 2004).

Because of these limitations in access to naloxone, some researchers recommended that naloxone be readily available to those who use opiates and to their family members and friends (Darke, Ross, & Hall, 1996; Lagu, Anderson, & Stein, 2006; Sporer, 1999; Strang, Darke, Hall, Farrell, & Ali, 1996). Though emergency response services are readily available in most cases of an overdose, Tobin and colleagues (2005) found that slow response times by emergency responders is not the only reason for overdose fatalities, but that bystanders of opiate overdoses are unlikely to call 911 for assistance due to fear of legal repercussions. Many people who misuse opiates are on parole or have outstanding warrants (Davidson, et al., 2003). Research has established that bystanders witnessing an opiate overdose would be willing to, and have successfully administered, naloxone to victims of opiate overdoses (Baca & Grant, 2007; Doe-Simkins, Walley, Epstein, & Moyer, 2009; Green, Heimer, & Grau, 2008; Lagu et al., 2006; Strang et al., 1999; Walley et al., 2013).

Despite the findings reported above, naloxone is still not widely available in the U.S. Indeed, only 136 programs in a total of 30 states currently distribute naloxone through community-based programs, such as needle exchange programs (CDC, 2015). At these programs, naloxone is distributed directly to their clients, after a brief 10-to 30-minute training (Albert et al., 2011; Green et al., 2008; Piper et al., 2007). These programs are typically in areas with high concentrations of intravenous drug use (IDU) and HIV/AIDS, thus generating the political and societal support for needle exchanges and other HIV/AIDS and IDU community-based interventions. However, national epidemiological drug use studies have clearly established that opiate misuse and overdose is not limited to these thirty states (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2017; SAMHSA, 2016). The challenge facing the other twenty states is how to distribute naloxone effectively to those in greatest need, without the foundational support of needle exchange programs and other similar community-based efforts.

Current state of U.S. naloxone distribution

Distribution programs.

The distribution of naloxone is a relatively new concept. In 1999, underground operations in Chicago and San Francisco began distributing naloxone to active IDUs with the hope that they would be able to prevent potential overdose fatalities (Sporer & Kral, 2007). A physician would prescribe naloxone and train active IDUs in the proper administration of the drug. However, this arrangement put the prescribing physician at risk for civil, medical, and legal liability mainly in that naloxone would either not be administered by the individual for whom the drug was prescribed or that the prescribed

naloxone would be injected into an individual who did not have a prescription for that drug.

In 2001, after becoming aware of the successes these underground operations were having with decreased overdose fatalities through distributing naloxone, the San Francisco Department of Public Health funded a pilot naloxone distribution program (Seal et al., 2005). In this program, 24 IDUs enrolled in the program, which was modeled after the two underground operations. Enrollees attended four 2-hour interactive training sessions where they learned how to identify an overdose, administer CPR, contact emergency medical services, and administer naloxone. Upon successful completion of the program, each person was provided a naloxone kit that contained two prefilled injection cartridges of naloxone, gloves, a rescue-breathing mask, and detailed instructions. Additionally, a written prescription for naloxone was provided to each participant. From August 2001 through January 2002, the participants reported witnessing and responding to 20 overdoses and all victims survived (Seal et al., 2005).

Also in 2001, New Mexico became the first state to recommend that physicians prescribe naloxone to active opiate users. The then New Mexico Governor, Gary Johnson, was the leader of the legislation that released the medical liability of individuals and medical professionals who administered naloxone (Sporer & Kral, 2007). Connecticut and New York shortly followed New Mexico by granting all individuals immunity from civil and medical liability for administering naloxone by defining the use of naloxone as a first aid or emergency treatment (Beletsky, Burris, & Kral, 2009). Currently, eight states (NY, IL, WA, CA, RI, CT, MA, and NM) have made legal changes to remove medical, legal, and civil liability concerning the administration of

naloxone (Davis, Webb, & Burris, 2013). Throughout the U.S., an estimated 644 community agencies provide education and training, similar to the training described above, to potential opiate overdose bystanders (i.e., family members, friends, community advocates, active opiate users) in order to distribute and administer naloxone to potential overdose victims. Moreover, these agencies have trained over 150,000 potential bystanders that have prevented over 26,000 opiate overdose fatalities with the use of naloxone (CDC, 2015).

Recently, several state legislatures, including Indiana, have revised naloxone administration laws and regulations allowing all first responders and third parties (i.e., family member or friends) to administer naloxone. Indiana's law, specifically, allows physicians to administer prescriptions to third parties or people who misuse heroin and opiates. Additionally, the law grants immunity from civil and medical liability (Muraskin, 2015).

Future directions.

Despite the successes described above, there is still much to be done to ensure access to naloxone throughout the U.S. The strong push to increase naloxone access is coming from multiple fronts (legal, medical, and policy scholars) focusing on three targeted areas. The first targeted area is to increase the number of physicians who are prescribing naloxone. Primary care physicians and other physicians who have more frequent contact with active opiate users, such as ED physicians, are encouraged to provide naloxone prescriptions to their patients who are active opiate users (Beletsky et al., 2006; Kim, Irwin, & Khoshnood, 2009; Sporer & Kral, 2007). Additionally, chronic pain physicians and other physicians who work closely with people with painful chronic

illnesses, such as cancer, are also being asked to provide naloxone prescriptions, due to the increased risk of chronic pain patients misusing their prescription painkillers (Beletsky et al., 2009; Beletsky, Rich, & Walley, 2012). Unintentional overdoses are more likely to involve prescribed medication than illicit drugs (CDC, 2012).

The second targeted area is to advocate for changes in state laws and regulations that restrict the availability of naloxone. As described above, only eight states have taken direct measures to address the legal, civil, and medical liability that may follow administering naloxone. Some states have passed laws that allow other licensed medical professionals (i.e., nurse practitioners, physician assistants) to prescribe naloxone, instead of only a physician (Beletsky et al., 2009; Burris et al., 2009).

Finally, the third targeted area involves the Food and Drug Administration (FDA) reclassifying naloxone from prescription-only to an over-the-counter (OTC) drug. This process is likely to be lengthy, cumbersome, and expensive, due to all of the paperwork and filings required of pharmaceutical companies. However, support is strong for this option as the best way to make naloxone readily available (Beletsky et al., 2009; Burris et al., 2009; Coffin et al., 2003; Compton, Volkow, Throckmorton, & Lurie, 2013; Kim et al., 2009; Lagu et al., 2006; Seal et al., 2003; Sporer & Kral, 2007).

Conceptualization of the Problem

The foundation of this dissertation research rests on preventing opiate-related overdose fatalities. Naloxone is clearly the most effective tool for preventing acute overdose fatalities. As stated above, increasing the availability and reach of naloxone is a complex endeavor with numerous barriers, including policies at all levels of government,

professional regulations, and probably most damaging, public stigma surrounding addiction and drug misuse (Selin, Hakkarainen, Partanen, Tammi, & Tigerstedt, 2013).

Addressing this stigma concerning substance misuse is an important and constant effort that should continue; however, as opiate overdoses continue to rise so do opiate fatalities. Thus, it is prudent and ethical to seek alternative channels of using naloxone for preventing and intervening in opiate overdoses. This dissertation research involves a longitudinal, epidemiological analyses of opiate-related fatalities. It was implemented in a location where an analysis of opiate-related fatalities had not previously been conducted, Marion County, Indiana. The purpose of the study was to describe the demographic characteristics of the decedents using information from death certificates, toxicology reports, and the death investigation and then apply this information to inform future preventative efforts to decrease opiate-related fatalities.

Further exploration is needed concerning overdose deaths involving chronic pain and chronic diseases or illnesses. Research has not identified if one specific form of chronic pain (i.e., neurological, back pain) or chronic disease or illness (i.e., cancer, HIV/AIDS, diabetes) has a stronger positive relationship with prescription painkiller overdoses than others. This information could be important, as health care providers who work with patients with identified higher risk conditions could be trained to place a greater emphasis on informing their patients about the risks of overdose from prescription painkillers, as well as encouraging them to prescribe naloxone to their patients. Along the same line of identifying a specific illness or disease, we also do not know if specific populations are at risk for prescription painkiller overdoses (i.e., children, older adults, people from racially and ethnically diverse backgrounds).

Similar focus on specific overdose fatalities could also be used with specific populations and subcultures at risk for heroin or prescription painkiller overdoses, such as college students, military personnel and veterans, and individuals recently released from jail or prison (Andrews & Kinner, 2012; Binswanger et al., 2011; Kerns & Dobscha, 2009; Wakeman et al., 2009). Some research demonstrates that although these populations are at risk for overdoses, specific risk profiles from within these populations have not been identified.

Perhaps, the largest gap in the literature may be the identification of the best way to distribute naloxone in states and cities that do not have, or do not have the need for, needle exchange programs. Part of the problem with using needle exchange programs as a model for distribution is twofold. First, if a large HIV/AIDS concern does not exist in a city or state, or it has been determined that the HIV/AIDS population in a city or state largely acquired their infection through channels other than needle sharing, needle exchange programs would have little practical value. The second problem with using a needle exchange program model for the prevention of prescription painkiller overdoses assumes that people who use and misuse prescription painkillers behave and have a similar social network as those who use and misuse heroin. Currently, data do not suggest that users and misusers of heroin behave and share social networks with users and misusers of prescription painkillers, nor is there research that describes the behaviors and social network of users and misusers of prescription painkillers.

This dissertation research is based on the collection of primary data from existing public records in the Marion County Coroner's Office. Data were collected from seven years of coroner's data from 2007 through 2014. All cases had a death certificate that

contained standard demographic variables and identifiable information that can be used to cross-reference with variables from other datasets (i.e., prescription drug monitoring programs; department of corrections). Additionally, the death certificates included county and state of residence, cause, reason, and place of death, highest education achieved, and former military status. The decedent case files also contain the Field Deputy's and autopsy report. The Field Deputy's report is a detailed narrative of the circumstances of the death and social, medical, and general history of the deceased as provided by family members and police and medical records. This report included information about previous injuries, surgeries, illnesses, or diseases, along with histories of mental health, substance use and misuse, previous overdoses, suicide attempts, and recent incarcerations. The autopsy report contains a detailed toxicology report of both blood and urine samples that differentiates between brand of prescription painkillers, heroin, and all other illicit and licit drugs and medications.

Chapter 2 Opiate-Related Fatalities Study Protocol: Study of Longitudinal Epidemiological Analyses, Marion County, Indiana

Background

Overdose fatalities related to the increased use and misuse of prescription painkillers and heroin has reached epidemic proportions in the United States (Centers for Disease Control and Prevention [CDC], 2012). In 2015, 12.4 million people reported illicit misuse of prescription painkillers (i.e., opiates and opioids) (Substance Abuse and Mental Health Services Administration [SAMHSA], 2016). In 2010, prescription painkillers accounted for the majority of the 5.1 million drug-related emergency department (ED) visits (SAMHSA, 2013). Substance misuse treatment at inpatient and outpatient clinics for opiate misuse has risen from 17% of all types of substance misuse treatment episodes in 2000 to 28% in 2013. Opiates other than heroin accounted for 16% of all primary opiate admissions in 2003, but rose to 33% in 2013 (SAMHSA, 2015). Moreover, opiate overdose deaths have increased threefold from 1999 (13,995 deaths) to 2015 (48,987 deaths) (CDC, 2016). States have monitored these fatalities, providing necessary information that has contributed to the understanding of opiate overdose fatalities (Cerda et al., 2013; Green, Grau, Carver, Kinzly, & Heimer, 2011; Johnson et al., 2012; Paulozzi & Xi, 2008; Piercefield, Archer, Kemp, & Mallonee, 2010; Shah, Lathrop, Reichard, & Landen, 2007). As the problem has grown, it is becoming more apparent that this epidemic is not isolated to specific regions of the US or even specific populations. Instead this epidemic is far-reaching, impacting the lives of all Americans (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2017; SAMHSA, 2016).

Surveillance of public health records, mainly death certificates, from Coroner and Medical Examiners' offices were used to examine the emergence of this developing epidemic. New Mexico (Mueller, Shah, & Landen, 2006; Shah et al., 2007) and Chicago (Scott, Thomas, Pollack, & Ray, 2007) were some of the early documenters of this crisis. In New Mexico, researchers examined the medical examiner records from the New Mexico Office of the Medical Investigator and identified all cases of an unintentional drug overdose death caused by an identifiable drug from 1994 – 2003. From these records, they gathered toxicology reports, as well as decedent characteristics – age, gender, race, co-intoxication with alcohol, and urbanization level of the decedent's residence. They reported rates and trends of overdose fatalities due to prescription drugs, analyzed decedent characteristics, and described common drug combinations causing death. Their report indicated a significant increase in rates of prescription drug overdose during the 10-year study period (Mueller et al., 2006).

For Chicago's analysis, death certificates from 1999 – 2003 were manually screened to identify all opiate-related fatalities and the location of the fatality, as they were conducting a spatial pattern analysis. During data collection, they identified inconsistencies in how the medical examiner's office filed and coded death certificates. The example they provided was a multiple drug combination being the cause of death, but the death certificate did not reveal the specific drugs involved. This finding led the research group to develop a case definition for opiate-related fatalities that they detailed in their methods description (Scott et al., 2007).

Johnson and colleagues (2012) interviewed decedent's next of kin or best contact for opiate-related fatalities in Utah from 2008-2009. Their purpose was to obtain more

in-depth information about those who died from opiate-related overdoses. The interviews explored histories of chronic pain, financial problems, mental health, substance misuse, and patterns of pain medication use. Using records from the Office of the Medical Examiner, all suspected or possible opiate-related drug overdose fatalities were included as candidates for interviewing.

This study involves a longitudinal epidemiological analyses of opiate-related fatalities and was implemented in Marion County, Indiana, where an analysis of opiate-related fatalities had not been conducted. The goals of the study were to (1) describe the demographic characteristics of the decedents using information from death certificates, toxicology reports, and the death investigation and (2) use this information to inform future preventative efforts to decrease opiate-related fatalities.

For this study, data were collected using an epidemiological research design with existing public records. This design included a unique protocol for examining these records in order to understand better the magnitude of this epidemic in Marion County, Indiana. Over 90% of Marion County's population lives in the city of Indianapolis, which is the capital of the state. This information is presented with the hope that other cities and locales will replicate this protocol in order to tailor prevention and intervention strategies specific to their unique populations.

Methods

Research design and sample.

This study was a population-based, observational study using public records from Marion County, Indiana, namely coroner records and a prescription drug-monitoring program from the years 2007 through 2014. Subjects for the study were identified from

records in the Marion County Coroner's Office (MCCO). Indiana's medical death investigation system is county-based and conducted by an elected coroner. State statute requires the Coroner to investigate all deaths from violence, casualty, apparently in good health, apparently suspicious, unusual, or unnatural in manner, or been found dead (Ind. Code Ann. §36-2-14-6). All records were reviewed manually to identify the cause of death (COD) by focusing on the manner of death (MOD) determined as accident, undetermined, or suicide. All case subjects were deceased. Toxicology reports were used to confirm that each death was caused by an opiate or an opiate contributed in the death of the individual. The Indiana University IRB was notified of this study and the determination was made that no IRB oversight was needed as there were no live human subjects in this research study. Even though sensitive and confidential information were available from the death certificates, the IRB concluded that these documents are public records and privacy is protected by the MCCO. The Chief Deputy Coroner is responsible for the release of this information and granted the researcher access to the records.

Study procedures.

Case study identification.

For each year of analysis, coroner records were searched by manner of death – Accident, Undetermined, and Suicide. The Marion County Coroner uses these identifiers for any opiate-related mortality. Homicide, though a possible manner of death for an opiate overdose, was not used as a search criterion because the Chief Deputy Coroner cannot ever recall an opiate overdose identified as the cause of death for a Homicide (A. T. Ballew, personal communication, May 8, 2014).

An initial search identified all of the past year decedents in Marion County whose manner of death was either ruled an accident, undetermined, or a suicide by the MCCO. For each year of the study, a Coroner employee accessed the Coroner database to identify all of the deaths that were ruled as an Accident, Undetermined, and Suicide. A list was then generated of all of these cases. The list was printed and then given to the investigator. The list provided four columns of information – Coroner Case #, Age, Sex, and Race of the decedents.

