Published in final edited form as:
Drug Alcohol Depend. 2013 August 1; 131(3): 263–270. doi:10.1016/j.drugalcdep.2012.11.018.

National Trends in Pharmaceutical Opioid Related Overdose Deaths Compared to other Substance Related Overdose Deaths: 1999-2009

Susan Calcaterra[a,b], **Jason Glanz**[c,d], and **Ingrid A. Binswanger**[a,b,e]

[a]Division of General Internal Medicine, University of Colorado School of Medicine, Aurora, CO

[b]Denver Health Medical Center, Denver, CO

[c]Institute for Health Research, Kaiser Permanente Colorado, Denver, CO

[d]Department of Epidemiology, Colorado School of Public Health, Aurora, CO

[e]Division of Substance Dependence, University of Colorado School of Medicine, Aurora, CO

Abstract

Background: Pharmaceutical opioid related deaths have increased. This study aimed to place pharmaceutical opioid overdose deaths within the context of heroin, cocaine, psychostimulants, and pharmaceutical sedative hypnotics, examine demographic trends, and describe common combinations of substances involved in opioid related deaths.

Methods: We reviewed deaths among 15-64 year olds in the US from 1999-2009 using death certificate data available through the CDC Wide-Ranging Online Data for Epidemiologic Research (WONDER) Database. We identified International Classification of Disease-10 codes describing accidental overdose deaths, including poisonings related to stimulants, pharmaceutical drugs, and heroin. We used crude and age adjusted death rates (deaths/100,000 person years [p-y] and 95% confidence interval [CI] and multivariable Poisson regression models, yielding incident rate ratios (IRRs), for analysis.

Results: The age adjusted death rate related to pharmaceutical opioids increased almost 4-fold from 1999 to 2009 (1.54/100,000 p-y [95% CI 1.49-1.60] to 6.05/100,000 p-y [95% CI 5.95-6.16; p<0.001). From 1999 to 2009, pharmaceutical opioids were responsible for the highest relative increase in overdose death rates (IRR 4.22, 95% CI 3.03-5.87) followed by sedative hypnotics (IRR 3.53, 95% CI 2.11-5.90). Heroin related overdose death rates increased from 2007 to 2009 (1.05/100,000 persons [95% CI 1.00-1.09] to 1.43/100,000 persons [95% CI 1.38-1.48; p<0.001). From 2005-2009 the combination of pharmaceutical opioids and benzodiazepines was the most common cause of polysubstance overdose deaths (1.27/100,000 p-y (95% CI 1.25-1.30).

Conclusion: Strategies, such as wider implementation of naloxone, expanded access to treatment, and development of new interventions are needed to curb the pharmaceutical opioid overdose epidemic.

Keywords

Overdose; poisoning; pharmaceutical opioids; stimulants; heroin; mortality

Corresponding Author: Susan Calcaterra MD, MPH Division of General Internal Medicine University of Colorado Denver School of Medicine Mail Stop F443 13199 East Montview Blvd, Suite 300 Aurora, CO 80045 USA Tel: 248-703-5947 Fax: 303-724-2270 Susan.Calcaterra@ucdenver.edu.

1. Introduction

Poisoning deaths account for a large number of deaths in the United States (US) and were second only to motor vehicle crashes as a cause of unintentional injury death for all ages in 2009 (Paulozzi et al., 2011). Overdose death rates have varied significantly by drug type (Centers for Disease Control and Prevention, 2004). Cocaine and heroin were historically considered leading causes of overdose death in the US (Tardiff et al., 1996; Harlow, 1990; Mittleman and Wetli, 1984). Methamphetamine use increased in the last decade, and thus may have contributed to an increase in related overdose deaths (Substance Abuse and Mental Health Services Administration, 2005; Substance Abuse and Mental Health Services Administration, 2007).

Deaths related to pharmaceutical opioids began rising in the early part of the 21st century. By 2002, death certificates listed opioid analgesic poisoning as a cause of death more commonly than heroin or cocaine (Paulozzi et al., 2006). From 1999 to 2006, deaths related to pharmaceutical opioids tripled (Warner et al., 2009). In 2000, the Joint Commission on Accreditation of Healthcare Organizations published new standards to improve pain management in healthcare settings. These standards encouraged the use of pain scales and pain tools, such as the “Pain as the Fifth Vital Sign Initiative” which resulted in increased physician driven opioid prescribing and pharmaceutical opioid availability for nonmedical use and overdose (Paulozzi, 2011; Davis and Johnson, 2008; Firestone and Fischer, 2008). Physicians have reported feeling ill-prepared to manage chronic non cancer pain due to inadequate training, especially when a patient exhibits aberrant behavior, such as failing a urine drug screen or frequently requesting early refills on opioid medications (Yanni et al., 2010; Gupta et al., 2011). Physician prescribing patterns for chronic pain and the use of pain scales to manage pain likely contributed to the increase in pharmaceutical opioid availability.

The goal of this study was to place the pharmaceutical opioid overdose epidemic within the context of overdose death rates related to other commonly abused substances. We compared pharmaceutical opioid related death rates to cocaine, psychostimulants, heroin, and sedative hypnotics related death rates to identify where targeted interventions may be most impactful for preventing death. We used a large national database to examine overdose death rate trends by age group, race, year, and gender. Lastly, emerging studies have suggested that pharmaceutical opioid dependence may lead to heroin use (Grau et al., 2007; Lankenau et al., 2012; Inciardi et al., 2009). We examined heroin related death rate trends to determine whether heroin related deaths mirrored trends in pharmaceutical opioid related deaths. We also examined rates of death from common combinations of substances involved in overdose by demographic characteristics. We aimed to highlight populations at risk to inform public policy makers, researchers, public health workers, and healthcare and substance abuse treatment providers about the important and diverse patterns of overdose by substance type and demographic groups.

2. Methods

2.1. Data Sources and Variables

This study reviewed publically available data which was exempted from protocol review by the Colorado Multiple Institutional Review Board. We used the Centers For Disease Control and Prevention (CDC) Wide-Ranging Online Data for Epidemiologic Research (WONDER) Database which collected mortality data from records for all death certificates filed in the US and listed all cause of death data taken from each death certificate (Centers for Disease Control and Prevention, WONDER Database, 2012). Deaths of residents who died abroad and deaths of foreign residents were excluded. This dataset included mortality information

and population-based data spanning 1999 to 2009. Each death record contained a single underlying cause of death and up to nineteen multiple causes of death listed by the physician/coroner. An underlying cause of death was defined as the "disease or injury which initiated the the train of events leading directly to death, or the circumstances of the accident or violence which producted the fatal injury" (World Health Organization, 2012). The additionally listed multiple causes of death refer to health conditions giving rise to the immediate cause of death and other conditions contributing to death.