From this list, the investigator either entered in each Coroner Case number in the Coroner database or manually pulled the paper file held in the Coroner's storage area. The MCCO is in the process of entering all of their data electronically and some of their older cases (i.e., 2007-2010) have yet to be entered into their electronic database. Whether accessed electronically or manually, the first information gathered was from the Death Certificate to determine the cause of death. The cause of death is determined by the pathologist who performed the autopsy and specific criteria for stating the cause of death do not exist. For example, someone who has died from a heroin overdose, the cause of death could be Heroin Intoxication, Drug Overdose, or Opiate Intoxication. Similarly, if someone died from an Oxycodone and Xanax (benzodiazepine) overdose, the cause of death could be Mixed Drug Overdose, Opioid and Benzodiazepine Intoxication, Oxycodone and Alprazolam (generic name for Xanax), or Poly Drug Intoxication. Thus, if any cause of death included the word heroin, painkiller, opiate, opioid, or any of the prescription painkiller names (e.g., Morphine, Codeine, Hydrocodone) then the case was included in the study.

For the coroner records that did not have an opiate mentioned in the cause of death, toxicology reports were examined to determine if any cases were eligible for inclusion in the study. Any coroner case record that had a positive test for any opiate or opioid found in the blood or urine sample was included in the case study. For those coroner case records that did not have a toxicology report, further investigations were conducted with the coroner case file. The coroner case files could include records from the EMTs if the decedent was transported by an ambulance to a hospital as well as any hospital records and insurance information. Hospital records can contain records from emergency and inpatient departments. Where appropriate, these records were examined to catalogue any positive identification for any opiate or opioid substance in the patient's system upon admission to the emergency department or hospital.

Data Sources.

Marion County Coroner's Office.

Data from MCCO were gathered from four potential sources: (1) Death Certificate (DC), (2) Deputy Coroner Field Officer Report (DCFOR), (3) Autopsy Report (AR), and (4) hospital records. For every death that is reported to and examined by MCCO, the record will include a DC, DFOR, and AR. If an overdose fatality involves the services of an ambulance or hospital, those records are forwarded and included in the decedent's coroner records. For some cases, when a drug overdose fatality occurred at a hospital and the MCCO is not notified to investigate the death for a variety of reasons (e.g., hospital administrative error; hospital doctor inadvertently signing the DC). When this happens, these deaths are treated as natural deaths and do not undergo a Coroner investigation. The actual number of these cases are unknown, but the Indiana State

Department of Health processes all death certificates that have been issued in Indiana. For some occurrences, the State processes these death certificates but does not identify the overdose fatalities that should have been investigated by MCCO. The State then notifies MCCO about these fatalities and a Deputy Coroner Field Officer will conduct an investigation. These type of cases are referred to as “Greensheets” and will not have an autopsy or toxicology performed as the body has already been buried, cremated, or processed in some other manner. Greensheet cases can still be used as cases in this study, because hospital records are reviewed for toxicology tests administered by the hospital and any other information that can be used to confirm a fatality from a heroin or prescription painkiller overdose. Additionally, the Deputy Coroner Field Officer will conduct an investigation and interview surviving family members and friends about the decedent’s history and events that occurred on the decedent’s date of death.

Death certificate.

From the death certificate, the following information was collected by MCCO and Indiana State Department of Health officials about the decedent: (1) first, middle, last name, and maiden name; (2) sex; race; ethnicity; (3) time and date of death; (4) date of birth and birth place; (5) social security number; (6) age; (7) marital status; (8) city, county, state, and zip code of residence; (9) city, county, state, and zip code of place of death; (10) surviving spouse’s name; (11) highest level of education attained; (12) decedent’s occupation and kind of business or industry; (13) veteran status; (14) father and mother’s name of decedent; (15) method and place of disposition; (16) cause of death; place of death; and manner of death.

Deputy coroner field officer report (DCFOR).

The DCFOR is a narrative report detailing the events involving the overdose fatality. The narrative describes the scene where the body is found, how the body is found (e.g., face-down, sitting in a chair), and any unique or extraordinary characteristics of or on the body (e.g., found naked, syringes, artifacts from emergency resuscitative efforts). The narrative attempts to detail the last 24-48 hours preceding the death. This information is gathered from the police and paramedics on the scene, witnesses, neighbors, and friends and family. The report also attempts to document any significant medical or social history. These data are gathered from multiple sources (i.e., family, friends, police records, hospital records) and can take several days to complete. Seven descriptive variables were gathered from the medical and social history report used for analysis in this project: (1) history of acute or chronic pain; (2) mental health history; (3) substance misuse history; (4) IDU history; (5) previous overdose; (6) previous suicide attempt; and (7) recent release from incarceration or an inpatient setting. All seven variables were coded as occurring or not occurring. The information gathered for three variables from the field deputies – history of injury, surgery, disease, or chronic disorder causing acute or chronic pain; history of mental health, and history of substance use – allow for a more detailed examination and will be described in the Measures section.

Autopsy report.

An autopsy consists of two procedures: an external exam and a full exam. In an external exam a general description of the body is made. Height and weight are recorded, as well as identifying features, such as, race, sex, hair color and length, eye color, and marks on the body (i.e., scars, tattoos, birthmarks). A medical examiner is able to

differentiate between a scar that was made by a medical incision or any other method. A full autopsy includes an external and internal exam. In the autopsy report, the medical examiner will note any surgically absent organs (i.e., spleen, ovaries, appendix), medical procedures (i.e., pacemaker, staples and meshing from gastric bypass, metal plates), or internal injuries.

Toxicology report.

The MCCO routinely screens all suspicious deaths for licit and illicit drugs, including narcotics (e.g., heroin and opioid analgesics), stimulants (e.g., amphetamines and cocaine), marijuana, alcohol, depressants (e.g., benzodiazepines and barbiturates), and other licit drugs (e.g., antidepressants, antipsychotics, antihistamines). Screening tests use blood from subclavian, iliac, or femoral sites and in unusual cases from liver tissue or vitreous fluid.

Prescription drug monitoring program.

Indiana's prescription monitoring program (PDMP) is called INSPECT (Indiana Scheduled Prescription Electronic Collection & Tracking) and is monitored and managed by the Indiana Professional Licensing Agency and the Indiana Board of Pharmacy. All requests for de-identified data are approved or denied through the Indiana Board of Pharmacy and must include an INSPECT protocol and IRB application and approval for Indiana Board of Pharmacy review. Additionally, a personal appearance before the Board may be requested.

The request made for this project was a bit unorthodox, as there was no IRB approval or monitoring of this study and the data were requested to be identifiable so the INSPECT data could be matched with MCCO data. The investigators, in addition to

completing and submitting the INSPECT Protocol of Release of De-Identified Data, provided the Board with an IRB form notifying the investigator that the proposed study did not meet standards for IRB monitoring as there were no human subjects in the study. In addition to submitting the Protocol request, the investigator gave a ten-minute in-person presentation of the request for data for the Board members. Approval for INSPECT data was granted.

The investigator provided the INSPECT data manager with the full name, gender, date of birth, zip code of residence, and social security number of the decedents. The INSPECT data manager then matched their records with the sources of information from the Coroner records. The information provided by INSPECT include the prescribing practitioner (unique identifier created by INSPECT), prescribing practitioner's zip code, pharmacy (unique identifier created by INSPECT), pharmacy's zip code, prescription number, date prescription written, date prescription filled, the National Drug Code (NDC), product name, strength, quantity, and type of medication (i.e., opioid, stimulant, benzodiazepine).

Measures

Matching.

Personal information from the deceased's death certificate were collected in order to match MCCO records with INSPECT data, as well as potential future sources (e.g., Medicaid, Department of Corrections). First, middle, and last names, date of birth, and social security numbers were collected and used only for matching purposes. Matching data were not used in project analysis.

Demographic and Descriptive Variables.

Demographic variables – gender, race, ethnicity, age, residence (city, state, county, and zip code), highest level of education, and veteran status – were collected from the Death Certificate. Additionally, the cause of death, place of death, and manner of death were collected from the death certificate.

Gender was identified as “Female” or “Male”. Race was identified as “White”, “Black”, “Latino/Latina”, “Native American”, “Asian/Asian American”, or “Other”. Ethnicity was identified as “Not Hispanic” or “Hispanic”. City, state, and county, and zip code were recorded as documented in the death certificate. Veteran status was identified as “No” or “Yes”.

Education was assigned an ordinal variable consisting of eight items – 8th grade or less, some high school, high school diploma/GED, some college/trade school, associates/trade degree, bachelor’s degree, master’s degree, and doctorate degree. Injury, surgery, or other potential pain causing condition.

The injury, surgery, or other potential pain causing condition (ISPC) was assigned as a dichotomous variable and measured as either having an ISPC or not having an ISPC. A list of all ISPCs is provided in Appendix A.

Mental health.

The mental health variable was assigned as dichotomous and measured as either having a mental health history or not having a mental health history. A decedent was identified as having a mental health history if a mental illness was reported in the DFOR, autopsy report, or medical records. See Table 2 for a list and frequencies of mentioned mental health disorders.

Table 2: Frequencies of Mentioned Mental Health Disorders: (n = 1174)

<i>Disorder</i>	<i>Frequency</i>
<i>Depression</i>	212
<i>Anxiety</i>	104
<i>Bi-Polar</i>	73
<i>Schizophrenia</i>	23
<i>Unspecified</i>	15
<i>PTSD</i>	8

Substance misuse.

A history of substance misuse was assigned a dichotomous variable and measured as either having a history or no history of substance misuse. See Table 3 for a list and frequencies of mentioned substances of misuse.

Table 3: Frequency of Reported History of Substance Misuse: (n = 1174)

<i>Substance Misuse History</i>	<i>Frequency</i>
<i>Prescription medicine</i>	540
<i>Alcohol</i>	428
<i>Heroin</i>	391
<i>Not specified</i>	179
<i>Cocaine</i>	155
<i>Marijuana</i>	71
<i>Methamphetamine</i>	31
<i>Ecstasy</i>	6

Injection drug use.

A history of IDU was assigned a dichotomous variable and measured as either having a history or no history of IDU.

Previous overdoses.

A history of previous overdoses was assigned a dichotomous variable and measured as either having a history or no history of overdoses.

Previous suicide attempts.

A history of previous suicide attempts was assigned a dichotomous variable and measured as either having a history or no history of suicide attempts.

Recent release from incarceration or inpatient setting.

A recent release from incarceration or inpatient setting was defined as occurring within the past two weeks. This factor was dichotomized as either having a recent release from incarceration or inpatient setting or no recent release from incarceration or inpatient setting.

Toxicology Reports.

All potential licit and illicit substances identifiable by the MCCO toxicology reports were each created as a variable. All licit or illicit substances were measured and assigned a dichotomous variable as either appearing or not appearing in each decedent's toxicology report. See Appendix B for a list of screened licit and illicit substances.

Data Analysis

All data were analyzed using SPSS 22.0 (IBM, Armonk, NY) and consisted of two components. This first analysis was an exploratory descriptive analysis that involved determination of frequencies and percentages for key demographics such as, gender, race, Marion County residency, veteran status, and highest level of education. Additionally, frequencies and percentages were reported for type of opiate found in blood toxicology reports and past significant histories as described in the DCFOR; e.g., an injury, disease, disorder, or surgery causing acute or chronic pain; a mental health history; a substance misuse history; IDU history; overdose history; suicide history; recent release from incarceration or inpatient setting.

The second component was a predictive model exploring the characteristics of decedents with only heroin, only painkillers, or a combination of heroin and painkillers in their toxicology reports. A stepwise, likelihood ratio, multinomial logistic regression

analysis was conducted to estimate a regression model to predict the probability of opiate-related overdose decedents having only heroin, only painkillers, or a combination of heroin and painkillers in their toxicology reports. Prior to conducting the analysis, chi-square and independent *t*-tests were utilized to examine the bivariate relationship between the three groups of opiate-related overdose decedents and each factor. Each of the independent variables (i.e., gender, mental health history, cocaine use) were entered individually into a single multinomial logistic regression, twice, to identify significant relationships. A multinomial logistic regression analysis was run twice to allow each of the dependent variables to be compared to one another, as a multinomial logistic regression analysis will hold one of the dependent variables as the referent group. Statistically significant bivariate relationships at the $p \leq 0.05$ level were entered into the initial multinomial logistic regression. In all, 16 factors were found to be statistically significant and thus were entered into the initial multinomial logistic regression analysis: Gender, Race, Age, Education, Marion County Residency, Socioeconomic Status Indicator, Acute/Chronic Pain History, Mental Health History, Substance Misuse History, Injection Drug Use History, Overdose History, Suicide History, Incarceration History, Benzodiazepine, Cocaine, and Alcohol.

The initial multinomial logistic regression analysis found statistically significant relationships (at the $p \leq 0.05$ level) between the three groups of opiate-related overdose decedents and ten factors: gender, race, acute/chronic pain history, mental health history, substance misuse history, injection drug use history, incarceration history, benzodiazepine, cocaine, and alcohol. On the other hand, no significant relationships were detected between the three groups of opiate-related overdose decedents and age,

socioeconomic status, education, Indianapolis residency, overdose history, and suicide history. Consequently, these six factors were excluded from the final predictive model.

Descriptive Results

From 2007-2014, a total of 1185 opiate-related overdose fatalities were reported in Marion County. Eleven of these cases only had a death certificate and did not have a DCFOR and/or a toxicology report and were thus excluded from analysis. Accordingly, this analysis was of coroner records of 1174 decedents.

Demographic data for all 1174 overdose-related deaths in Marion County are presented in Table 4 by year from 2007 through 2014. The overall average age of the decedents was 39.7 years old. The average age range between the study years was the youngest at 36.7 years old for 2007 and the oldest average age at 41.9 years old for 2009. Data in Table 4 also indicate that opiate-related overdoses were likely to be male (63.6%), White (85.6%), and a Marion County resident (82.5%).

When examining these demographic variables over time, the number of deaths increased while the percentages of each variable showed little change. For example, males represented about two out of every three deaths each year, which is rather consistent. For years 2007 and 2011 respectively, the percentages of male deaths were 56% and 58%, which still means at no time were females dying at a greater rate than males. A similar trend with limited variability is seen with race and Marion County residence, where Whites and residents of Marion County accounted for 80% or more of the fatalities.

Table 4: Demographic Characteristics Overdose-Related Deaths in Marion County

	2007 n=84	2008 n=122	2009 n=130	2010 n=123	2011 n=137	2012 n=160	2013 n=178	2014 n=240	Total N=1174
Age, mean (sd)	36.69 (12.73)	38.26 (12.13)	41.88 (11.91)	39.97 (12.59)	40.34 (11.85)	40.19 (12.26)	39.98 (12.89)	39.20 (12.08)	39.69 (12.32)
min-max	16-66	18-73	19-69	18-76	18-66	16-68	18-81	17-70	16-81
Gender									
Male, % (n)	56 (47)	66.4 (81)	65.4 (85)	61 (75)	57.7 (79)	64.4 (103)	62.9 (112)	68.8 (165)	63.6 (747)
Race									
White, % (n)	86.9 (73)	82 (100)	81.5 (106)	87.8 (108)	89.1 (122)	83.8 (134)	84.3 (150)	88.3 (212)	85.6 (1005)
African American, % (n)	11.9 (10)	17.2 (21)	16.9 (22)	11.4 (14)	7.3 (10)	15.6 (25)	12.9 (23)	10 (24)	12.7 (149)
Latino/a, % (n)	---	0.8 (1)	0.8 (1)	0.8 (1)	0.7 (1)	0.6 (1)	1.1 (2)	0.8 (2)	0.8 (9)
Asian American, % (n)	---	---	---	---	2.2 (3)	---	1.1 (2)	0.4 (1)	0.5 (6)
Native American, % (n)	1.2 (1)	---	0.8 (1)	---	0.7 (1)	---	---	0.4 (1)	0.3 (4)
Other, % (n)	---	---	---	---	---	---	0.6 (1)	---	0.1 (1)
Marion County Resident									
Yes, % (n)	82.1 (69)	88.5 (108)	83.8 (109)	82.1 (101)	81.8 (112)	82.5 (132)	82 (146)	80 (192)	82.5 (969)
Indiana Resident									
Yes, % (n)	97.6 (82)	99.2 (121)	98.5 (128)	98.4 (121)	94.9 (130)	98.1 (157)	98.3 (175)	96.3 (231)	97.5 (1145)
Veteran									
Yes, % (n)	7.2 (6)	9 (11)	10.2 (13)	9 (11)	9.6 (13)	5.7 (9)	9.7 (17)	8.4 (20)	8.6 (100)
Education									
Some HS, % (n)	28 (23)	26.2 (32)	28.5 (37)	23.8 (29)	21.8 (29)	25.6 (41)	23.2 (41)	20.5 (49)	24.1 (281)
HS diploma/GED, % (n)	45.1 (37)	51.6 (63)	46.9 (61)	54.1 (66)	51.9 (69)	44.4 (71)	45.8 (81)	47.3 (113)	48.2 (561)
Some college, % (n)	19.5 (16)	11.5 (14)	12.3 (16)	13.9 (17)	15 (20)	15.6 (25)	14.1 (25)	15.9 (38)	14.7 (171)
College grad, % (n)	7.3 (6)	10.7 (13)	12.3 (16)	8.2 (10)	11.3 (15)	14.4 (23)	16.9 (30)	16.3 (39)	13 (152)

Discussion

This study described persons who died in Marion County, Indiana, from an opiate-related overdose between 2007 and 2014. Death certificates, toxicology reports, and narratives from the DCFOR were used for data collection and analyses. Most of the decedents (63.6%) were male with average age of 40 (SD=12) years. Over 80% of these decedents were Caucasian and had been Marion County residents. Over 75% of the decedents had a high school education or higher. These findings are consistent with previously published epidemiological data from Utah, the U.S., and Canada (Johnson et al., 2012; King, Fraser, Boikos, Richardson, & Harper, 2014).