2.2. Case Selection and Classification

We reviewed all overdose deaths in the US among 15-64 year olds from 1999 to 2009 by searching the underlying cause of death dataset for all deaths with an International Classification of Diseases-10 (ICD) code X40-X49, defined as "an accidental poisoning by and exposure to noxious substances". We limited our dataset to those who died of an unintentional or accidental overdose. Among the "accidental poisoning" deaths, we searched the multiple cause of death dataset for all "poisoning related" deaths using the ICD-10 "T" codes which categorized cocaine, heroin, pharmaceutical opioid, sedative hypnotic (*e.g.* barbituates), and psychostimulant (*i.e.* methamphetamine, amphetamine salts, methylphenidate, and 3,4-methylenedioxy-metamphetamine (MDMA) related deaths (Appendix 1). In some cases the combination of multiple substances may be the reason for death, as polysubstance use is a risk factor for overdose (Andrews and Kinner, 2012; Jones, et al, 2012; Jones et al., 2011). For this reason, we searched for deaths involving pharmaceutical opioids and other substances by including "T" codes for pharmaceutical opioids plus "T" codes for cocaine, psychostimulants, heroin, sedative hypnotics, or alcohol. The final dataset included all accidental poisoning (overdose) deaths for the above listed substances and combinations of substances. Cases in which a decedent had multiple substances listed upon death may have been represented more than once. For example, if a decedent had both heroin and barbituates in their system at the time of death, both ICD-10 codes T40.1 and T42.3 would be represented uniquely as a cause of death. We excluded individuals younger than 15 years old and older than 64 years old due to small numbers relative to other age groups.

2.3. Statistical Analyses

Crude death rates were calculated by age and gender for the years 2005 to 2009 and were expressed as the number of deaths reported each calendar year divided by the bridged-race estimates of the July 1st resident population (per 100,000 persons and 95% confidence interval [CI]) from the corresponding county level postcensal series. Using the midyear 2000 US standard population, we calculated age adjusted death rates (number of deaths/100,000 person-years [p-y] and 95% confidence interval [CI]) by gender and race/ethnicity for years 1999 to 2009 to account for changes in the age distribution of the population over time. Population estimates were US Census Bureau estimates of mid-year national, state, and county resident populations. The 1999 and 2000 population estimates were bridged-race intercensal estimates of the July 1st yearly resident population based on the 1990 and 2000 census counts. The 2001-2009 population estimates are bridged-race postcensal estimates of the July 1st yearly resident population (Centers for Disease Control and Prevention, 2012). Race bridging is a method used to make multiple-race and single-race data comparable to permit estimation and analysis of race-specific statistics (Centers for Disease Control and Prevention, 2012).

Temporal trends in deaths by substance (heroin, pharmaceutical opioids, cocaine, psychostimulants, and sedative hypnotics) were assessed using the Cochran-Armitage test for linear trends. Poisson regression analyses were used to assess associations between crude death rates by substance adjusted for gender, race, age group, and year. Poisson regression

was used because outcome variables were calculated by counts (deaths/yearly population). Results are reported as incidence rate ratios (IRRs). $P<0.05$ was considered statistically significant. All analyses were performed with SAS software, version 9.2 (SAS Institute Inc.).

3. Results

3.1. Accidental Overdose Age Adjusted Death Rates

By 2006, pharmaceutical opioid related deaths were more common than cocaine, heroin, and psychostimulant related deaths combined (Figure 1). By 2009, deaths related to sedative hypnotics exceeded cocaine related deaths. The age adjusted pharmaceutical opioid related death rate increased almost 4-fold from 1999 to 2009 (1.54/100,000 person-year [p-y], 95% Confidence Interval [CI] 1.49-1.60 to 6.05/100,000 p-y, 95% CI 5.95-6.16; p<0.001]). From 2000 to 2009, pharmaceutical opioids were involved in the highest number of accidental poisonings followed by cocaine and sedative hypnotics. Deaths related to sedative hypnotics increased 5-fold from 1999 to 2009 (0.43/100,000 p-y, 95% CI 0.40-0.46 to 2.31/100,000 p-y, 95% CI 2.25-2.38; p<0.001). Heroin related deaths also increased significantly from 2007 to 2009 (1.09/100,000 p-y, 95% CI 1.04-1.13 to 1.47/100,000 p-y, 95% CI 1.41-1.52; p<0.001).

Among pharmaceutical opioid related deaths, morphine and its derivatives accounted for the highest number of deaths across all years (Figure 1). Methadone related deaths rose steadily from 1999 (0.33/100,000 p-y, 95% CI 0.30-0.35) to 2007 (2.34/100,000 p-y, 95% CI 2.27-2.40; p<0.001), but then decreased significantly in 2009 (2.01/100,000 p-y, 95% CI 1.95-2.08; p<0.001).

3.2. Death Rates by Gender and Age Groups

Death rates varied by gender for all substances during 2005 to 2009. Males had higher death rates for each substance examined. When compared to females, heroin related deaths were 4 to 6 times more likely among males and cocaine and psychostimulant related deaths were 2 to 4 times more likely among males (Table 1). The difference in death rates by gender was less apparent among pharmaceutical opioid and sedative hypnotic related deaths.

Males aged 15-24 years old were 3.6 times more likely to die from a pharmaceutical opioid related death than similarly aged females. The death rate ratio decreased with each advancing age group. Males aged 55-64 were only 1.3 times more likely to die from a pharmaceutical opioid related death than females of the same age group. The decrease in the death rate ratio by advancing age was also noted in deaths related to sedative hypnotics (Table 1).

The crude death rate related to pharmaceutical opioids among 15-24 year olds was 0.51/100,000 persons, 95% CI 0.44-0.58 in 1999 and peaked to 3.38/100,000 persons, 95% CI 3.21-3.56 in 2009, a 6-fold increase. The death rate related to sedative hypnotics increased 10-fold among 15-24 year olds from 1999 to 2009 (0.11/100,000 persons, 95% CI 0.08-0.15 to 1.16/100,000 persons, 95% CI 1.06-1.26 (data not shown).