Although the protocol for this research study is not the first of its kind (Andrews & Kinner, 2012; Cerda et al., 2013; Mueller et al., 2006; Piercefield et al., 2010; Scott et al., 2007), the dissemination of the methods in this manner is unique and serves a far-reaching public health need by illustrating a strategy of using readily available public information to aid in combating a community epidemic. Websites such as the CDC's WONDER provides descriptive mortality trends, but they are unable to include toxicology reports and death investigation reports (i.e., DCFOR) that could provide more insight and information concerning these opioid fatalities. If targeted and tailored interventions for specific populations at risk of overdose fatalities are intended to address the epidemic, integrating multiple sources of data is needed in order to paint a full picture of opiate-related overdose fatalities. By linking the PDMP data with the coroner records and DCFOR information, a deeper layer of understanding of who is at risk is being discovered. Additional layers can be readily added and precisely matched as identifying information is connected with the death certificates. Next steps with this project can

incorporate local, state, and federal Department of Corrections, Medicaid information, and records from first responders including, fire, police, and ambulance. One final notable aspect of this project concerns the feasibility of implementing such a project within a specific community. All data and information were primarily collected and analyzed by one individual over a one and a half year period of time and required no financial support.

Chapter 3 Predictive Factors of Decedents Who Overdose On Heroin, Prescription Painkillers, or a Combination of Both

Background

Prescription painkiller and heroin-related overdose deaths are a national, state, and local public health concern (Rudd, Aleshire, Zibbell, & Gladden, 2016). In the U.S., opiate overdose deaths have seen over a threefold increase from 1999 (13,995 deaths) to 2015 (48,987 deaths) (Centers for Disease Control and Prevention [CDC], 2016). Indiana and Marion County (the county of the state capital and Indiana's largest urban area) experienced a similar trend, but with a far greater increase between 1999 and 2015. Indiana reported 145 deaths related to opiate overdoses in 1999 and 1,140 deaths in 2015, almost an eight-fold increase (CDC, 2016). Marion County reported 14 deaths in 1999 and 244 deaths in 2015, over a seventeen-fold increase (CDC, 2016). In Table 5, the number of deaths and the crude death rate are displayed per 100,000 people for the US, Indiana, and Marion County for the years 1999 – 2015. Figure 2 is a comparative line graph reporting the crude death rate per 100,000 people for the US, Indiana, and Marion County.

It is likely the progression of fatalities will continue to rise as the demand for prescription painkillers increases. Retail sales of prescription painkiller medications in the U.S. have increased 149% from 1997 to 2007 and account for 80% of global painkiller consumption (Manchikanti, Fellows, Ailinani, & Pampati, 2010). To some extent, this use of prescription painkillers has some justification, as the Institute of Medicine (2011) estimates 100 million U.S. adults suffer from chronic pain. Chronic severe pain is prevalent in diseases, such as cancer (Deandrea, Montanari, Moja, &

Apolone, 2008), diabetes (Krein, Heisler, Piette, Makki, & Kerr, 2005), HIV/AIDS (Tsao, Stein, & Dobalian, 2010), sickle-cell disease (Elander, Lusher, Bevan, Telfer, & Burton, 2004), and gastro-intestinal illnesses (Bruce & Krukowski, 2006). Specific populations have been identified as especially challenged by pain, such as children (Finley, Kristjansdottir, & Forgeron, 2010), older adults (Reisner, 2011), racially and ethnically diverse individuals (Anderson, Green, & Payne, 2009), military personnel and veterans (Kerns & Dobscha, 2009), and recently released prisoners (Andrews & Kinner, 2012; Binswanger, Blatchford, Lindsay, & Stern, 2011; Wakeman, Bowman, McKenzie, Jeronimo, & Rich, 2009).

Table 5: Opiate-related Fatalities: Number of Deaths and Crude Death Rate, 1999-2015

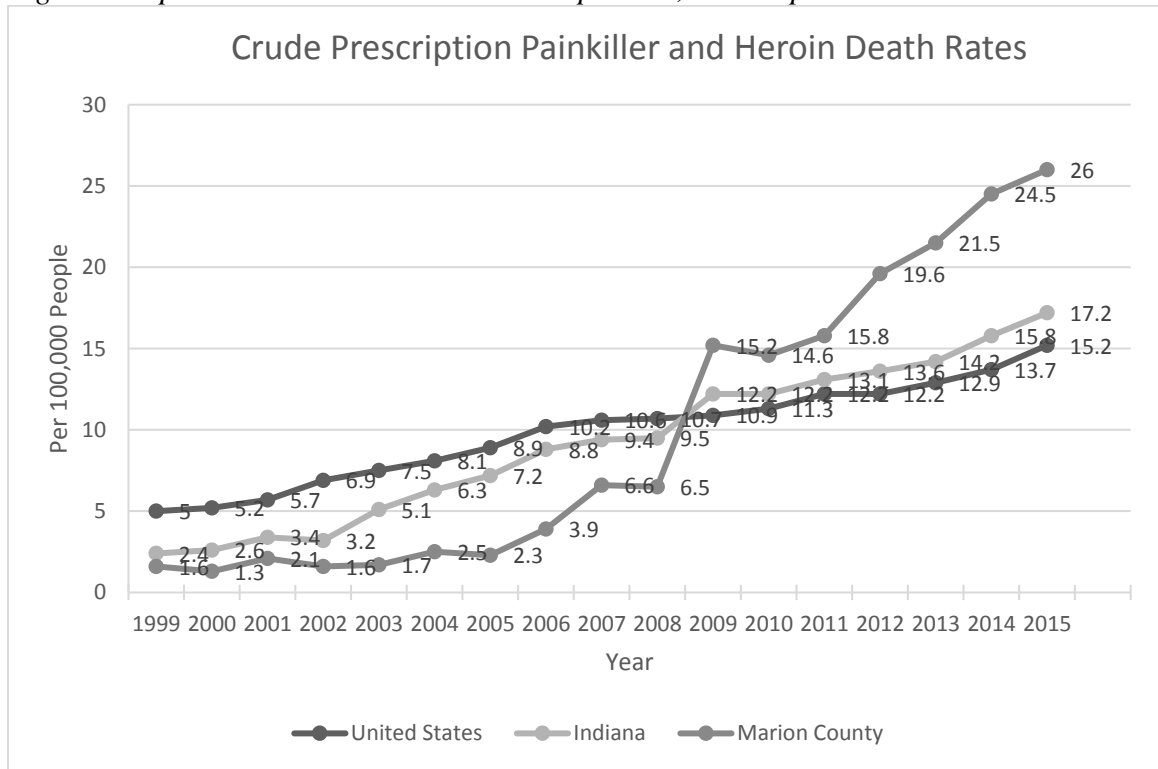
Year	United States		Indiana		Marion County	
	# of deaths	Death Rate per 100,000	# of deaths	Death Rate per 100,000	# of deaths	Death Rate per 100,000
1999	13,995	5	145	2.4	14	1.6
2000	14,572	5.2	157	2.6	11	1.3
2001	16,170	5.7	207	3.4	19	2.1
2002	19,829	6.9	200	3.2	14	1.6
2003	21,732	7.5	314	5.1	15	1.7
2004	23,599	8.1	392	6.3	22	2.5
2005	26,219	8.9	449	7.2	20	2.3
2006	30,525	10.2	555	8.8	34	3.9
2007	31,915	10.6	598	9.4	58	6.6
2008	32,655	10.7	608	9.5	58	6.5
2009	33,379	10.9	786	12.2	137	15.2
2010	34,898	11.3	792	12.2	132	14.6
2011	37,982	12.2	854	13.1	144	15.8
2012	38,270	12.2	891	13.6	180	19.6
2013	40,714	12.9	931	14.2	200	21.5
2014	43,787	13.7	1,043	15.8	229	24.5
2015	48,987	15.2	1,140	17.2	244	26.0

Source: CDC WONDER website

Further exploration concerning overdose deaths involving chronic pain and chronic diseases or illnesses could be helpful in addressing this problem. Research has not identified if one specific form of chronic pain (i.e., neurological, back pain) or chronic disease or illness (i.e., cancer, HIV/AIDS, diabetes) has a strong positive relationship with prescription painkiller overdoses. This information could be important

for physicians and other health care providers in order to place a greater emphasis on informing their patients about the risks of overdose from prescription painkillers, as well as encouraging them to prescribe naloxone to their patients. Similarly, we also do not know if specific populations are at risk for prescription painkiller overdoses (i.e., children, older adults, people from racially and ethnically diverse backgrounds).

Figure 2: Opiate Related Crude Death Rate per 100,000 People



Source: CDC Wonder website

Similar focus on specific overdose fatalities could also be used with specific populations and subcultures at risk for heroin or prescription painkiller overdoses, such as college students, military personnel and veterans, and individuals recently released from jail or prison (Andrews & Kinner, 2012; Binswanger et al., 2011; Kerns & Dobscha, 2009; Wakeman et al., 2009). Some research demonstrates that although these populations are at risk for overdoses, specific risk profiles from within these populations have not been identified.

Perhaps, the largest gap in the literature may be the identification of the best way to distribute naloxone in states and cities that do not have or do not have the need for needle exchange programs. Part of the problem with using needle exchange programs as a model for distribution is twofold. First, if a large HIV/AIDS concern does not exist in a city or state, or it has been determined that the HIV/AIDS population in a city or state acquired their infection through other channels and not because of IDUs, needle exchange programs would have little practical value. The second problem with using a needle exchange program model for the prevention of prescription painkiller overdoses assumes that people who use and misuse prescription painkillers behave and have a similar social network as those who use and misuse heroin. Currently, data do not suggest that users and misusers of heroin behave and share social networks with users and misusers of prescription painkillers.

Methods

Research Questions.

The purpose of this study was to conduct a longitudinal epidemiological analysis of opiate-related fatalities in Marion County, Indiana, using publicly available information. The project aimed to: (a) Report the types of opiates identified in blood toxicology reports and (b) Present the medical histories of decedents as reported in the Deputy Coroner Field Officer's Reports (DCFOR). Additional analyses were conducted to determine if decedent characteristics differed depending on the type of opiate fatality based on the toxicology report: 1) heroin alone, 2) painkillers alone, and 3) heroin and painkillers combined. Questions of interest included:

1. Are demographic variables differentially predictive among the three types of opiate fatalities?
2. Are the reported individual health histories in the deputy coroner field officer reports differentially predictive of the three types of opiate fatalities?
3. Is poly drug use predictive of the three types of opiate fatalities?

Data Source.

Using public records from the Marion County (Indianapolis, Indiana) Coroner's Office (MCCO) from 2007 to 2014, overdose fatalities due to prescription painkillers and heroin were identified among all recorded fatalities. Indiana's medical death investigation system is county-based, and investigations are conducted by an elected coroner. State statute requires the Coroner to investigate deaths resulting from violence or casualty, deaths of citizens who were in apparently good health, deaths apparently associated with suspicious, unusual, or unnatural circumstances, and deaths of people who had been found dead (Ind. Code Ann. §36-2-14-6). A manual review was conducted of all records with a manner of death (MOD) determined as accident, undetermined, or suicide. All case subjects were deceased and toxicology reports confirmed that each death was caused by an opiate or an opiate contributed in the death of the individual. This study was designated exempt from oversight by the Indiana University IRB as this research did not include living human subjects.

Measures.

Type of opiate fatality.

All blood toxicology reports were reviewed to determine which opiate(s) were involved in the fatal overdose. Overdoses were categorized into three groups: (1) those

involving only heroin, which was confirmed by the presence of only 6-monoacetylmorphine; (2) those involving only prescription painkiller, confirmed by the presence of specific metabolites in the blood (i.e., hydrocodone, oxycodone, fentanyl) and (3) those with confirmed quantities of both heroin and painkiller metabolites in the blood. A three-category outcome variable for type of opiate fatality was constructed where, 0 = only heroin, 1 = only painkillers, and 2 = both heroin and painkillers.

Demographic variables.

Gender, age, race, education level, veteran status, Marion County residency, and Indianapolis residency (determined by zip code) were identified from the death certificates. Gender, veteran status, Marion County residency, and Indianapolis residency were assigned as dichotomous variables where, 0 = male, 1 = female, 0 = no, and 1 = yes. After review of frequency counts, a dichotomous variable for race was assigned, where, 0 = white and 1 = not white. Education was assigned a four-category variable where, 0 = some high school education or less, 1 = high school diploma or equivalency degree, 2 = some college, 3 = college graduate and above. Age was not categorized and remained in its interval form. These variables were used to address Research Question #1.

Socioeconomic status indicator.

A census-derived, standardized socioeconomic status (SES) indicator (Carlson, McNulty, Bellair, & Watts, 2014; Hensel, Hummer, & Tanner, 2016) was developed based on the percentage of people with a high school degree or higher, percentage of families below the poverty level, percentage of female-headed households, percentage of owner-occupied homes, percentage of vacant homes, and median household income. A standardized value was created for each variable by generating a z-score. Three of the

variables – high school degree, median income, and owner-occupied homes – were reverse-scored in order for lower values to reflect a lower score. All six variables were then added together to create an interval score. The lower the score, the lower the SES. This variable, combined with the above demographic variables, were used to address Research Question #1.

Opiates.

The type of opiate(s) related to the fatality were determined by the toxicology reports and were reported by the generic names of the drugs and were categorized as 0 = not present and 1 = present.

Health histories as reported in Deputy Coroner Field Officer Reports (DCFOR).

All DCFOR variables were reviewed for additional histories and behaviors that have been identified in the literature as being predictive of an overdose (King, Fraser, Boikos, Richardson, & Harper, 2014) (i.e., histories of acute or chronic pain, mental health disorders, substance misuse, injection drug use (IDU), overdoses, suicide attempts, and recent release from incarceration or an inpatient facility). Further information about this process is detailed elsewhere (Willis et al., 2017). In all, seven variables were created: (1) history of acute or chronic pain; (2) mental health history; (3) substance misuse history; (4) IDU history; (5) previous overdoses; (6) previous suicide attempts; and (7) recently released from incarceration or an inpatient setting. All variables were dichotomous and measured whether a history was present or not where, 0 = no and 1 = yes. These variables were used to address Research Question #2.

Polydrug use.

Polydrug use was defined as having another substance in the blood toxicology report in addition to opiates. All variables were dichotomous and measured whether a substance was present or not where, 0 = no and 1 = yes. These variables were used to address Research Question #3.

Data Analysis

All data were analyzed using SPSS 22.0 (IBM, Armonk, NY). As the aims of this study were exploratory, data were analyzed using descriptive procedures, focusing on frequencies and percentages for key demographics such as, gender, race, Indianapolis residency, veteran status, and highest level of education. Additionally, frequencies and percentages were reported for type of opiate found in blood toxicology reports and past significant histories as described in the DCFOR (e.g., an injury, disease, disorder, or surgery causing acute or chronic pain; a mental health history; a substance misuse history; IDU history; overdose history; suicide history; recent release from incarceration or inpatient setting).