3.3. Combined Substance Related Death Rates

Pharmaceutical opioids used in combination with other substances contributed to overdose deaths (Table 2). The death rate related to pharmaceutical opioids and benzodiazepines was the highest among combinations of substances (1.27/100,000 p-y, 95% CI 1.25-1.30), followed by the combination of pharmaceutical opioids and cocaine (0.73/100,000 p-y, 95% CI 0.72-0.76), alcohol (0.63/100,000 p-y, 95% CI 0.61-0.63) and antidepressants

(0.61/100,000 p-y, 95% CI 0.60-0.64). Men were more likely to die from a death related to the combination of pharmaceutical opioids and cocaine (1.08/100,000 p-y, 95% CI 1.05-1.11), alcohol (0.96/100,000 p-y, 95%CI 0.93-0.99), and benzodiazepines (1.63/100,000 p-y, 95% CI 1.60-1.67). Women were more likely to die from a death related to pharmaceutical opioids and antidepressants (0.65/100,000 p-y, 95% CI 0.63-0.67). American Indians/Alaska Natives (AI/AN) had the highest death rate related to pharmaceutical opioids and alcohol (1.43/100,000 p-y, 95% CI 1.17-1.69) (Table 4). Non Hispanic Whites (NHW) and AI/ANs had the highest death rates related to pharmaceutical opioids and antidepressants (NHW: 0.80/100,000 p-y, 95% CI 0.78-0.82; AI/AN: 0.93/100,000 p-y, 95% CI 0.73-1.16) and pharmaceutical opioids and benzodiazepines (NHW: 1.72/100,000 p-y, 95% CI 1.69-1.76; AI/AN: 1.76/100,000 p-y, 95% CI 1.47-2.05). Those aged 45-54 years old had the highest death rates related to pharmaceutical opioids combined with other substances.

3.4. Incidence Risk Ratios by Gender, Race, Age Group and Year

In the adjusted model of substance related deaths, males had a higher death rate for each substance. When compared to females, males were almost 4 times more likely to die a heroin related death (IRR 3.92, 95% CI 2.96-5.20). The gender difference was less pronounced for sedative hypnotic related deaths (IRR 1.58, 95% CI 1.27-1.98; Table 4).

Race was examined as a factor in overdose deaths. Asian Americans/Pacific Islanders were chosen as the referent group because they had the lowest death rate for most substances examined, excluding psychostimulants. African Americans had the highest death rate related to cocaine (IRR 17.36, 95% CI 12.04-25.04). NHWs (IRR 12.20, 95% CI 8.68-17.15) and AI/ANs (IRR 13.06, 95% CI 9.30-18.34) had the highest rates of pharmaceutical opioid related deaths. Similar trends were noted among NHWs and AI/ANs for sedative hypnotic related deaths. Heroin related deaths were elevated among NHWs (IRR 7.27, 95% CI 3.77-14.02), African Americans (IRR 7.65, 95% CI 3.97-14.75), and AI/ANs (IRR 7.00, 95% CI 3.62-13.56). Psychostimulant related deaths were lowest among African Americans (IRR 0.48, 95% CI 0.27-0.84).

After adjusting for gender, race, and year of death, those aged 45-54 were generally at highest risk of death (Table 4). The death rate for those aged 45-55 years was highest for cocaine (IRR 6.41, 95% CI 4.79-8.58), followed by heroin (IRR 3.56, 95% CI 2.35-5.40), and pharmaceutical opioids IRR 3.15, 95% CI 2.54-3.89).

With adjustment for gender, race, and age group, there were significant increases in the death rates related to pharmaceutical opioids each year relative to 1999 starting in 2002 (IRR 1.76, 95% CI 1.21-2.55) through 2009 (IRR 4.22, 95% CI 3.03-5.87;Table 4). Similar trends were noted for sedative hypnotic related death from 2005 (IRR 2.39, 95% CI 1.20-4.75) to 2009 (IRR 3.53, 95% CI 2.11-5.90). Cocaine related deaths peaked in 2005 (IRR 1.61, 95% CI 1.20-2.16). Psychostimulant related deaths peaked in 2005 (IRR 2.59, 95% CI 1.14-5.85), declined during 2006 and 2007, but were elevated again in 2009 (IRR 2.52, 95% CI 1.11-5.71). In the adjusted model, there was no significant difference in heroin related deaths across 1999 (IRR 1.00 [ref.]) to 2009 (IRR 1.51, 95% CI 0.94-2.41; Table 4).

4. Discussion

While overdose death rates related to heroin, cocaine, sedative hypnotics, and psychostimulants increased between 1999 and 2009, deaths related to pharmaceutical opioids increased most dramatically, nearly 4-fold. In 2000, the Joint Commission on the Accreditation of Health Care Organizations introduced new standards for pain management which focused on increased awareness of patient's right to pain relief which contributed to

an increase in prescribing of opioid analgesics (Phillips, 2000; Federation of State Medical Boards of the US, 1998). The average milligrams of morphine prescribed per patient per year increased more than 600% from 1997 to 2007, which led to an increased availability of pharmaceutical opioids for illicit use (US Department of Justice, 2012). From 1999 to 2007, substance abuse treatment admissions for pharmaceutical opioid abuse increased nearly 4-fold and emergency department visit rates related to pharmaceutical opioids increased 111% from 2004 to 2008; visit rates were highest for oxycodone, hydrocodone, and methadone (Substance Abuse and Mental Health Services Administration, 2009; Substance Abuse and Mental Health Services Administration, 2011). Risks associated with pharmaceutical opioid related overdose included taking high daily doses of opioids and seeking care from multiple healthcare providers to obtain many prescriptions (Paulozzi et al., 2012; Hall et al., 2008). "Doctor shopping" has also been associated with opioid diversion and illicit use (Substance Abuse and Mental Health Services Administration, 2010; Rigg et al., 2012). National survey data showed that 75% of pharmaceutical opioid users were using opioids prescribed to someone else (Substance Abuse and Mental Health Services Administration, 2010).

The combination of pharmaceutical opioids with alcohol, cocaine, antidepressants and benzodiazepines were observed among overdose deaths. Use of pharmaceutical opioids in combination with other substances is common. National prevalence estimates have shown that the majority of individuals with past year sedative, tranquilizer, stimulant and opioids use disorders also met DSM-IV criteria for an additional past-year substance use disorder (McCabe et al., 2008). Physicians, patients, and users should be made aware of the risks of combining sedating medications, drugs and alcohol due to the risk of overdose.

Deaths related to sedative hypnotics increased significantly. Risk factors for death among sedative hypnotic users increased with the number of prescriptions obtained, the number of providers visited in the previous year, and the number of pharmacies used to obtain prescriptions (Paulozzi et al., 2012; Martyres et al., 2004). Certain sub-populations have been found to be at greater risk of inappropriate sedative hypnotic use including those with opioid and/or alcohol abuse/dependence (Wolf et al., 1990; Havens et al., 2012). Opioids and benzodiazepines were found to be co-abused by opioid users to enhance opioid intoxication (Jones et al., 2012). The prevalence of sedative hypnotic use is higher among the elderly, and risk of inappropriate use is more likely (Straand and Rokstad, 1999). Our data showed that the combination of pharmaceutical opioids and benzodiazepines was a significant contributor to overdose deaths. Increased access and use of state run prescription drug monitoring programs may allow prescribers to identify patients who have filled multiple prescriptions for pharmaceutical medications and are at increased risk of abuse. Whether this will affect overdose deaths is unknown.

The rise in methadone related deaths may be attributed to numerous causes. Over the last decade, the number of methadone prescriptions written for treatment of chronic pain and the overall sales of methadone increased (US Government Accountability Organization, 2009; US Department of Justice, 2011). The increase in methadone related deaths may be the result of diversion from hospitals, pharmacies, practitioners, and to a lesser extent, methadone treatment programs for addiction (National Drug Intelligence Agency, 2007). Additional factors contributing to methadone related deaths are physician error due to knowledge deficits regarding evidence based guidelines used for pain treatment, unanticipated medical and mental health comorbidites, and insurance payer policies mandating methadone as first line therapy for pain (Scanlon and Chugh, 2004; Webster et al., 2011). The number of methadone related deaths attributed to drug treatment misuse versus pain treatment misuse is difficult to quantify. However, rates of methadone used for addiction treatment have remained relatively stable compared to rates of methadone used for chronic pain, which have risen significantly, and mirror the increase in death rates related to

methadone overdose (Substance Abuse and Mental Health Services Administration, 2007). Additionally, studies using medical examiner data suggested that more than three quarters of methadone overdoses involved persons not enrolled in a methadone treatment program and had used methadone illicitly (Substance Abuse and Mental Health Services Administration, 2010).

Substance specific overdose deaths varied among different racial/ethnic groups. AI/ANs were at high risk of dying from a psychostimulant related or a pharmaceutical opioid related death. AI/ANs aged 12 years and older reported the highest rates of substance dependence or abuse among all racial/ethnic groups examined (Substance Abuse and Mental Health Services Administration, 2004; Substance Abuse and Mental Health Services Administration, 2010). Factors which may lead to increased substance use, such as mental disorders and stress, are more prevalent among AI/ANs as compared to the general population (Grant et al., 2004). Barriers to receiving substance abuse treatment among AI/ANs living in urban areas or on reservations include low insurance coverage, limited access to transportation, and “discomfort” in the Westernized healthcare system (Gone and Trimble, 2012, Katz, 2004; Moulton et al., 2007; Call et al., 2006). Culturally targeted substance abuse interventions may impact initiation of substance use and help in the treatment of abuse (Hetch et al., 2003; Unger, 2012).

The increase in heroin related deaths from 2007 to 2009 did not remain significant after adjustment for age, gender, and race. This finding may be related to misclassification of heroin related deaths, as discussed below. Non medical use of pharmaceutical opioids leading to injection heroin use and concomitant use of heroin and pharmaceuticals opioids have been reported (Siegal et al., 1994; Lankenau et al., 2012; Nielsen et al., 2011; Wilkins et al., 2011). Tolerance to pain medications, worsening withdrawal symptoms, and increased availability and affordability of heroin relative to the high street cost of pharmaceutical opioids may push pharmaceutical opioid users to heroin (Inciardi et al., 2009). The risk of heroin transition has been shown to increase with illicit use of multiple types of pharmaceutical opioids or illicit use of pharmaceutical opioids for greater that two years (Grau et al., 2007). The increase in non medical use of pharmaceutical opioids may contribute to an increase in heroin use and related overdose deaths in the future.

4.1. Strengths and Limitations

This study examined trends in accidental overdose deaths using a national dataset of all deaths among 15-64 year olds in the US over an 11 year period. Limitations relate to use of data based on death certificates which contain diagnostic information recorded from the best available information, especially in the circumstance when a decedent was found post-mortem. Toxicology findings and cause of death determinations may not be consistent between counties or states due to differing medical examiner/coroner policies. We could not examine other risk factors for death, such as socioeconomic status or lifetime history of substance abuse. We could not ascertain the indication for pharmaceutical opioid use. For example, methadone may be used to treat pain, heroin or other opioid dependence, or for recreational purposes. Similarly, we were unable to estimate which decedents used sedative hypnotics recreationally or for medical purposes. Our data source did not permit us to estimate how many individuals used each substance thus we were unable to calculate the death rate among users nor could we determine how common overdose was for appropriately versus inappropriately used pharmaceutical medications.

Autopsy information was recorded beginning in 2003 on all overdose deaths and were performed 69-87% of the time. Confirmation of substances present through toxicology performed during an autopsy may have increased the validity of these results; however, if a person had multiple drugs in their system at death, it may have been difficult for the coroner

to determine which substance predominantly contributed to death. This study was not designed to describe additional causes of death related to substance use, such as homicides, motor vehicle crashes, and long-term sequelae of substance use (*e.g.* congestive heart failure, infectious disease). This study was not designed to calcuate the fatality rate related to the use of pharmaceutical opioids because our denominators were based on US population estimates rather than the number of people taking pharmaceutical opioids. The increasing pharmaceutical opioids related death rate may be attributed to an overall increase in the number of people taking pharmaceutical opioids. These data do not allow us to know definitively if the decedent overdosed on heroin or mophine. Heroin is quickly metabolized to 6-monoacetylmorphine (6-MAM) before it is metabolized to morphine. 6-MAM can be tested for in the blood and urine, but the absence of 6-MAM does not have a high predictive value due to its short half life (Verstraete, 2004). Medical examiners may have attributed the decedent's poisoning to be due to morphine when they were unsure if the overdose was related to heroin or morphine, *i.e.* in situations where drug injection paraphernalia was not found on the scene. This may have led to an overestimation of pharmaceutical opioid related deaths and an underestimation of heroin related deaths, leading to misclassification bias in our study.

Although this study included only "accidental overdose deaths", this restrospective design cannot effectively distinguish between deaths that are truly due to accidental overdose, (*i.e.* in the case of loss of tolerance to opioids after detoxification and subsequent relapse, or due to a gradual increase in pharmaceucical opioid dose to overcome tolerance in the treatment of chronic pain to where the effective dose reaches the toxic dose) versus overdose deaths from suicides which appeared to be accidental and were miscoded (*i.e.* in the case of dually diagnosed patients with a mental/behavioral disorder and an opioid dependence comorbidity who intentionally commit suicide by overdosing on pharmaceutical opioids). We did not examine intentional overdose deaths, *i.e.* suicides, or deaths of undetermined intent, because we focused on accidental, and potentially preventable, deaths.