Due to the dependent variable being nominal with more than two levels a stepwise, likelihood ratio, multinomial logistic regression analysis was chosen to estimate a regression model that correctly predicts the probability of opiate-related overdose decedents having only heroin, only painkillers, or a combination of heroin and painkillers in their toxicology reports. Prior to conducting the analysis, chi-square and independent *t*-tests were used to examine the bivariate relationship between each independent variable and the three groups of opiate-related overdose decedents. Each of the independent variables (i.e., gender, mental health history, cocaine use) were entered individually into

a single multinomial logistic regression, twice, to identify significant relationships. A multinomial logistic regression analysis was run twice to allow each of the dependent variables to be compared to one another, as a multinomial logistic regression analysis will hold one of the dependent variables as the referent group (Field, 2009). Statistically significant bivariate relationships at the $p \leq 0.05$ level were entered into the initial multinomial logistic regression (Table 9).

Results

Type of Opiates from 2007–2014.

Percentages and frequencies for the various opiates involved in Marion County overdose deaths between the years 2007 and 2014 can be found in Table 6. In Figure 3, these data illustrate the trends of opiates involved in opiate-related overdoses. Heroin was identified in over a third of all the deaths (38.4%, n=451) and hydrocodone/hydromorphone was found in a quarter of fatalities (25.1%, n=295). Oxycodone/oxymorphone (20.8%, n=244) was the third most common opiate identified in overdose fatalities, followed by methadone (17%, n=199), fentanyl (14.1%, n=166), and morphine (12.7%, n=149), respectively. Examining Figure 4, two trends are notable. First, heroin use appeared to fluctuate in use along with all of the other opiates from 2007 through 2010. However, starting in 2011 deaths due to heroin overdoses began to increase dramatically through 2014. This constant trend upward is in contrast to all the other opiates continuing to fluctuate throughout the years. Second, in the last year of this study, we see a sharp increase in identifying fentanyl in opiate-related overdoses, from 11 occurrences in 2013 and 67 occurrences in 2014.

Deputy Coroner Field Officer Reports from 2007 – 2014.

A review of the related research literature identified several variables related to opiate overdoses (King et al., 2014). Percentages and frequencies for these variables from the DCFOR are presented in Table 7 from 2007 through 2014. These variables are illustrated in Figure 5 as trends in opiate-related overdoses. For the entire eight years of this study, a total of 1174 overdose fatalities occurred in Marion County. 56.8% were reported to have had a previous injury, surgery, disease, or disorder that could cause acute or chronic pain (n=667). 30.8% were reported to have had a mental health history (n=362). 81.8% were reported to have a history of substance misuse (n=960). 15.3% were reported to have had a history of IDU (n=180). 13.3% were reported to have had at least one previous overdose before their fatal overdose (n=156). 7.2% were reported to have had at least one previous suicide attempt (n=84). 8.3 % were reported to have been recently released (within the past two weeks) from incarceration or an inpatient setting (n=97).

Sample as Categorized into Three Groups Based on Type of Opiate.

The study sample consisted of 1174 decedents categorized into three groups based on the type of opiate in their blood toxicology report. The demographics, significant histories reported in the DCFOR, and poly drug use are presented in Table 8 by total sample and type of opiate fatality (only heroin, only painkillers, both heroin and painkillers). Almost two-thirds of the decedents were male (63.6%, n=747), a large majority were White (85.6%, n=1005) and most lived in Marion County (82.5%, n=969). Almost half had a high school diploma or equivalency (47.8%, n=561) and 8.5% were veterans (n=100). The average age was just under 40 years old with the youngest being

16 and the oldest 81 and the average value for the SES indicator, with lower the score indicating a lower SES, was -0.57 with the lowest value being -11.72 and the highest value being 7.93.

Over half of the sample had a reported history of an injury, illness, or surgery causing acute or chronic pain (56.8%, n=667). Just under one-third were reported to have had a mental health history (30.8%, n=362). The majority of decedents were reported to have had a substance abuse history (81.8%, n=960), whereas 15.3% (n=180) and 13.3% (n=156) were reported to have had a history of IDU and a previous overdose, respectively. A history of a previous suicide attempt was reported for 7.2% (n=84) decedents and 8.3% (n=97) were reported to have been recently released from incarceration or an inpatient setting.

More than half of the decedents had a least one benzodiazepine in their blood toxicology reports (54.4%, n=639). Cannabis (22.5%, n=264), alcohol (21.6%, n=254), and cocaine (19.2%, n=225) were the next most common substances found in the toxicology reports, respectively. Amphetamines (including methamphetamine) were found in 5.2% (n=61) of the decedents.

Table 6: Identified Opiates from Blood Toxicology Reports

	2007-2014 % (n)								
	2007 n=84	2008 n=122	2009 n=130	2010 n=123	2011 n=137	2012 n=160	2013 n=178	2014 n=240	Total N=1174
Heroin	16.7% (14)	36.9% (45)	32.3% (42)	22.8% (28)	33.6% (46)	44.4% (71)	48.9% (87)	49.2% (118)	38.4% (451)
Fentanyl	20.2% (17)	9.8% (12)	13.1% (17)	15.4% (19)	8% (11)	6.3% (10)	7.3% (13)	27.9% (67)	14.1% (166)
Methadone	34.5% (29)	25.4% (31)	19.2% (25)	22.8% (28)	21.2% (29)	11.9% (19)	10.7% (19)	7.9% (19)	17% (199)
Oxycodone/oxymorphone	19% (16)	20.5% (25)	22.3% (29)	26% (32)	18.2% (25)	23.1% (37)	21.9% (39)	17.1% (41)	20.8% (244)
Hydrocodone/hydromorphone	25% (21)	17.2% (21)	36.2% (47)	31.7% (39)	28.5% (39)	30.6% (49)	23.6% (42)	15.4% (37)	25.1% (295)
Morphine	15.5% (13)	13.9% (17)	16.9% (22)	8.1% (10)	13.9% (19)	18.8% (30)	7.9% (14)	10% (24)	12.7% (149)
All other opiates	7.2% (6)	4.9% (6)	10% (13)	9.8% (12)	9.5% (13)	4.4% (7)	6.2% (11)	10.4% (25)	8% (93)

Percentages may add up to over 100% and number counts could exceed the yearly number of fatalities as each fatality could have had more than one opiate identified in the toxicology report.

Table 7: Histories and Behaviors Reported in Deputy Coroner Field Officer Reports

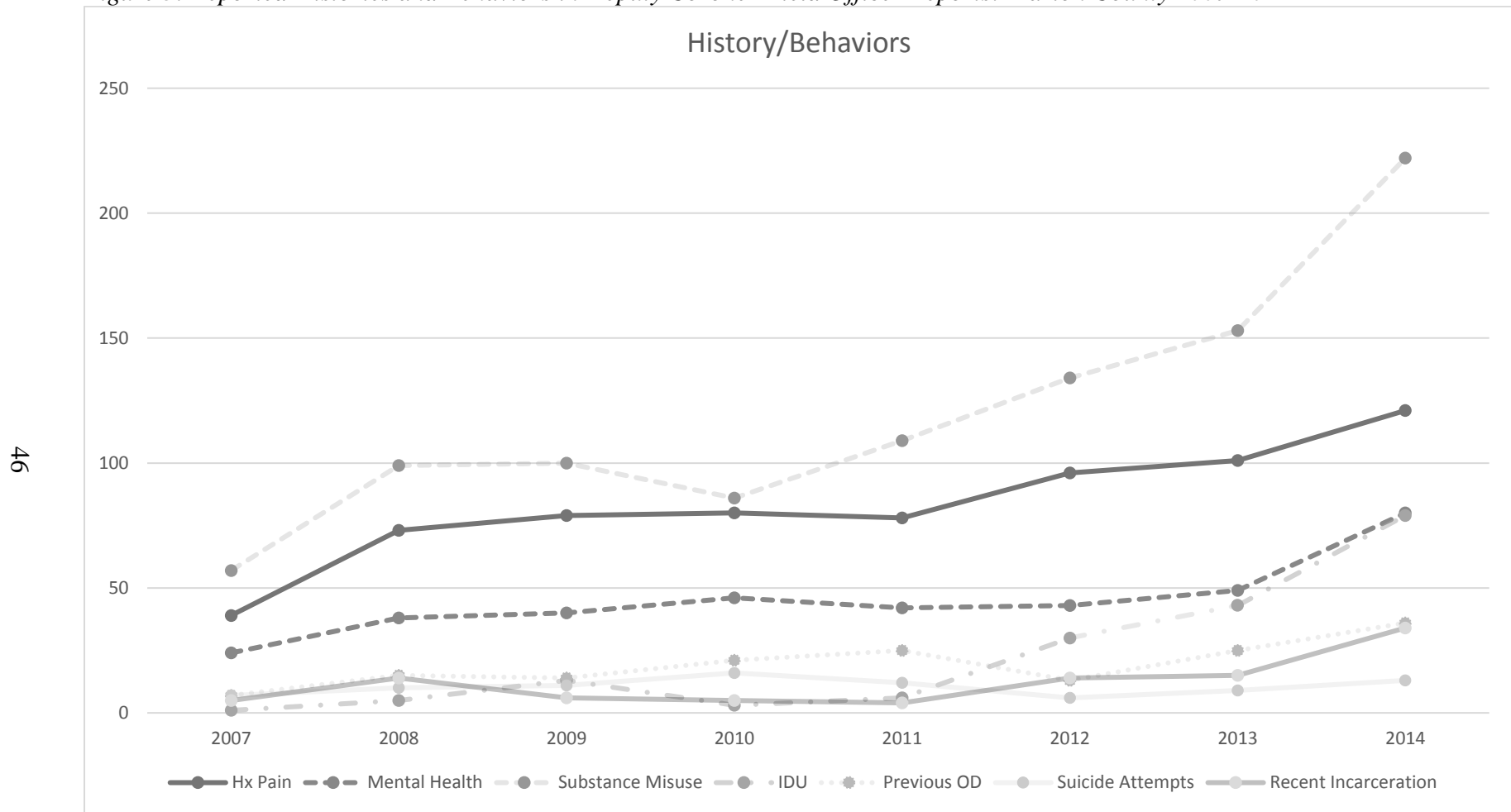
	2007-2014 % (n)								
	2007 n=84	2008 n=122	2009 n=130	2010 n=123	2011 n=137	2012 n=160	2013 n=178	2014 n=240	Total N=1174
History of pain	46.4 (39)	59.8 (73)	60.8 (79)	65 (80)	56.9 (78)	60 (96)	56.7 (101)	50.4 (121)	56.8 (667)
Mental health	28.6 (24)	31.1 (38)	30.8 (40)	37.4 (46)	30.7 (42)	26.9 (43)	27.5 (49)	33.3 (80)	30.8 (362)
Substance misuse	67.9 (57)	81.1 (99)	76.9 (100)	69.9 (86)	79.6 (109)	83.8 (134)	86 (153)	92.5 (222)	81.8 (960)
IDU	1.2 (1)	4.1 (5)	10 (13)	2.4 (3)	4.4 (6)	18.8 (30)	24.2 (43)	32.9 (79)	15.3 (180)
Previous overdose(s)	8.3 (7)	12.3 (15)	10.8 (14)	17.1 (21)	18.2 (25)	8.1 (13)	14 (25)	15 (36)	13.3 (156)
Suicide attempt(s)	8.3 (7)	8.2 (10)	8.5 (11)	13 (16)	8.8 (12)	3.8 (6)	5.1 (9)	5.4 (13)	7.2 (84)
Recent incarceration	6 (5)	11.5 (14)	4.6 (6)	4.1 (5)	2.9 (4)	8.8 (14)	8.4 (15)	14.2 (34)	8.3 (97)

Percentages may add up to over 100% and number counts could exceed the yearly number of reported histories and behaviors as each reported history and behavior were recorded as occurring or not for each decedent.

Table 8: Percentages and Frequencies of Demographics, Reported Histories, and Poly Drug Use

Characteristic % (n)	Total Sample 100% (1174)	Only Heroin 28.4% (334)	Only Painkillers 61.6% (723)	Both 10% (117)	p value
Demographics					
Male, % (n)	63.6 (747)	77.5 (259)	55.3 (400)	75.2 (88)	0<.001
White, % (n)	85.6 (1005)	78.7 (263)	89.3 (646)	82.1 (96)	0<.001
Resident Marion Cty, % (n)	82.5 (969)	77.5 (259)	84.6 (612)	83.8 (98)	0.02
Education					
Some HS, % (n)	24.1 (281)	21.8 (72)	24 (172)	31.9 (37)	0.006
HS Diploma/GED, % (n)	48.2 (561)	50.2 (166)	46.2 (332)	54.3 (63)	
Some college, % (n)	14.7 (171)	16 (53)	15 (108)	8.6 (10)	
College grad, % (n)	13 (152)	12 (40)	14.8 (106)	5.2 (6)	
Veteran, % (n)	8.6 (100)	9.0 (30)	8.3 (60)	8.5 (10)	0.911
Age, mean (sd)	39.69 (12.32)	37.44 (12.03)	40.72 (12.42)	39.68 (11.73)	0<.001
SES, mean (sd)	-0.57 (5.07)	-0.60 (5.58)	0.16 (4.83)	0.76 (4.89)	0.018
Reported Histories					
Acute/chronic pain, % (n)	56.8 (667)	38.6 (129)	65.6 (474)	54.7 (64)	0<.001
Mental health, % (n)	30.8 (362)	17.4 (58)	38.9 (281)	19.7 (23)	0<.001
Substance misuse, % (n)	81.8 (960)	94.6 (316)	74.4 (538)	90.6 (106)	0<.001
IDU, % (n)	15.3 (180)	28.1 (94)	6.8 (49)	31.6 (37)	0<.001
Previous overdose, % (n)	13.3 (156)	8.7 (29)	15.6 (113)	12 (14)	0.006
Suicide attempt, % (n)	7.2 (84)	4.5 (15)	8.9 (64)	4.3 (5)	0.013
Incarceration/inpatient, % (n)	8.3 (97)	14.4 (48)	5.5 (40)	7.7 (9)	0<.001
Poly Drug Use					
Benzodiazepine, % (n)	54.4 (639)	41.6 (139)	58.9 (426)	63.2 (74)	0<.001
Cannabis, % (n)	22.5 (264)	24.3 (81)	20.6 (149)	29.1 (34)	0.09
Alcohol, % (n)	21.6 (254)	30.5 (102)	17.2 (124)	23.9 (28)	0<.001
Cocaine, % (n)	19.2 (225)	28.7 (96)	13.6 (98)	26.5 (31)	0<.001
Amphetamine, % (n)	5.2 (61)	6.9 (23)	4.7 (34)	3.4 (4)	0.225

Figure 3: Reported Histories and Behaviors in Deputy Coroner Field Officer Reports: Marion County 2007-2014



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Figure 4: Opiate-Related Fatalities: Marion County 2007-2014

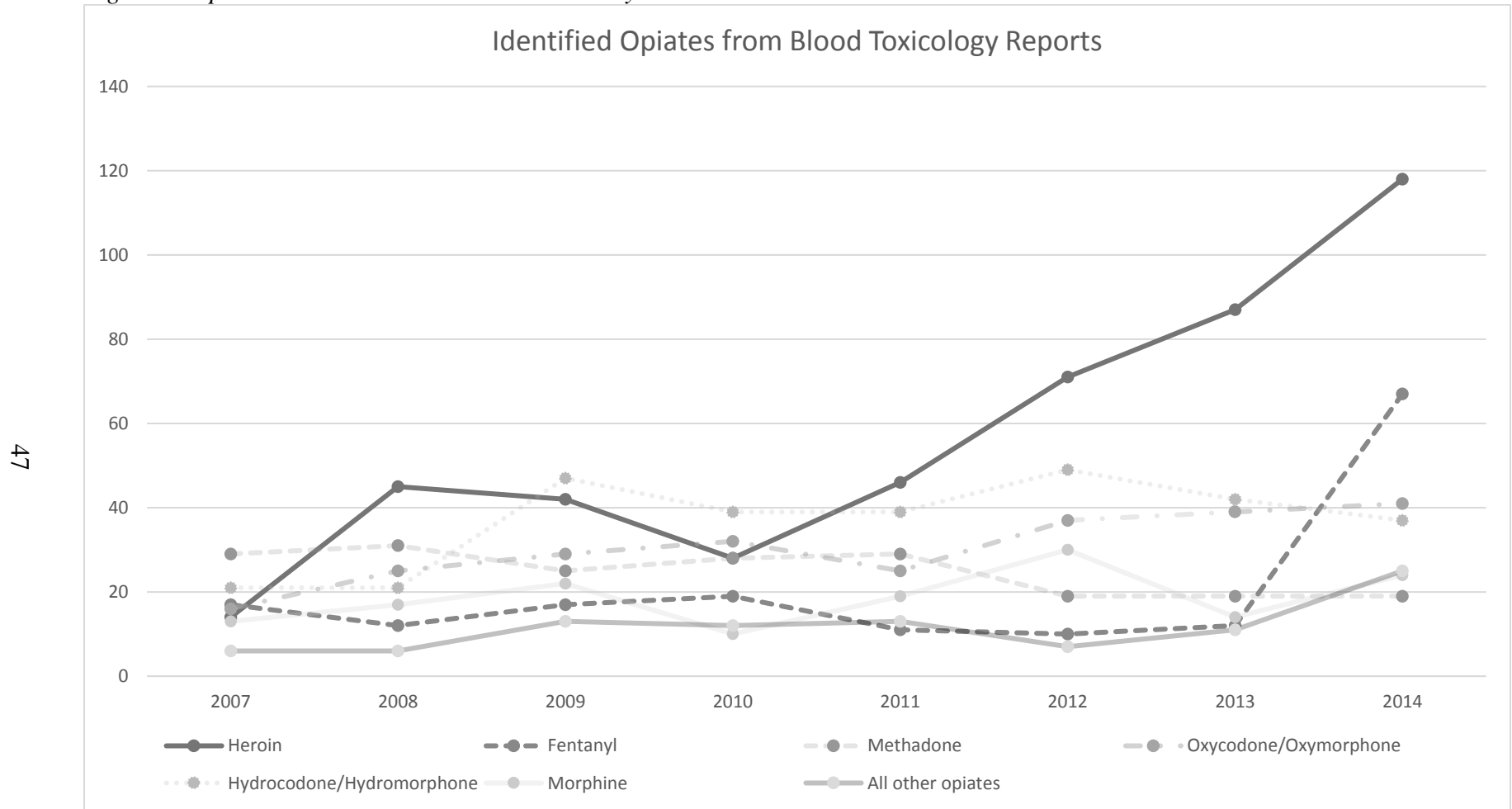
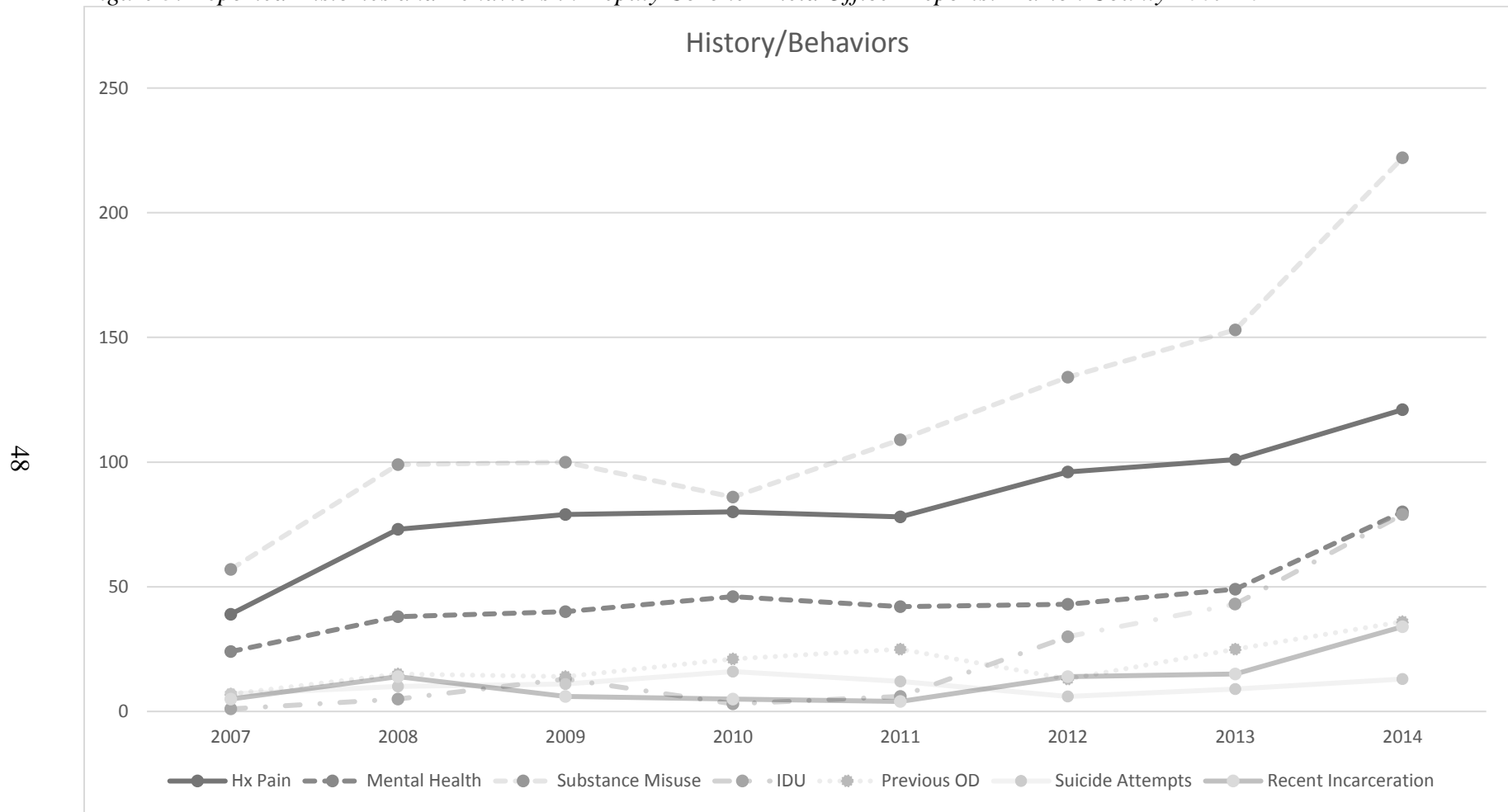


Figure 5: Reported Histories and Behaviors in Deputy Coroner Field Officer Reports: Marion County 2007-2014



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Individual Bivariate Analysis of Independent Variables.

The results of the individual bivariate multinomial logistic regression analyses are presented in Table 9. Of the seven demographic variables, all had a statistically significant relationship with the dependent variables, except for veteran status. All seven factors from the DCFOR were found to have a significant relationship with the dependent variables, while benzodiazepine, alcohol, and cocaine had a statistically significant relationship with the dependent variables and cannabis and amphetamines did not have a statistically significant relationship.

Table 9: Initial Multivariate, Multinomial Logistic Regression Model Results of Predictive Characteristics of having Either Only Heroin, Only Painkillers, or Both Heroin and Painkillers in Blood Toxicology Reports

Variable	χ^2 -value	p value
Age	3.87	0.144
SES	5.80	0.055
Gender	10.76	0.005
Race	18.29	0<.001
Education	11.75	0.068
Marion County resident	0.06	0.969
Acute/chronic pain	14.20	0.001
Mental health	12.47	0.002
Substance misuse	25.75	0<.001
IDU	61.41	0<.001
Overdose	5.85	0.054
Suicide	1.28	0.527
Incarceration/inpatient	6.72	0.035
Benzodiazepine	16.63	0<.001
Alcohol	14.36	0.001
Cocaine	7.65	0.022

Multinomial Logistic Regression Analyses.

In all, 16 variables were found to be statistically significant and thus were entered into the initial multinomial logistic regression analysis: Gender, Race, Age, Education, Indianapolis Residency, Socioeconomic Status Indicator, Acute/Chronic Pain History, Mental Health History, Substance Misuse History, IDU History, Overdose History,

Suicide History, Incarceration History, presence of Benzodiazepines, presence of Cocaine, and presence of Alcohol.

The initial multinomial logistic regression analysis found statistically significant associations (at the $p \leq 0.05$ level) between the three groups of opiate-related overdose decedents and ten variables: gender, race, acute/chronic pain history, mental health history, substance misuse history, IDU history, incarceration history, benzodiazepine, cocaine, and alcohol. On the other hand, significant associations were not detected between the three groups of opiate-related overdose decedents and age, socioeconomic status, education, Indianapolis residency, overdose history, and suicide history (Table 9). Consequently, these six factors were excluded from the final predictive model (Table 10).

See Table 10 for the Chi-square and p -values of the significant variables for the final predictive model. Table 11 presents the odds ratios, confidence intervals, and p -values for the statistically significant predictive values of having either only heroin, only painkillers, or both heroin and painkillers in blood toxicology reports.

Table 10: Final Multivariate, Multinomial Logistic Regression Model Results of Predictive Characteristics of having Either Only Heroin, Only painkillers, or Both Heroin and Painkillers in Blood Toxicology Report

Variable	χ^2 -value	p value
Gender	14.23	0.001
Race	14.01	0.001
Acute/chronic pain	23.38	<0.001
Mental health	14.92	0.001
Substance misuse	27.19	<0.001
IDU	64.12	<0.001
Incarceration/inpatient	6.89	0.032
Benzodiazepine	16.51	<0.001
Alcohol	12.90	0.002
Cocaine	7.86	0.02

Table 11: Odds Ratios, Confidence Intervals, and p -values for the Statistically Significant Predictive Values of having Either Only Heroin, Only Painkillers, or Both Heroin and Painkillers in Blood Toxicology Reports

Characteristic	Only Painkiller Versus Only Heroin OR (95% CI)	Both Versus Only Heroin OR (95% CI)	Only Painkillers Versus Both OR (95% CI)
Demographics			
Gender			
Male	0.58** (0.42-0.82)	1.14 (0.68-1.92)	0.51** (0.32-0.83)
Race			
White	2.08*** (1.39-3.12)	1.04 (0.59-1.84)	1.99* (1.13-3.52)
Reported Histories			
Acute/chronic pain	2.04*** (1.52-2.78)	2.00** (1.28-3.13)	1.01 (0.66-1.54)
Mental health	1.82*** (1.28-3.37)	0.94 (0.54-1.67)	1.92** (1.16-3.23)
Substance misuse	0.28*** (0.16-0.48)	0.47 (0.21-1.08)	0.58 (0.29-1.15)
IDU	0.26*** (0.17-0.40)	1.59 (0.97-2.63)	0.17*** (0.09-0.28)
Incarceration/inpatient	0.53** (0.32-0.87)	0.56 (0.26-1.19)	0.95 (0.43-2.08)
Poly Drug Use			
Benzodiazepine	1.43* (1.05-2.75)	2.50*** (1.59-4.00)	0.56** (0.36-0.88)
Alcohol	0.54*** (0.38-0.76)	0.85 (0.51-1.39)	0.64 (0.39-1.05)
Cocaine	0.63** (0.44-0.90)	1.05 (0.64-1.72)	0.60* (0.37-0.98)

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

Research question #1: Are demographic variables differentially predictive among the three types of opiate fatalities?

Decedents had lower odds of being male (OR = 0.58, 95% CI = 0.42-0.82) and higher odds of being white (OR = 2.08, 95% CI = 1.39-3.12) when found to have only painkillers in their blood versus those with only heroin. Decedents were found not to be statistically significantly different in gender or race with both heroin and painkillers in their blood versus those with only heroin. Decedents had lower odds of being male (OR = 0.51, 95% CI = 0.32-0.83) and higher odds of being white (OR = 1.99, 95% CI = 1.13-3.52) when found with only painkillers in their blood versus those with both heroin and painkillers.

Research question #2: Are the reported individual health histories in the deputy coroner field officer reports differentially predictive of the three types of opiate fatalities?

Decedents had lower odds of substance misuse history (OR = 0.28, 95% CI = 0.16-0.48), history of IDU (OR = 0.26, 95% CI = 0.17-0.40), and recent release from incarceration or an inpatient setting (OR = 0.53, 95% CI = 0.32-0.87), but greater odds of a reported history of acute/chronic pain (OR = 2.04, 95% CI = 1.52-2.78) and mental health history (OR = 1.82, 95% CI = 1.28-3.37) when found to have only painkillers in their blood versus those with only heroin. Decedents had greater odds of a reported history of an injury, illness, or surgery causing acute or chronic pain (OR = 2.00, 95% CI = 1.28-3.13) when found with both heroin and painkillers in their blood versus those with only heroin. Decedents had lower odds of having a reported history of IDU (OR = 0.17, 95% CI = 0.09-0.28), but had greater odds of a reported mental health history (OR = 1.92, 95% CI = 1.16-3.23) when found with only painkillers in their blood versus those with both heroin and painkillers.

Research question #3: Is poly drug use predictive of the three types of opiate fatalities?

Decedents had lower odds to have had cocaine (OR = 0.63, 95% CI = 0.44-0.9) and alcohol (OR = 0.54 95% CI = 0.38-0.76) in their blood, but had greater odds of having benzodiazepines (OR = 1.43, 95% CI = 1.05-2.75) in their blood when found to have only painkillers in their blood versus those with only heroin. Decedents had greater odds of having benzodiazepines (OR = 2.50, 95% CI = 1.59-4.00) in their blood with both heroin and painkillers in their blood versus those with only heroin. Decedents had lower odds of having benzodiazepines (OR = 0.56, 95% CI = 0.36-0.88) and cocaine (OR

= 0.60, 95% CI = 0.37-0.98) in their blood with only painkillers in their blood versus those with both heroin and painkillers.

Discussion

The types of opiates found in the toxicology reports of this study are similar to other cities and states (Cerdá et al., 2013; Piercefield, Archer, Kemp, & Mallonee, 2010; Shah, Lathrop, Reichard, & Landon, 2007). It is unclear why some painkillers are found in high frequencies some years and not in others, while some painkillers appear to have a fairly stable rate of use. Explanations for this observation include cost, prescribing habits, and availability of each specific opiate painkiller. A much more nuanced examination using provider and PDMP data is needed to understand this use of prescription painkillers.

When looking at the reported histories from the DCFOR, a few findings warrant further discussion. First, over half of the decedents in the analysis were reported to have had a history of some type of accident, surgery, illness, disorder, or disease that could cause acute or chronic pain. Additionally, almost one-third of the decedents were reported to have had a mental health disorder. According to the USDUH the US prevalence for any type of mental health disorder is about 18.5%. Thus, it would appear that a disproportionate number of individuals with a previous mental health history died in Marion County from opiate-related overdoses. Moreover, the annual average of individuals who were reported to have had a mental health history for each year in this study hovered around the overall average of 31% (range 26.9-37.4%). The averages for individual years did not vary much from the overall average. This observation is important, because the increase in opiate fatalities that has been occurring in Marion

County from 2007-2014 cannot be explained by or attributed to mental health. If mental health was a contributing factor to this increase, we should see an increase in the proportion of people who were reported to have had a mental health history. This finding further supports the notion that we are dealing with a problem that affects multiple people and multiple cultures. Ultimately, the narratives provided in the DCFOR suggests that many of the decedents were suffering and in some type of physical and/or emotional pain.

When looking specifically at those decedents with only painkillers in their toxicology report compared to those with only heroin, we find statistically significant differences on all variables used in the multivariate, multinomial logistic regression. This is important to understand because the people who use painkillers are much different from those who use heroin and this can influence prevention and intervention strategies. Decedents with only heroin in their toxicology report were more likely to be male and white. When comparing their reported histories, decedents with only heroin in their toxicology reports were more likely to have a substance misuse and IDU history and more likely to have been recently released from incarceration or an inpatient setting. Expanding on the substance misuse history, decedents with only heroin in their toxicology reports were more likely to have had alcohol and cocaine metabolites present in their toxicology report. These findings are similar to findings from an Australian study of recently released inmates who died of accidental drug-related causes. Those individuals were significantly less likely to have had a mental health history and significantly more likely to have had a history of IDU and substance misuse (Andrews & Kinner, 2012).