4.2. Conclusion

Pharmaceutical opioids have become the primary cause of overdose death in the US. In 2011, the Office of National Drug Control Policy addressed the pharmaceutical drug abuse epidemic by aiming to achieve a 15% reduction in illicit use of pharmaceutical opioids and a 15% in reduction in overdose deaths over the next five years (Office of National Drug Control Policy, 2011). Successful strategies to reduce opioid overdoses include wider implementation of rescue medications such as naloxone to reverse opioid overdose and enhanced access to drug treatment with medications such as buprenorphine (Albert et al., 2011; Centers for Disease Control and Prevention, 2012; Cornish et al., 2010). Prescription drug monitoring programs need further evaluation to determine if their use can reduce pharmaceutical drug related overdoses. Finally, decreased stigmatization of drug users and criminal justice policy changes are needed to combat the opioid epidemic.

References

Albert S, Brason FW 2nd, Sanford CK, Dasgupta N, Graham J, Lovette B. Project Lazarus: community-based overdose prevention in rural North Carolina. Pain Med. 2011; 12:S77–S85. [PubMed: 21668761]

Andrews JY, Kinner SA. Understanding drug-related mortality in released prisoners: A review of national coronial records. BMC Public Health. 2012; 12:270. Epub ahead of print. [PubMed: 22475069]

Call KT, McAlpine DD, Johnson PJ, Beebe TJ, McRae JA, Song Y. Barriers to care among American Indians in public health care programs. Med Care. 2006; 44:595–600. [PubMed: 16708009]

Centers for Disease Control and Prevention (CDC). 2012. http://wonder.cdc.gov/mcd.html [Accessed on June, 2012]

Centers for Disease Control and Prevention (CDC). CDC Wonder Database. 2009. http://wonder.cdc.gov [Accessed on January, 2012]

Centers for Disease Control and Prevention (CDC). Community-based opioid overdose prevention programs providing naloxone - United States, 2010. MMWR Morb Mortal Wkly Rep. 2012; 61:101–105. [PubMed: 22337174]

Centers for Disease Control and Prevention (CDC). Unintentional and undetermined poisoning deaths--11 states, 1990-2001. 2004; 53:233–238.

Centers for Disease Control and Prevention (CDC). Vital signs: overdoses of prescription opioid pain relievers-United States, 1999-2008. MMWR Morb Mortal Wkly Rep. 2011; 60:1487–1492. [PubMed: 22048730]

Cornish R, Macleod J, Strang J, Vickerman P, Hickman M. Risk of death during and after opiate substitution treatment in primary care: a prospective observational study in UK General Practice Research Database. BMJ. 2010; 341:c5475. [PubMed: 20978062]

Davis WR, Johnson BD. Prescription opioid use, misuse, and diversion among *street drug users in New York City*. Drug Alcohol Depend. 2008; 92:267–276. [PubMed: 17913395]

Federation of State Medical Boards of the US. Model Guidelines for the use of controlled substance for the treatment of pain: A policy document of the Federation of State Medical Boards of the United States, Inc. Dallas, TX: 1998.

Firestone M, Fischer B. A qualitative exploration of prescription opioid injection among street-based drug users in Toronto; behaviours, preferences and drug availability. Harm Reduct J. 2008; 5:30. [PubMed: 18928556]

Gilson AM, Kreis PG. The burden of the non-medical use of prescription opioid analgesics. Pain Med. 2009; 10:S89–S100. [PubMed: 19691688]

Gone J, Trimble J. American Indian and Alaska Native mental health: diverse perspectives on enduring disparities. Annu Rev Clin Psychol. 2012; 8:131–160. [PubMed: 22149479]

Grant BF, Stinson FS, Dawson DA, Chou SP, Dufour MC, Compton W, Pickering RP, Kaplan K. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Arch Gen Psychiatry. 2004; 61:807–816. [PubMed: 15289279]

Grau LE, Dasgupta N, Harvey AP, Irwin K, Givens A, Kinzly ML, Heimer R. Illicit use of opioids: is OxyContin a "gateway drug"? Am J Addict. 2007; 16:166–173. [PubMed: 17612819]

Gupta A, Patton C, Diskina D, Cheatle M. Retrospective review of physician opioid prescribing practices in patients with aberrant behaviors. Pain Physician. 2011; 14:383–389. [PubMed: 21785482]

Hall AJ, Logan JE, Toblin RL, Kaplan JA, Kraner JC, Bixler D, Crosby AE, Paulozzi LJ. Patterns of abuse among unintentional pharmaceutical overdose fatalities. JAMA. 2008; 300:2613–2620. [PubMed: 19066381]

Harlow KC. Patterns of rates of mortality from narcotics and cocaine overdose in Texas, 1976-87. Public Health Rep. 1990; 105:455–462. [PubMed: 2120721]

Havens JR, Walker R, Leukefeld CG. Benzodiazepine use among rural prescription opioid users in a community-based study. J Addict Med. 2010; 4:137–139. [PubMed: 21769029]

Hetch ML, Marsiglia FF, Elek E, Wagstaff DA, Kulis S, Dustman P, Miller-Day M. Culturally grounded substance use prevention: An evaluation of the keepin' it REAL curriculum. Prev Science. 2003; 4:233–248.

Inciardi JA, Surratt HL, Cicero TJ, Beard RA. Prescription opioid abuse and diversion in an urban community: the results of an ultrarapid assessment. Pain Med. 2009; 10:537–548. [PubMed: 19416440]

Jones AW, Kugelberg FC, Holgren A, Ahlner J. Drug poisoning deaths in Sweden show a predominance of ethanol in mono-intoxications, adverse drug-alcohol interactions and poly-drug abuse. Forensic Sci Int. 2011; 206:43–51. [PubMed: 20630671]

Jones JD, Mogali S, Comer SD. Polydrug abuse: A review of opioid and benzodiazepine combination use. Drug Alcohol Depend. 2012; 2012; 125:8–18. [PubMed: 22857878]

Katz, R. Addressing the health care needs of American Indians and Alaska Natives. Am J Public Health. 2004; 94:13–14.