In the present study, decedents with only painkillers in their blood versus decedents with only heroin in their blood present a different story. These decedents are more likely to be female, to have had a history of acute or chronic pain, and to have had a mental health history. One interesting finding concerning the mental health history is that these decedents were more likely to have had benzodiazepines in their blood, which supports the increased likelihood of their reported mental health history being accurate. Additionally, this co-occurring use of prescription painkillers and benzodiazepines reinforces the conventional wisdom that the use of prescription painkillers and prescription medicine in general is not thought of as misusing substances, which offers an explanation for the large odds ratio of decedents with only heroin in their toxicology report being more likely to have had a substance misuse history.

The many differences found between decedents with only heroin compared to decedents with only painkillers in their toxicology reports is not observed when comparing decedents with both heroin and painkillers in their blood versus decedents with only heroin in their blood. In fact, only two variables were statistically significantly different – history of acute or chronic pain and presence of benzodiazepine in the blood. Decedents with both heroin and painkillers in their blood were more likely to have had a reported history of acute or chronic pain and more likely to have had benzodiazepine in their blood. Further investigation is needed to fully understand these results, but the history of acute or chronic pain could suggest these decedents were using prescription painkillers at one time to treat their pain, which may have led to eventual misuse of painkillers and initiation of heroin use.

When comparing decedents with only painkillers in their toxicology reports versus those with both painkillers and heroin in their blood results are quite similar to the results found when comparing decedents with only painkillers in their blood to those with heroin in their blood. Decedents with only painkillers in their blood versus those with both heroin and painkillers were more likely to be female, White, and to have no IDU history. Additionally, decedents with painkillers in their blood were more likely to have a mental health history and to have no cocaine metabolites in their blood. Results indicate that those with painkillers in their blood compared to those with both heroin and painkillers were not different with respect to histories of acute or chronic pain, substance misuse, and recent release incarceration or inpatient setting. The major difference when comparing the different groups (i.e., only painkillers vs. only heroin and only painkillers vs. both heroin and painkillers) concerns benzodiazepines being present in the blood. Decedents with only painkillers in their blood versus those with both heroin and painkillers were less likely to have benzodiazepines in their blood. In contrast, decedents with only painkillers in their blood were more likely to have benzodiazepines in their blood than those with only heroin. As with some of the other results, this finding needs further exploration in order to understand how it may inform prevention and intervention strategies. Concerning the targeting of specific groups for provision of naloxone, the results of this study suggest people with a history of acute or chronic pain and a mental health history are at risk of dying from an opiate-related overdose. Furthermore, individuals who are prescribed or known to misuse benzodiazepines should be informed of their increased risk of dying from an opiate-related overdose and should be given a prescription to and instructed on the use of naloxone.

A concerning finding from this study is the large increase in IDU, especially during the last three years of the analysis. These findings are even more alarming when considered in context with the recent HIV/AIDS outbreak that occurred in Scott County, Indiana, which was largely driven by IDU and needle sharing. Along with concerns of spreading HIV/AIDS, increases in hepatitis C infections have been found among both injection users and non-injection users. Moreover, Bruneau and colleagues (2012) observed increased likelihood of seroconversion among those who inject only prescription painkillers opposed to those who inject both heroin and prescription painkillers.

Ultimately, all of these deaths were preventable. Clinical and policy responses aimed at addressing the misuse of prescription painkillers typically offer opiate specific treatment centers, increased enforcement, implementation of prescription drug monitoring programs (PDMP) (Gugelmann & Perrone, 2011), and reduction in prescribing opioids (Dowell, Haegerich, & Chou, 2016). Although PDMPs can decrease the amount of diverted prescription drugs in the community, they have had limited success with decreasing use of prescription drugs and have little to no effect on the number of overdose mortalities (Paulozzi, Kilbourne, & Desai, 2011). Additionally, recent evidence reports the decline in opiates being prescribed by physicians, however, opioid-related overdose fatality rates continue to rise (Schuchat, Houry, & Guy, Jr., 2017).

As a result, an alternative approach proposed to respond to overdose mortalities involves a more fluid dissemination of an opiate antidote, naloxone. Naloxone is an opiate antagonist that safely and effectively reverses the often-fatal respiratory depression

effects caused by an opiate overdose (Chamberlain & Klein, 1994; Sporer, 2003). Naloxone only works with opiates and has no similar antidote properties for any other illicit or licit drug, including alcohol (Chamberlain & Klein, 1994; Sporer, 2003) and has been clinically available since 1962 (Baselt, 2000). Naloxone has been routinely used by paramedics, emergency departments, and other medical services to reverse the otherwise fatal effects of a heroin or prescription painkiller overdose (Sporer, 2003; Strang, Kelleher, Best, Mayet, & Manning, 2006). Despite its extensive clinical history and efficacious nature, it is relatively unknown to the general community and has limited use due to federal and state administrative restrictions (Beletsky, Burris, & Kral, 2009; Burris, Norland, & Edlin, 2001; Davis, Webb, & Burris, 2013; Green et al., 2013).

Naloxone is needed tremendously throughout the U.S and a strong push to increase naloxone access is coming from multiple fronts (legal, medical, and policy scholars) focusing on three targeted areas. The first targeted area is to increase the number of physicians who are prescribing naloxone. Primary care physicians and other physicians who have more frequent contact with active opiate users, such as ED physicians, are encouraged to provide naloxone prescriptions to their patients that are active opiate users (Beletsky et al., 2006; Kim, Irwin, & Khoshnood, 2009; Sporer & Kral, 2007). Additionally, chronic pain physicians and other physicians who work closely with people with painful chronic illnesses, such as cancer, are also being asked to provide naloxone prescriptions, due to the increased risk of chronic pain patients misusing their prescription painkillers (Beletsky et al., 2009; Beletsky, Rich, & Walley, 2012). Unintentional overdoses are more likely to involve prescribed medication than illicit drugs (CDC, 2012).

The second targeted area is to advocate for changes in state laws and regulations that restrict the availability of naloxone. As described above, only eight states have taken direct measures to address the legal, civil, and medical liability that may follow administering naloxone. Some states have passed laws that allow other licensed medical professionals (i.e., nurse practitioners, physician assistants) to prescribe naloxone, instead of only a physician (Beletsky et al, 2009; Burris et al., 2009).

Finally, the third targeted area involves the Food and Drug Administration (FDA) reclassifying naloxone from prescription-only to an over-the-counter (OTC) drug. This process can be lengthy, cumbersome, and expensive, due to all of the paperwork and filings required of pharmaceutical companies. However, support is strong for this option as the best way to make naloxone readily available (Beletsky et al., 2009; Burris et al., 2009; Coffin et al., 2003; Compton, Volkow, Throckmorton, & Lurie, 2013; Kim et al., 2009; Lagu et al., 2006; Seal et al., 2003; Sporer & Kral, 2007).

Limitations

This study has several limitations. First, the results inform us only about the individuals who died in Marion County, Indiana and whose deaths were investigated by the MCCO. It is likely that some people whose deaths were opiate-related were never investigated by MCCO for a variety of reasons. For example, if a physician listed the cause of death as natural and caused by cancer there would be no need for an investigation and toxicology report. Similarly, hospital administrative error could release a deceased individual to a mortician before final steps were enacted to notify MCCO of the death.

Second, as a retrospective study, the internal validity could be negatively affected due to the data being collected for archival reasons and not specifically for this study.

Third, the results inform us only about the individuals who died and thus we are unable to define fully who is at greatest risk of a fatal overdose.

Fourth, we were unable to identify opiates by specific trade names due to the chemical structure of the opiates and how they are metabolized in the body. All drugs from the Marion County toxicology reports are reported by generic name. For example, Vicodin and Percacet (trade names) each contain hydrocodone. Toxicology tests detect hydrocodone, for example, but do not determine which brand of hydrocodone was taken. Additionally, hydrocodone is metabolized to hydromorphone. Hydromorphone will remain in the blood stream long after the hydrocodone has been completely metabolized. Thus, the toxicology assay can be interpreted as showing the presence of an opiate, but we cannot then know if it was hydrocodone or hydromorphone. The same is true for oxycodone, which is likewise metabolized to oxymorphone. Because Vicodin and all other hydrocodone-containing medications metabolize to hydromorphone, which is itself a painkiller and the main ingredient of Dilaudid and Opana, it is not possible to tell from the results of toxicological assays which specific drug was taken. Opana is significant to this study because a common way to misuse this drug is to inject it, and Opana was identified as a significant variable in the recent HIV/AIDS outbreak that occurred in Scott County, Indiana.

A fifth limitation of the study involves important independent variables of this study – the reported histories as detailed in the DCFOR. There are layers to this limitation that introduce bias and error into the analysis. First, all of this information is

second-hand at best and cannot be verified. Additionally, the Deputy Coroner Field Officer determines individually what sources and information are to be included in the DCFOR. Some information may not be determined to be pertinent to the investigation and is excluded from the DCFOR. Finally, there is not one Deputy Coroner Field Officer investigating and writing the reports and like any occupation there is turnover and attrition for this position. Human error, inexperience, and personal styles and preferences can all impact how a DCFOR is written.

The social work implications of this analysis are far-reaching. Understanding this information is important on many levels, with implications for education, policy, clinical practice, and research. The results of this study suggest that teaching BSW and MSW students about the risk of overdose fatalities from the misuse of prescription painkillers and heroin is something that should occur in general social work classes and not just in substance misuse curricula, as the population affected by this problem reaches far beyond people who misuse substances, to family, friends, and community. Social work policy actions could include informing legislators and policy makers about the devastating effects of overdose fatalities and the need to create laws and regulations that improve the distribution and availability of naloxone, an antidote for opiate overdoses. Implications for clinical social work include educating social workers on identifying those at risk of an overdose, and advocating for naloxone to be prescribed or otherwise made available to those who are at risk of an overdose and to their families and friends. Finally, social work research needs to focus on further understanding this epidemic and, using community data, such as that from correction and judicial programs, Medicaid, and

prescription drug monitoring programs, to further understand and predict those who are at greatest risk of dying from a prescription painkiller or heroin overdose.

Chapter 4 Conclusion

People as young as 16 and as old as 81 years old died from an opiate-related overdose in Marion County, Indiana between the years 2007-2014. Some of these people had a lifelong history of substance misuse. Some had an extensive medical history with frequent hospitalizations. Some people were recently released from incarceration, some from an inpatient hospital stay, and some recently completed inpatient substance misuse treatment. Some of these people had significant mental illnesses, some previously overdosed on a prescription painkiller or heroin, and some have a history of using needles to inject drugs.

The three papers in this dissertation describe the process of using publically accessible local data to better understand a developing public health concern. The first paper described the methods used to identify, gather, and collect the information needed to create a database for analytical purposes. The second paper was a descriptive paper that reported the demographics of the decedents, the type of opioids found in toxicology reports, and the reported medical and behavioral histories of the decedents. The final paper explored the predictive characteristics of decedents who overdosed on heroin, prescription painkillers, or a combination of both.

This study demonstrated that people who have died from an opiate-related overdose in Marion County are more heterogeneous than homogeneous, however, the one commonality that all of these people share is that their death was preventable and their access to an antidote for their overdose was severely limited by policies and regulations. This was a social injustice and as a social worker it is my ethical duty to seek out and rectify social injustices.

The results from this study further highlight social injustices and expand the discussions concerning society's awareness and treatment of mental illness, physical pain, inmates, ex-offenders, and people in recovery from substance misuse and other issues. All levels of human development and systems of behavior are effected and influences how social workers will work with adolescents, young adults, older adults, couples, families, and even larger social networks and communities. Social work education, practice, policy, and research are all affected by the misuse of prescription painkillers and heroin. The impact, scope, and harm of misuse of prescription painkillers and heroin has transcended being just an addiction concern and has now become an issue that is touching all aspects of society.

The purpose of this project was to determine if the availability and reach of naloxone can be increased by directly identifying and targeting specific groups of people most at risk for an overdose fatality in Marion County, Indiana. More specifically, could the same sources of data (death certificate, autopsy and coroner's reports, and toxicology reports) that were used to inform us of the developing overdose epidemic be used to inform doctors, nurses, and others with prescribing authority on the type of patient or situation where a naloxone prescription would be warranted due to the high likelihood of an overdose? Currently, I am unable to determine if this study was able to answer the purpose and specific aim of the dissertation as my design was not prospective, however, the evidence is strong enough to warrant increased advocacy and discussion expanding the reach and availability of naloxone.

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Appendix A. List of Injury, Surgery, or Other Potential Pain Causing Condition

2007

- knee surgery
- Chronic pain/2Back Sur
- Guillain-Barre syndrome
- degenerative back disease
- broken ankle
- hysterectomy
- head/neck cancer/surgery/back-knee surgery
- back pain/neck fracture
- shoulder/disc dislocation
- chronic back pain
- GSW-abdomen
- Parkinson's
- MVA-back problems/kidney stones
- back surgery
- migraine/knee replacement
- chronic back pain
- hysterectomy/GI tube/intestinal obstruction/ovarian cysts
- knee pain
- back pain
- GSW-chest
- knee surgery/colonoscopy
- bariatric surgery 7 years ago
- breast cancer/surgeries/hysterectomy
- broken back-metal plate/pins in thumb
- gastric-bypass 6 years ago
- disc surgery on back
- kidney stones/neck surgery/MVA
- back problems
- disk replacement
- MVA-back problems/kidney stones
- malignant hystosynosis
- back problems
- MS
- gallbladder removed/toe amputated
- Fibromyalgia/Lupus
- dental
- gastric-bypass/chronic pain/migraine/bilateral knee replacement
- numerous hip surgeries/degenerative disk disease/chronic pain

2008

- leg/gall bladder removal
- diabetes/foot/back pain
- back pain
- appendectomy
- Hep C
- knee surgery/extensive scrips
- Chrons disease
- IDDM/chronic back pain
- HTN/OA/Hip fx/neuropathy
- MVA-elbow surgeries
- DM/COPD/fibromyalgia/neck and back pain
- CAD w/MIx2/COPD/NIDDM/Diabetes neuropathy/nephritis
- hip replacement/back surgery/dental extraction/chronic pain
- Hep C/cirrhosis
- hip dislocation
- chronic pain
- non-insulin diabetes
- insulin dependent/pancreatitis
- HIV+
- 3 surgeries for herniated disks
- kidney problems
- Hep C/COPD
- epilepsy
- spleen injury
- Hep C
- Hep C/back injury/seizures
- HIV+
- Hep C
- pinched nerve in back
- back pain
- chronic back pain
- hx liver/kidney failure
- back pain/bilateral knee replacement
- MVA
- ACL repair
- COPD
- COPD
- neuropathy
- dental work
- Diabetes/hysterectomy/cyst removed from face
- Bowel resection/hypothyroidism
- Hep C
- chronic back/neck pain/seizures/Diabetes
- Diabetes/sig med hx
- many med problems
- seizures
- MVA

- removal of one kidney
- chronic back pain
- severe back pain
- insulin dependent/dental work
- GSW-abdomen
- surgical scar on ankle
- gastric bypass (15 years ago)/hysterectomy/severe arthritis
- Chronic pain/OA
- sickle cell
- Diabetes/GSW-scrotum/HIV+
- Hep C
- chronic back pain
- chronic pain/hysterectomy/neck surgery/gall bladder removed/migraines/degenerative disk
- deviated septum surgery

- heart problems
- gastric bypass (9-10 years ago)/3-4 surgeries to correct problems-2008 most recent/hernia/rheumatoid arthritis
- Diabetes
- leg/knee pain
- chronic pain
- diabetes/MRSA
- back pain/liver/heart disease
- diabetes
- back pain/hip pain/diabetes/sleep apnea
- seizures
- Hep C/Diabetes/Cirrhosis/hernia
- Chronic pain/HTN
- crazy injury leading to self-excoriating/chronic pain

2009

- healing fracture of tibia/extensive medications
- diabetes
- serious MVA 2 years ago w/multiple fractures
- partial hysterectomy
- total hysterectomy/left thyroidectomy
- gastric bypass/hernia repair
- gunshot wound causing paraplegic
- total hysterectomy/cholecystectomy/left hip surgery
- chronic back pain from 2 MVA
- cardiac surgery
- mitral valve prolapse/scrips
- arthritis/anemia
- MVA-broken neck/spine fracture/tumor in brain/c-section/CAH
- heart surgery
- Hep C/Congestive Heart Failure
- c-section/ovarian cysts
- chronic back pain
- scoliosis
- GSW-shoot in stomach in Iraq
- back and neck surgeries/herniated disks/degenerative back disease/constant pain
- epilepsy
- Hep C/on disability due to back and legs
- neck surgery/appendectomy
- fibromyalgia/irritable bowel syndrome/sleep apnea/hysterectomy
- neck injury from MVA

- fibromyalgia/chronic pain/nerve damage in jaw/fractured shoulder/surgical scar on ankle
- bilateral mastectomy/cholecystectomy
- appendectomy
- 3 herniated discs/breast reduction surgery
- numerous surgical scars on both arms and hands/2 surgical scars on legs/surgical scar on butt/diabetes
- surgical scar on ankle
- rheumatoid arthritis/Lupus
- tubal ligation/HIV+
- quadruple bypass/nerofibrosyis
- seizures
- AIDS/pancreatitis/shingles
- fibromyalgia/cracked rib
- cirrhosis/Hep C
- fibromyalgia
- stage 4 lung cancer
- colostomy/AIDS
- head trauma from ultimate fighting/seizures/kidney failure
- back pain/lupus/cancer/hysterectomy/left oophorectomy/appendectomy/thyroidectomy
- gastric bypass/hernia surgery
- surgical scar on pelvic region/hysterectomy
- cholecystectomy/appendectomy/diabetes/MVA leading to bi lateral knee replacement/chronic pain
- back surgery 2-3 years ago

- multiple (11) GSWs to abdomen and legs and surgeries/CAD/HTN/cholecystectomy
- HTN
- lung cancer/appendectomy
- surgical scar on knee/HTN
- surgical scar on hand
- cholecystectomy
- diabetes
- disc problems/carpal tunnel/diabetes/pain
- chronic back pain/HTN
- paraplegic/shot 5xs/severely beaten on head needing surgeries and metal plates/spleen & gall bladder removed
- fractured collarbone/hep c
- bariatric surgery/cholecystectomy
- HTN/appendectomy
- kidney stones/ulcers/neurologist for headaches
- 2 separate surgical scars on abdomen and pelvis/HTN
- hysterectomy/MIs/CVAs
- kidney transplant 3/2009
- orchiectomy/surgical scars on abdomen/neck and shoulder injuries
- chronic pain syndrome/partial right mastectomy/left iliac crest surgery/surgery of lumbar spine/kidney stones/cancer/neurovasculitis/copd
- gsw to chest/tibia fracture/HTN/surgical scars on chest and arm
- HTN
- surgical scar on arm
- joint pain/cholecystectomy/appendectomy
- chronic pain/hysterectomy/cholecystectomy
- cholecystectomy
- hysterectomy/appendectomy/cholecystectomy/colonoscopy/false teeth fitting
- surgical scar on chest
- appendectomy
- appendectomy
- fractured shoulder/boxer fracture of finger/osteoarthritis
- CAD/COPD/dementia/diabetes/CVA/TIA/hammer toe correction/knuckle replacement/spinal fusion/arthritis/chronic pain
- appendectomy
- bariatric surgery/appendectomy
- chronic back pain

2010

- Hep C/rape victim
- end stage emphysema(COPD)/lung mass/HBP
- COPD/pancreatitis
- chronic pain since 13/hip replacements/chemo
- recent stent surgery/HBP/diabetes/MS
- brain surgery
- hysterectomy
- herniated discs/fibromyalgia
- gall bladder removal
- Prostate cancer/Hep C
- Chronic foot pain/diabetes/nerve damage
- chronic pain/osteoporosis
- fibromyalgia/shoulder surgery/liver & spleen problems
- pancreatitis/asthma/COPD
- back problems/spine stimulator
- appendectomy
- broken back/surgical scar on abdomen
- stroke/back and hip pain
- congestive heart failure
- bariatric surgery - 2004/surgery 3/23/10
- chronic pain/fibromyalgia
- knee surgery 2009/hbp
- MVA/back problems/rods & pins in legs/asthma
- hemorrhoid surgery/nonhodgkin lymphoma
- kidney stones
- cyst removed from back and tailbone
- back pain/seizures
- rotator cuff surgery/kidney stones
- ovarian cancer/HBP
- back, knee, leg, foot pain/fibromyalgia/HBP
- recent critical car accident
- Hep C
- back injury
- arthritis/high cholesterol
- hysterectomy/cholecystectomy/neck surgery/spinal surgery/degenerative disk disease/fibromyalgia
- diabetes
- old back injury
- severe leg pain/hypothyroid
- Hep C
- back surgery/seizure

- kidney transplant/Elport syndrome/osteoporosis/20 years dialysis
- amputation of toes/diabetes/diabetic ulcers/kidney cancer
- leg injury
- cancer
- injured knee
- thyroid cancer-removal/broken foot
- broken thumb
- healed surgical scar
- HIV+
- head injury/stitches
- chronic pain/pancreatitis/diabetes/hysterectomy/appendectomy/cholecystectomy
- hysterectomy
- Chron's/chronic back pain/IBS
- surgical scars on abdomen
- Chron's/extensive other surgeries-problems
- several medical problems
- Seizures/HTN/COPD
- MVA/chronic pain
- spinal degeneration/chronic back pain/Lumbar Spondylosis/toe amputation/bunionectomy
- heart stents
- leg pain
- chronic back pain
- back injury
- bariatric surgery/degenerative disk disease/sleep apnea
- back surgery
- appendectomy
- sleep apnea
- Vulva cancer/GSW
- diabetes/lower back pain/kidney stones
- surgical scars on abdomen
- diabetic
- Hep C/cancer
- Colon cancer
- appendectomy
- surgical scars on abdomen
- 2 neck surgeries/spinal problems
- fibromyalgia/partial hysterectomy/cervical cancer
- chronic back pain
- hysterectomy/cholecystectomy/knee surgery
- c-section

2011

- arthritis/asthma
- numerous back surgeries
- shoulder problems/gall stone surgery
- surgical scar on hand and wrist
- bypass-stent surgery/multiple vascular surgeries
- scoliosis/titanium rods in back
- hysterectomy/neck and shoulder pain
- back and leg pain/diabetes
- gastric bypass-1996/migraines/constant pain
- lupus/surgical scar on neck
- recent assault ruptured spleen
- back pain
- brain surgery/seizures/hep c
- hysterectomy/bilateral salpingo-oophorectomy
- chronic back pain/pancreatitis/hep c
- recent victim of robbery - broken nose, ribs, and numerous bruises contusions throughout/HIV+
- Pineal tumor in brain
- recent compressed disc
- surgeries for boils on back
- appendectomy
- heart valve replacement
- gout/chronic pain
- hysterectomy
- hysterectomy
- fibromyalgia/something else in/out of hospitals since age 14
- serious heart problems
- hit by car yesterday/cholecystectomy/hysterectomy/bilateral salpingo-oophorectomy
- cystic fibrosis/pancreatitis/9.5" of colon removed when 12
- back pain
- hysterectomy/cholecystectomy/ovarian cyst removal
- breast implants
- hysterectomy
- back disease
- plate in head due to bar fight
- chronic pain due to MVA/gout
- abdominal surgery/bariatric
- degenerative disc disease/back knee pain/copd/emphysema/arthritis
- c-section/chronic back pain
- amputated big toe/throat cancer

- lymphoma/chronic back pain
- kidney problems/pinched nerve in shoulder
- multiple back surgeries/chronic pain
- chronic pain/arm pain/diabetes/hernia
- hysterectomy
- hysterectomy/cholecystectomy/bilateral saphinogooophorectomy/appendectomy/seizure disorder
- fell off bike 2 weeks ago and fractured ribs
- cosmetic surgeries-tummy tuck, breast implants/cholecystectomy\
- abdominal surgery
- quadruple bypass
- sleep apnea
- exploratory laparotomy
- bowel surgery after rupture during birth/diabetes/MS/Chron's disease
- hysterectomy/kidney stones/back pain
- degenerative disc disease/stomach pain/bad knees
- cholecystectomy/icepick headaches
- chronic back pain/wrist surgery
- chronic back pain/polycystic kidney
- surgical scar on neck/exploratory laparotomy/surgical scar on ankle
- cystic fibrosis
- neuropathy/fibromyalgia
- severe back pain
- chronic pain/motorcycle accident - breaking clavicle/fell from garage roof
- back surgery/gout/deviated septum surgery
- kidney stones
- hysterectomy/bilateral saphinogooophorectomy
- surgical scars on both feet and ankles
- severe neuropathy
- Fibromyalgia/rheumatoid arthritis
- chronic pain/gout/diabetes
- sciatica/appendectomy/lumbar stenosis
- brain aneurysm surgery
- dirt bike accident/MVA-alcohol related
- chronic back pain from MVA
- hysterectomy/bilateral saphinogooophorectomy/appendectomy/fibromyalgia/lupus/breast implants
- AIDS/surgical abdomen scars
- chronic back pain/spinal defects/testicular cancer
- appendectomy/hernia repair/chronic pain from MVA - broken neck
- back pain
- recent outpatient surgery/partial hysterectomy
- bariatric surgery 2 years ago
- 2 back surgeries

2012

- AIDS/TB/Hep C
- Fibromyalgia/Degenerative spine disease/hip pain/surgical scar on right hip
- disc problems
- carpal tunnel surgery and bone marrow biopsy on 1/9/12/chronic pain/surgical scars on other hand
- back pain/multiple MVAs
- diabetes
- Chron's Disease
- hospitalized for 31 days 12/2011 for falling off bridge and breaking leg
- diabetes
- terminal thymus cancer
- kidney stones/Bell's palsy
- back injury/surgical scar on right shoulder
- partial foot amputation 12/2011/diabetes/Guillians-Barre
- chronic back pain/scoliosis/disc herniation/laparoscopic cholecystectomy
- back pain
- surgical scar on chin
- chronic knee pain after replacements/chronic hip pain/3 c-section births/deviated septum surgery
- ruptured ovarian cyst on 3/16/12
- GSW/forklift accident
- diabetes
- diabetes
- MVA w/neck injury 2010
- hysterectomy/appendectomy/chronic back pain/multiple surgeries
- fibromyalgia/spinal degeneration/surgical scar on arm
- surgical scar on wrist
- back pain
- knee surgery due to 12/2011 MVA
- fibromyalgia/surgical scar on ankle/partial hysterectomy

- acute pancreatitis/back pain/surgical scar on back/cholecystectomy
- HIV+/paralysis waist down/beaten up/13" surgical scar on abdomen/surgical scars on both arms
- hysterectomy
- double leg amputation
- diabetes/arthritis/pain
- chronic back pain/fibromyalgia
- sinus surgery/back surgery with spinal stenosis/cholecystectomy/bilateral tubal ligation/Hep C
- cholecystectomy
- diabetes
- diabetes
- fibromyalgia/migraines/appendectomy
- surgical scrotal procedure
- diabetes
- recent extraction of top teeth/cholecystectomy
- diabetes/open heart surgery/valve replacements
- diabetes/back pain from MVA
- diabetes/14 teeth pulled on 6/27/2012/surgical scar on abdomen
- sickle cell/nasal polyps surgery yesterday
- lupus
- gout/exploratory surgery/shot in abdomen 6 years ago
- chronic back pain/nerve pain
- total hysterectomy/cholecystectomy
- intracranial surgery/tubal ligation/MS/leukemia/breast cancer
- diabetes/kidney tumor/gout/chronic pain syndrome/stent placement
- gastric bypass in 2009/arthritis/cholecystectomy
- stent placement/diabetes
- spinal meningitis/seizures
- 19 pins in foot due to job accident over a year ago
- Grand Mal seizures/sees a neurologist
- appendectomy
- valve replacement/splenectomy/stent placement
- partial hysterectomy/ovarian cysts/cholecystectomy
- stomach bleeds
- hysterectomy/back and neck surgeries for herniated discs
- cancer/ulcers/arthritis
- chronic pancreatitis
- kidney stones
- back and neck pain/splenectomy/hernia repair/joint replacement
- surgical scar on elbow/ALS
- splenectomy/pancreatitis/hernia repair/diabetes
- back pain/cyst removed off tailbone/growth on spine/sacral ulcer with wound vacuum and antibiotic therapy
- cholecystectomy
- pancreatic problems
- surgical scar on hip/seizures
- hernia repair/seizures
- shot in face 11/2011
- diabetes/seizures/dialysis/surgical scar along left costal margin
- lymph node cancer & chemo
- disabled from motorcycle accident
- foot injury
- bad knees/appendectomy/tubes tied
- osteoarthritis/injections in spine for pain management
- back problems
- surgery for arthritis in ankle
- pelvic injury/lost left eye from bb gun
- chronic pain
- sutured scar on wrist
- severe back pain/fibromyalgia/degenerative disc disease/total hysterectomy
- appendectomy/cholecystectomy
- boxer-fracture of hand
- lumbar surgery/tubal ligation/gallstones
- chronic head pain
- partial hysterectomy
- diabetes/kidney injury
- back injury on disability
- laparoscopy/R&L knee repair/hysterectomy/cholecystectomy/multiple sinus surgeries/4 MVAs, last one lifelined
- appendectomy/severe headaches
- diabetes/abdominal surgical scar/surgical scar on knee

2013

- recently broken arm
- chronic back pain
- coronary artery bypass graft/stent placements/diabetes
- cholecystectomy

- chronic arthritis
- motorcycle accident
- diabetes
- scoliosis/chronic back and joint pain
- cystic fibrosis/diabetes/appendectomy/placement of gastrostomy tube
- cholecystectomy
- cholecystectomy
- staples on fallopian tubes/fibromyalgia/chronic pain
- bariatric surgery, 10 years ago/hysterectomy/appendectomy/cholecystectomy/osteoporosis-2 broken ankles in past year, multiple leg fractures
- diabetes
- neck pain
- hernia surgery
- kidney tumor
- pancreatitis-stent placement
- tooth extraction
- chronic pain from 38ft scaffolding fall/hep c
- neuropathy/cholecystectomy
- gsw to abdomen
- spine surgery/diabetes
- chronic back pain
- neck surgery last week/cyst on spine/migraine headaches/cholecystectomy/appendectomy/hysterectomy
- gsw-paraplegic, multiple operations
- constant pain
- gastric bypass and reversal/hysterectomy/bilateral salpingo-oophorectomy/MVA hip/pelvic problems
- chronic pain/surgical scar on ankle
- diabetes/cholecystectomy/tubal ligation
- previous rib fracture
- chronic knee pain/MS/Parkinsons/fibromyalgia
- endoscopy
- gastric bypass/cholecystectomy/hysterectomy
- surgical scar/endoscopy/colonoscopy
- hernia surgery
- cholecystectomy
- fibromyalgia/cholecystectomy/arthritis/back and stomach pain
- 2 purple hearts
- caesarean section
- gastric bypass/unspecified pain/hysterectomy/bilateral salpingo-oophorectomy/cholecystectomy
- HIV+
- open heart surgery/both knees needing replacement
- back pain
- HIV+/diabetes/chronic pain/surgical scars/diabetic neuropathy
- diabetes/stomach paralysis/J-tube/cholecystectomy
- surgical scar on knee
- tubal ligation/diabetes/broken ankle/bursitis
- fractured nose from MVA
- back surgery/both shoulders replaced
- multiple back surgeries/diabetes/chronic pain
- severe injury to right arm/constant acute pain
- cholecystectomy
- fibromyalgia/back pain/gall stones/diabetes
- hysterectomy/appendectomy
- partial leg amputation/MS/seizures/chronic pain
- hysterectomy/cholecystectomy/abdominal wall reconstruction/chronic back pain
- arthritis/extreme pain in shoulder and hip
- rod placed in femur after MVA/diabetes
- lung cancer
- hernia surgery
- breast implants/tummy tuck
- appendectomy
- surgical scar on abdomen
- chronic back and leg pain
- degenerative disc disease/chronic back pain/cholecystectomy
- chronic pain syndrome/degeneration of lumbar
- hysterectomy/cholecystectomy/brain tumor
- fibromyalgia/2 back surgeries/fractured hand
- bulging disc/back pain from MVA/surgical scar on arm
- partial foot amputation/chronic pain
- lost both legs in Vietnam/chronic back pain/glaucoma
- work related back injury
- c-section/chron's disease/cholecystectomy