Lankenau SE, Teti M, Silva K, Jackson Bloom J, Harocopos A, Treese M. Initiation into prescription opioid misuse amongst young injection drug users. Int J Drug Policy. 2012; 23:37–44. [PubMed: 21689917]

Martyres R, Cloade D, Burns JM. Seeking drugs or seeking help? Escalating “doctor shopping” by heroin users before fatal overdose. Med J Aust. 2004; 180:211–214. [PubMed: 14984339]

McCabe SE, Cranford JA, West BT. Trends in prescription drug abuse and dependence, co-occurrence with other substance use disorders, and treatment utilization: results from two national surveys. Addict Behav. 2008; 33:1297–305. [PubMed: 18632211]

Mittleman RE, Wetli CV. Death caused by recreational cocaine use. An Update. JAMA. 1984; 12:1889–1893.

Moulton PL, Miller ME, Offutt SM, Gibbens BP. Identifying rural health care needs using community conversations. J Rural Health. 2007; 23:92–96.

National Drug Intelligence Center, Drug Enforcement Administration, U.S. Department of Justice. Methadone diversion, abuse, and misuse: Deaths increasing at alarming rate. Johnstown, PA: Nov. 2007 Product No. 2007-Q0317-001http://www.justice.gov/ndic/pubs25/25930/25930p.pdf [Accessed on January, 2012]

National Institute of Drug Abuse. 2011. http://www.drugabuse.gov/publications/drugfacts/high-school-youth-trends [Accessed on June, 2012]

Nielsen S, Bruno R, Lintzeris N, Fischer J, Carruthers S, Stoové M. Pharmaceutical opioid analgesic and heroin dependence: how do treatment-seeking clients differ in Australia? Drug Alcohol Rev. 2011; 30:291–299. [PubMed: 21545560]

Office of National Drug Control Policy. Epidemic: Responding to America’s Prescription Drug Abuse Crisis. 2011. http://www.whitehouse.gov/sites/default/files/ondcp/policy-and-research/rx_abuse_plan.pdf [Accessed on January, 2012]

Paulozzi, LJ. MMWR Surveill Summ. Vol. 60. Centers for Disease Control and Prevention (CDC); 2011. 2011. Drug-induced deaths-United States, 2003-2007; p. 60-1.

Paulozzi LJ, Budnitz DS, Yongli X. Increasing deaths from opioid analgesics in the United States. Pharmacoepidemiol Drug Saf. 2006; 15:618–627. [PubMed: 16862602]

Paulozzi LJ, Kilbourne EM, Nolte KB, Desai HA, Landen MG, Harvey W, Loring LD. A history of being prescribed controlled substances and risk of drug overdose death. Pain Med. 2012; 13:87–95. [PubMed: 22026451]

Paulozzi LJ, Weisler RH, Patkar AA. A national epidemic of unintentional prescription opioid overdose deaths: how physicians can help control it. J Clin Psychiatry. 2011; 72:589–592. [PubMed: 21536000]

Phillips DM. JCAHO pain management standards are unveiled. Joint Commission on Accreditation of Healthcare Organizations. JAMA. 2000; 284:428–429. [PubMed: 10904487]

Rigg KK, Kurtz SP, Surratt HL. Patterns of prescription medication diversion among drug dealers. Drugs. 2012; 19:144–155. [PubMed: 22665955]

Samkoff JS, Baker SP. Recent trends in fatal poisonings by opiates in the United States. Am J Public Health. 1982; 72:1251–56. [PubMed: 7125028]

Scanlon MN, Chugh U. Exploring physicians' comfort level with opioids for chronic non cancer pain. Pain Res Manag. 2004; 9:195–201. [PubMed: 15605133]

Siegal HA, Carlson RG, Wang J, Falck RS, Stephens RC, Nelson ED. Injection drug users in the Midwest: an epidemiologic comparison of drug use patterns in four Ohio cities. J Psychoactive Drugs. 1994; 26:265–75. [PubMed: 7844656]

Straand J, Rokstad KS. Elderly patients in general practice: diagnoses, drugs and inappropriate prescriptions. A report from the Møre and Romsdal Prescription Study. Fam Pract. 1999; 16:380–388. [PubMed: 10493709]

Substance Abuse and Mental Health Services Administration. Methadone Mortality-A Reassessment. Washington DC: 2007. Substance Abuse Treatment. US Department of Health and Human Services. http://www.atforum.com/pdf/Methadone_Draft_Report_101807_Brief-w-attch.pdf [Accessed on March, 2012]

Substance Abuse and Mental Health Services Administration. Results from the 2004 National Survey on Drug Use and Health: National Findings (Office of Applied Studies, NSDUH Series H-28, DHHS Publication No. SMA 05-4062). Rockville, MD: 2005. http://www.oas.samhsa.gov/NSDUH/2k4NSDUH/2k4results/2k4results.htm#ch7 [Accessed on August, 2012]

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Results from the 2007 National Survey on Drug Use and Health: National Findings. NSDUH Series H-34. Rockville, MD: 2008. DHHS Publication No. SMA 08-4343. http://www.samhsa.gov/data/nsduh/2k7nsduh/2k7results.pdf [Accessed on January, 2012]

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. The NSDUH Report: Methamphetamine Use, Abuse, and Dependence: 2002, 2003, and 2004. Rockville, MD: 2005. http://www.samhsa.gov/data/2k5/meth/meth.htm [Accessed on January, 2012]

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. The NSDUH Report: Methamphetamine Use. Rockville, MD: 2007. http://www.samhsa.gov/data/2k7/meth/meth.pdf [Accessed January, 2012]

Substance Abuse and Mental Health Services Administration. Office of Applied Studies. Treatment Episode Data Set (TEDS). Highlights-2007. National Admissions to Substance Abuse Treatment Services. DASIS Series: S-45. DHHS Publication No. SMA 09-4360. Rockville. MD: 2009. http://wwwdasis.samhsa.gov/teds07/tedshigh2k7.pdf [Accessed on January, 2012]

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. The DAWN Report: Trends in Emergency Department Visits Involving Non-medical Use of Narcotic Pain Relievers. Rockville, MD: 2010. http://oas.samhsa.gov/2k10/dawn016/opioided.htm [Accessed on January, 2012]

Substance Abuse and Mental Health Services Administration. Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings, NSDUH Series H-41, HHS Publication No. (SMA) 11-4658. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2011. http://www.samhsa.gov/data/NSDUH/2k10NSDUH/2k10Results.pdf [Accessed on January, 2012]

Substance Abuse and Mental Health Services Administration, *Drug Abuse Warning Network, 2009:* National Estimates of Drug-Related Emergency Department Visits. HHS Publication No. (SMA) 11-4659, DAWN Series D-35. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2011. http://www.samhsa.gov/data/2k11/DAWN/2k9DAWNED/HTML/DAWN2k9ED.htm [Accessed on January, 2012]