- tubal ligation/cholecystectomy/4 laparoscopies/left ankle surgery
- appendectomy
- back and neck pain/cholecystectomy
- cholecystectomy
- 2 falls from ladders in 7/2013 resulting in broken ribs and 5 days in hospital
- torn ligament in leg/broken hand
- hysterectomy/kidney stones/multiple surgeries for kidney problems
- bypass graft surgery
- hip replacement
- appendectomy
- pacemaker
- surgical scar on leg
- prostate cancer
- pelvic surgery/three surgical scars on ankles and calf
- lung cancer
- liver transplant/degenerative disc disease/cholecystectomy
- diabetes/arthritis
- bleeding ulcers requiring surgical procedure
- spinal injury while spelunking/constant pain
- back fusion surgery/diabetes/neuropathy/back pain
- diabetes
- MVA serious head trauma
- MVA in 2010 leading to right lower paralysis/Grave's disease
- stabbed 3xs in 2012
- neuropathy/kidney disease/pancreatitis/chronic abdominal pain/oophorectomy
- gastric bypass/cholecystectomy/chronic back pain
- cholecystectomy/partial hysterectomy

2014

- **leg injury/back pain/bowel problems/headaches/cholecystectomy**
- occasional back pain
- ulcers
- chronic pain/COPD/HTN
- removal of cyst in tail region/Hep C/GI bleeds
- foot surgery last year/cholecystectomy/diabetes/arthritis
- recent surgery on leg that was the last of three/epilepsy
- chronic pancreatitis, multiple surgeries to both knees, non-Hodgkins lymphoma
- ovarian cancer, hysterectomy
- left thalamic deep brain stimulator placement-1/10/14/pacemaker
- diabetes
- heart transplant, 2007/gastroparesis last 6 weeks
- Fibromyalgia/diabetes/8" surgical scar on chest/surgical scar on wrist/surgical scar on abdomen
- severe migraines since age 12
- GSW to abdomen - 1987
- nephrectomy
- fibromyalgia
- diabetes
- chronic back pain
- chronic pain from 2006 MVA involving surgeries/tubal ligation
- Hep C
- Fibromyalgia/scoliosis/epilepsy/surgical scars on fallopian tubes
- degenerative disc disease/hep c/GERD
- hep c
- fell out of tree a week ago, hospitalized for 3 days/surgical staples present/broken ribs
- stabbed on 2 separate occasions one time collapsed lung
- cholecystectomy
- chronic back and neck pain/COPD/myalgia/cervical spondylosis
- scoliosis/thyroidectomy
- fibromyalgia/bone cancer in jaw
- degenerative disc disease/diabetes/COPD/multiple surgical scars on body
- bypass surgery/ASHD
- hear stent/diabetes
- chronic back and spine pain/copd/emphysema
- hemorrhoid surgery
- Hep C
- hep a,b,c/abdominal hernia/CHF
- recent cholecystectomy (open scar)/chronic osteo arthritis/COPD
- diabetes/trach due to excessive intubations/over 400 lifetime kidney stones/abdominal hernia/lymphedema/COPD/CHF

- cholecystectomy/lupus/diabetes/mitral valve prolapse
- shoulder and back pain/seizures
- seizures
- cholecystectomy
- HIV/AIDS/Hep B/renal failure/CHF
- chronic back pain/back and hip surgery
- gastric bypass/hernia/hysterectomy with bilateral salpingo-oophorectomy
- MS/diabetes/GERD/COPD/emphysema /spinal fusion with chronic back pain
- Back pain/emphysema/COPD/cholecystectomy/hysterectomy with bilateral salpingo-oophorectomy
- leg pain/assault
- crushed ankles in fall
- diabetes
- non-Hodgkin's Lymphoma/chemo and radiation/adhesions to chest wall with chronic pain
- fx left wrist in bicycle accident
- total hysterectomy with bilateral salpingo-oophorectomy/appendectomy/Noonan's syndrome/diabetes/seizure disorder/tonsillectomy/back surgery/mandible surgery/web neck
- bilateral tube ligation/arthritis/tonsillectomy
- broken arm last month/seizures
- degenerative disc disease/diabetes/COPD/emphysema/2 neck surgeries
- triple bypass/hep c/diabetes
- metallic staples (uterovesical pouch of Meiring)/bilateral fallopian tube scars
- numerous surgical scars on legs and abdomen
- surgery on rt. arm caused by injection
- open heart surgery/copd/cad/diabetes/hep c/uterine cancer/hysterectomy/seizures/chf
- injuries from 1/2014 car accident/1/2 colon removed
- chronic headaches - treated with vicodin
- stent placement
- diabetes
- spleen, thyroid, pancreas with benign tumors - removed or resected/multiple endocrine neoplasia/diabetes/open heart surgery
- car accident
- renal failure-dialysis/diabetes
- surgical scars on legs and abdomen
- diabetes/arthritis
- appendectomy
- motorcycle accident shattering left foot/chronic pain/recent hydrocodone scrip for bronchitis
- tonsillectomy
- open heart surgery/pacemaker/valve replacement
- broken wrist from snowboarding
- degenerative disc disease/left shoulder surgery/arthritis/COPD
- AIDS/colon cancer
- chronic back pain/spondylosis
- back pain/foot problems
- stent placement
- back injury
- pain in side of head/stomach ulcers/mass in stomach
- car accident 2/2014 causing chronic back pain
- skin cancer
- chronic pain
- COPD
- MVA/back pain
- appendectomy
- diabetes/hip surgery
- recent removal of teeth
- seizures
- injured ankle in military - receiving benefits
- appendectomy/hernia repair/tonsillectomy/hep c
- motorcycle accident, skull fx with steel plate/shoulder fx
- low back and knee pain/COPD/emphysema
- motorcycle accident year ago w/serious injuries
- diabetes
- COPD/chronic pain in knees
- MVA 4 years ago fractured neck
- irritable bowel
- appendectomy
- stent placement
- recent burn on hand requiring skin graft
- MVA 2 weeks ago-fractured hip, ribs, facial injuries
- Hep c
- bariatric surgery/4 cosmetic surgeries/breast implants
- chronic back and foot pain
- diabetes

- chronic pain
- seizures from head trauma from sexual assault
- hep c
- fibromyalgia
- diabetes/emphysema/COPD
- GSW to left side/chronic knee pain
- Liver stents/cirrhosis/chf
- 2 hip replacements/seizures/migraines
- bilateral tubal ligation/cholecystectomy
- frequent falls/multiple blood transfusions/Cirrhosis
- GSW to leg/COPD/Cancer right lung
- migraines
- assault causing head trauma, loss of left eye sight, taste, and smell/seizures

Appendix B. List of Licit and Illicit Substances Tested for in Toxicology Report

Alcohol
Amphetamines
Analgesics
Anesthetics
Antibiotics
Anticonvulsants
Antidepressants
Antihistamines
Antipsychotics
Barbiturates
Benzodiazepines
Cannabinoids
Cardiovascular agents
Cocaine
Endocrine agents
Fentanyl
Gastroenterology agents
Methadone
Narcotics
Neurology agents
Opiates
Phencyclidine
Propoxyphene
Sedatives/hypnotics
Stimulants
Urology agents

Curriculum Vitae

Aaron Carl Willis

EDUCATION:

GRADUATE

Indiana University Ph.D. (Social Work) 2017

University of Chicago A.M. (Social Work) 2006

UNDERGRADUATE

Gustavus Adolphus College B.A. (Religion & Criminal Justice) 1996

FURTHER EDUCATION:

Indiana University LEAH Fellow 2011-2013

School of Medicine LEAH Fellow Coordinator 2012-2013

Section of Adolescent Medicine

University of Iowa Social Work Doctoral Student 2006-2009

LICENSURE:

Licensed Social Worker 2010-present

Indiana Professional Licensing Agency

Indianapolis, IN

PROFESSIONAL ORGANIZATION MEMBERSHIPS:

Society for Social Work and Research 2013-present

PUBLICATIONS:

Peer-reviewed Publications:

Lau, K. S. L., Willis, A. C., Perkins, A. J., Roseman, M. B., Wiehe, S. E., Wanzhu, T., Aalsma, M. C. (in process). Mortality: The high cost of juvenile justice involvement.

Schwartz, J. & Willis, A. C. (2010). Coverage of methamphetamine in GLBT newspapers. *Mass Communication & Society*, 13, 30-47.

Willis, A. & Gill, A. (2006). An introduction to the client-orientated, practical, evidence search (COPES). *Advocates Forum*, 50.

Willis, A. (2006). Cocaine-abusing methadone patients: Can COPES lead to an appropriate intervention? *Advocates' Forum*, 64-77.

PRESENTATIONS: (lead presenter in BOLD):

Refereed:

Willis, A. C. (2016). Opiate Related Overdose Deaths: Differences with Heroin or No Heroin in the Blood? Presentation at the *2016 National Rx Drug Abuse & Heroin Summit*, Atlanta, GA.

- Willis, A. C.** (2015). Using Marion County Coroner Data to Inform the Prevention of Opiate Overdose Fatalities. Presentation at the *6th Annual Prescription Drug Abuse Symposium*, Indianapolis, IN.
- Lau, K. S. L., Willis, A. C., Perkins, A. J., Tu, W., Rosenman, M. B., Wiehe, S. E., & Aalsma, M. C.** (2015). Criminal Justice Involvement is Associated with Early Mortality and Homicide Related Death Among Juvenile Offenders. Poster presented at the *Society for Adolescent Health and Medicine Annual Meeting*, Los Angeles, CA.
- Lau, K. S. L., Willis, A. C., Rosenman, M. B., Wiehe, S. E., Tu, W., & Aalsma, M. C.** (2015). Racial/Ethnic Identity, and Mental Health and Substance Use Status as Predictors of Arrest and Arrest Outcomes in a Large Sample of First Time Juvenile Offenders. Poster presented at the *Society for Adolescent Health and Medicine Annual Meeting*, Los Angeles, CA.
- Willis, A. C.** (2014). Suicide Plans and Attempts as Predictors of Carrying Weapons Among Adolescents. Poster presented at the *18th Annual Society for Social Work Research Conference*, San Antonio, TX.
- Willis, A. C., Best, C., & Aalsma, M. C.** (2013). Trauma Experiences among Detained Youth: Predictors of Recidivism. Poster presented at the *Society for Adolescent Health and Medicine Annual Meeting*, Atlanta, GA.
- Willis, A. C. & Aalsma, M. C.** (2013). Traumatic Experiences and Predictors of Recidivism among Juvenile Detainees. Poster presented at the *17th Annual Society for Social Work Research Conference*, San Diego, CA.
- Schwartz, J. & Willis, A. C.** (2008, August). Coverage of methamphetamine in GLBT newspapers. Presented at the *91st Annual Convention of the Association for Education in Journalism and Mass Communication*, Chicago, IL.
- Hall, J. A. & **Willis, A.** (2007). Comparing family and group treatments for adolescent substance abuse: Findings at 6-months following intake. Presentation at *11th Annual Society for Social Work Research Conference*, San Francisco, CA.

Invited:

- Willis, A.** (2014). Prescription Painkiller Use from the Perspective of Family Members of Military Personnel and Veterans. Poster presented at the *18th Annual PhD Spring Research Symposium*, Indiana University School of Social Work, Indianapolis, IN.
- Willis, A. & Brommage, L.** (2006). Working with methadone patients or an MISA client, for that matter. Special training offered through the *Illinois Mental Illness Substance Abuse (MISA) Institute*, Chicago, IL.

GRANT FUNDING:

Internal:

Travel Grant	University of Iowa (\$500)	2007
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APPOINTMENTS:

ACADEMIC

Indiana University School of Social Work	Adjunct Instructor	2013-present
Indiana University School of Social Work	Research Assistant	2013

Indiana University School of Medicine	Research Assistant	2011-2013
University of Iowa College of Medicine	Research Assistant	2006-2008
University of Chicago/SSA	Independent Research Study	2004-2006
University of Chicago/Biological Sciences	Research Assistant	2004-2005

TEACHING:

Undergraduate

<u>Course #</u>	<u>Short Title</u>	<u>Format</u>	<u>Role</u>	<u>Term</u>	<u>Enrollment</u>
S371	Social Work Research	Online	Faculty	Spr 16	22
S472	Practice Evaluation	Lecture	Faculty	Spr 14	20

Graduate

<u>Course #</u>	<u>Short Title</u>	<u>Format</u>	<u>Role</u>	<u>Term</u>	<u>Enrollment</u>
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Spr 16	25
S623	Advanced Research	Lecture	Faculty	Fall 15	21
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Fall 15	12
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Sum 15	20
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Spr 15	20
S623	Advanced Research	Lecture	Faculty	Spr 15	16
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Fall 14	15
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Sum 14	21
S623	Advanced Research	Lecture	Faculty	Sum 14	22
S517	Assess Mntl Hlth & Add	Lecture	Faculty	Spr 14	15
S623	Advanced Research	Lecture	Faculty	Sum 13	24

PROFESSIONAL EXPERIENCE:

Post-Master's Practice Experience

2010 – 2012

Behaviorist

Independent Contractor with Compass Residential and Consulting
Indianapolis, Indiana

Complete a Behavior Service Plan, using a Maladaptive Behavior Assessment and Functional Behavior Assessment. Meet weekly with clients to provide behavioral supports. Provide a wide variety of therapeutic and behavioral interventions in order to best fit the needs of the individual clients and their family members. Train and provide continuing education and support to direct care support staff workers working with the individual clients. Provide monthly reports to Indiana State case managers.

2009 – 2010

Clinician I

Midtown Community Mental Health
Indianapolis, Indiana

Completed adolescent biopsychosocial evaluations, with an emphasis on mental health and addiction needs. Provided individual diagnosis, determined level of need, and integrated individual diagnostic summary. Prepared treatment plans, managed a caseload of clients, performed a variety of therapeutic interventions (i.e., individual and group

sessions) and case management duties (i.e., corresponding with Department of Child Services, probation), and interpreted and applied Medicaid service and billing procedures according to client needs.

2006 – 2008

Staff Therapist/Caseworker

Adolescent Health and Resource Center

Iowa City, Iowa

Conducted substance abuse and mental health evaluations using a comprehensive biopsychosocial assessment (GAIN) at a clinic sponsored by the Department of Pediatrics, University of Iowa (College of Medicine). Presented treatment recommendations at feedback sessions with adolescent clients and family members. Teamed with LiCSW to provide adolescent family therapy. Conducted and co-facilitated joint sessions with adolescent and parents. Meet individually with adolescent for individual therapy sessions, using cognitive-behavioral and strengths-based techniques.

Practica

2005 – 2006

Counselor (2nd year practicum)

Family Guidance Center, Inc.

Chicago, IL

Maintained a caseload of ten patients at a substance abuse treatment facility. Conducted individual therapeutic sessions and led treatment recovery groups. Became familiar with Stages of Change theory and Motivational Interviewing.

2004 – 2005

Counselor (1st year practicum)

Specialized Assistance Services

Chicago, IL

Received clinical supervision and training at a substance abuse treatment facility. Maintained a caseload of five patients, conducted individual therapeutic sessions, and led treatment recovery groups. Focused on learning, understanding, and appreciating diversity of patient issues and developing appropriate individualized treatment interventions.

SERVICE:

Manuscript Review:

2012-present

Reviewer, *Psychology of Addictive Behaviors*

2012-present

Reviewer, *The American Journal on Addictions*

2004 – 2006

Editorial Board member, *Advocate's Forum*

Community:

2001 – 2004

Board Member

2003 – 2004

Board President

Tourette Syndrome Association of Minnesota

Eden Prairie, Minnesota

Served on eight-person board that created, managed, and reviewed \$100,000 yearly budget, identified and organized fundraising events, and provided advocacy and exposure of Tourette Syndrome for families and communities in Minnesota.

1997 – 1998

Victim and Offender Mediator

Dakota County Department of Corrections

Apple Valley, Minnesota

Provided mediation services for victims and offenders of misdemeanor crimes. Met with offender(s) and victim(s) separately to determine feasibility of mediation. If mediation deemed appropriate, arranged and provided mediation services between the offender(s) and victim(s).

1997 – 1998

Truancy Coordinator

Dakota County Department of Corrections

Apple Valley, Minnesota

Received referrals for students who have three or more truant events from junior high school. Arranged and facilitated a meeting at the school between school administrators, student, and student's parent(s) to create a strategy to prevent further trancies.