Tardiff K, Marzuk PM, Leon A.C. Portera L. Hartwell N, Hirsch CS, Stajic M. Accidental Fatal Drug Overdoses in New York City: 1990-1992. Am J Drug Alcohol Abuse. 1996; 22:135–146. [PubMed: 8727051]

Unger JB. The most critical unresolved issues associated with race, ethnicity, culture, and substance use. Subst Use Misuse. 2012; 47:390–395. [PubMed: 22217334]

US Department of Justice. Automation of Reports and Consolidated Orders System (ARCOS). US Department of Justice, Drug Enforcement Administration; Springfield, VA: 2011. http://www.deadiversion.usdoj.gov/arcos/index.html [Accessed on March, 2012]

US Government Accountability Office. Methadone-associated overdose deaths: Factors contributing to increased deaths and efforts to prevent them. Mar. 2009 GAO-09-34126http://www.gao.gov/products/GAO-09-341 [Accessed on March, 2012]

Verstraete AG. Detection times of drugs of abuse in blood, urine, and oral fluid. Ther Drug Monit. 2004; 26:200–205. [PubMed: 15228165]

Warner, M.; Chen, LH.; Makuc, DM. NCHS data brief. Vol. 22. National Center for Health Statistics; Hyattsville, MD: 2009. Increase in fatal poisonings involving opioid analgesics in the United States, 1999-2006.

Webster L, Cochella S, Dasgupta N, Fakata KL, Fine PG, Fishman SM, Grey T, Johnson EM, Lee LK, Passik SD, Peppin J, Porucznik CA, Ray A, Schnoll SH, Stieg RL, Wakeland W. An analysis of the root causes for opioid-related overdose deaths in the United States. Pain Medicine. 2011; 12:S26–S35. [PubMed: 21668754]

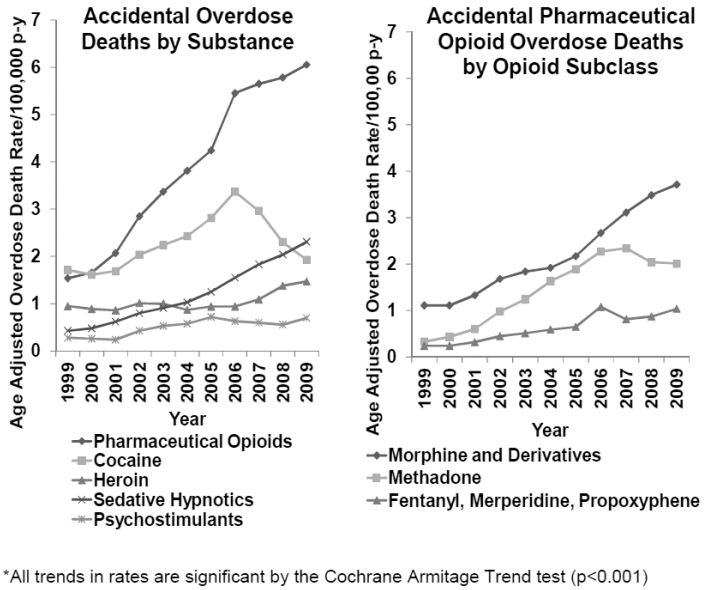
Wilkins C, Sweetsur P, Griffiths R. Recent trends in pharmaceutical drug use among frequent injecting drug users, frequent methamphetamine users and frequent ecstasy users in New Zealand, 2006-2009. Drug Alcohol Rev. 2011; 30:255–263. [PubMed: 21545555]

Wolf B, Grohmann R, Biber D, Brenner PM, Ruther E. Benzodiazepine abuse and dependence in psychiatric inpatients. Pharmacopsychiatry. 1989; 22:54–60. [PubMed: 2566180]

World Health Organization. http://www.who.int/healthinfo/statistics/mortdata/en/index.html [Accessed on June, 2012]

World Health Organization. International Classification of Diseases. http://www.who.int/classifications/icd/en/ [Accessed on January, 2012]

Yanni LM, McKinney-Ketchum JL, Harrington SB, Huynh C, Amin Bs S. Matsuyama R, Coyne P, Johnson BA, Fagan M, Garufi-Clark L. Preparation, confidence, and attitudes about chronic non-cancer pain in graduate medical education. J Grad Med Educ. 2010; 2:260–8. [PubMed: 21975631]



*All trends in rates are significant by the Cochrane Armitage Trend test (p<0.001)

Figure 1.
Age Adjusted Overdose Death Rates in 15-64 Year Olds 1999-2009*

Table 1

Crude Overdose Death Rates by Age Group and Gender and Age Adjusted Overdose Death Rates from 2005-2009 for 15-64 Year Olds

Crude Overdose Death Rates/100,000 persons (95% CI)						
Age	**Gender**	**Heroin**	**Pharmaceutical Opioids[a]**	**Cocaine**	**Psycho-Stimulants[b]**	**Sedative Hypnotics[c]**
15-24	**Female**	0.33 (0.30-0.37)	1.32 (1.25-1.39)	0.48 (0.44-0.52)	0.17 (0.15-0.20)	0.51 (0.46-0.55)
	Male	1.30 (1.23-1.36)	4.69 (4.56-4.82)	1.55 (1.48-1.62)	0.43 (0.39-0.47)	1.47 (1.40-1.55)
25-34	**Female**	0.47 (0.43-0.51)	3.29 (3.18-3.40)	1.15 (1.08-1.22)	0.35 (0.32-0.39)	1.15 (1.08-1.21)
	Male	2.40 (2.31-2.50)	8.02 (7.84-8.19)	3.95 (3.83-4.07)	0.89 (0.83-0.94)	2.58 (2.48-2.68)
35-44	**Female**	0.47 (0.42-0.51)	4.94 (4.81-5.07)	2.08 (1.99-2.17)	0.49 (0.45-0.53)	1.75 (1.67-1.83)
	Male	2.19 (2.10-2.28)	8.19 (8.02-8.36)	5.40 (5.26-5.54)	1.27 (1.20-1.34)	2.65 (2.55-2.74)
45-54	**Female**	0.51 (0.47-0.56)	6.40 (6.26-6.55)	2.13 (2.05-2.22)	0.49 (0.44-0.53)	2.20 (2.11-2.29)
	Male	2.34 (2.25-2.43)	8.97 (8.79-9.15)	5.86 (5.71-6.00)	1.35 (1.28-1.42)	2.88 (2.78-2.98)
55-64	**Female**	0.14 (0.12-0.17)	2.83 (2.72-2.95)	0.54 (0.49-0.59)	0.15 (0.13-0.18)	0.95 (0.89-1.02)
	Male	0.92 (0.86-0.99)	3.80 (3.66-3.93)	2.60 (2.49-2.71)	0.59 (0.54-0.65)	1.10 (1.03-1.17)
Age Adjusted Death Rate/100,000 person-years (95% CI)						
15-64		1.15 (1.13-1.17)	5.47 (5.42-5.51)	2.68 (2.64-2.71)	0.65 (0.63-0.66)	1.79 (1.76-1.81)

[a] Morphine and its derivatives, fentanyl, propoxypiiene, merperidine, metiiadone (ICD-10T40.2-T40.4)

[b] etiiampiietamine, MDMA, ampiietamine salts, metiiyipiienidate (ICD-10 T43.6)

[c] Barbiturates, benzodiazepines, antiepileptics (ICD-10 T42.3-42.7)

Table 2

Crude and Age Adjusted Overdose Death Rates (95% CI) for Pharmaceutical Opioids[a] and Other Substances from 2005-2009 for 15-64 Year Olds

	Crude Death Rate/100,000 persons	Age Adjusted Death Rate/100,000 person-years (95% CI)
Pharmaceutical Opioids	5.37 (5.32-5.41)	5.47 (5.42-5.51)
Pharmaceutical Opioids + Benzodiazepines	1.27 (1.25-1.29)	1.27 (1.25-1.30)
Morphine and Derivatives + Benzodiazepines	0.81 (0.79-0.83)	0.84 (0.82-0.85)
Methadone + Benzodiazepines	0.50 (0.48-0.51)	0.53 (0.51-0.54)
Fentanyl, Propoxyphene, Merperidine + Benzodiazepines	0.17 (0.17-0.18)	0.19 (0.18-0.19)
Pharmaceutical Opioids + Cocaine	0.73 (0.72-0.75)	0.74 (0.72-0.76)
Pharmaceutical Opioids + Alcohol[d]	0.62 (0.61-0.64)	0.63 (0.61-0.64)
Pharmaceutical Opioids + Antidepressants[c]	0.61 (0.60-0.63)	0.61 (0.60-0.63)
Pharmaceutical Opioids + Heroin	0.20 (0.19-0.21)	0.19 (0.18-0.19)
Pharmaceutical Opioids + Psychostimulants[b]	0.15 (0.14-0.16)	0.17 (0.16-0.17)
Pharmaceutical Opioids + Sedative Hypnotics[e] **(excluding benzodiazepines)**	0.13 (0.12-0.14)	0.12 (0.12-0.13)

[a] Morphine and its derivatives, fentanyl, propoxypiiene, merperidine, metiiadone (ICD-10 T40.2-T40.4)

[b] Metiiampiietamine, MADA, ampiietamine salts, methylphenidate (ICD-10 T43.6)

[c] Tricyclics, tetracyclics, SSRIs, monoamine oxidase inhibitors (ICD-10 T43.0-T43.2)

[d] Ethanol, methanol, 2-propanol, fusel oil (ICD-10 T51.0-T51.9)

[e] Barbiturates, antiepileptics (ICD-10 T42.3, T42.5, T42.6, T42.7)

Table 3

Overdose Death Rates (95% CI) for Pharmaceutical Opioids and Other Drug Combinations from 2005-2009 by Demographics among 15-64 Year Olds

	Pharmaceutical (Dpioids + Other Drugs Combinations			
	Cocaine	**Antidepressants**	**Alcohol**	**Benzodiazepines**
Gender[a]				
Male	1.08 (1.05-1.11)	0.58 (0.56-0.60)	0.96 (0.93-0.99)	1.63 (1.60-1.67)
Female	0.41 (0.39-0.43)	0.65 (0.63-0.67)	0.29 (0.27-0.30)	0.97 (0.94-1.00)
Race/Ethnicity[a]				
Asian American /Pacific Islander	0.04 (0.02-0.07)	0.07 (0.04-0.10)	0.02 (0.01-0.04)	0.10 (0.07-0.13)
Non Hispanic White	0.88 (0.86-0.90)	0.80 (0.78-0.82)	0.79 (0.77-0.82)	1.72 (1.69-1.76)
African American	0.76 (0.71-0.81)	0.28 (0.25-0.31)	0.28 (0.25-0.31)	0.31 (0.28-0.34)
American Indian/ Alaska Native	0.71 (0.53-0.92)	0.93 (0.73-1.16)	1.43 (1.17-1.69)	1.76 (1.47-2.05)
Hispanic	0.46 (0.42-0.49)	0.24 (0.21-0.26)	0.38 (0.34-0.41)	0.44 (0.41-0.48)
Age Groups[b]				
15-24	0.42 (0.39-0.45)	0.13 (0.12-0.15)	0.32 (0.30-0.34)	0.78 (0.74-0.81)
25-34	0.91 (0.87-0.96)	0.46 (0.43-0.49)	0.67 (0.64-0.71)	1.43 (1.38-1.48)
35-44	1.00 (0.96-1.04)	0.83 (0.79-0.87)	0.81 (0.77-0.85)	1.55 (1.50-1.60)
45-54	0.94 (0.90-0.98)	1.07 (1.02-1.11)	0.90 (0.86-0.94)	1.78 (1.72-1.84)
55-64	0.28 (0.26-0.31)	0.54 (0.50-0.57)	0.34 (0.31-0.37)	0.64 (0.60-0.68)

[a] age adjusted death rate (deaths/100,000 person-years)

[b] crude death rate (deaths/100,000 persons)

Table 4

Incidence Rate Ratio (95% CI) of Substance-Related Deaths by Gender, Race, and Age Group from 1999 to 2009

	Heroin	Pharmaceutical Opioids	Cocaine	Psychostimulants	Sedative Hypnotics
Female	1.00	1.00	1.00	1.00	1.00
Male	3.92 (2.96-5.20)	1.65 (1.47-1.86)	2.72 (2.37-3.13)	2.15 (1.60-2.90)d	1.58 (1.27-1.98)
Race					
Asian American /Pacific Islander	1.00	1.00	1.00	1.00	1.00
Non Hispanic White	7.27 (3.77-14.02)	12.20 (8.68-17.15)	5.72 (3.90-8.39)	1.43 (0.95-2.17)	7.66 (4.49-13.07)
African American	7.65 (3.97-14.75)	5.53 (3.87-7.88)	17.36 (12.04-25.04)	0.48 (0.27-0.84)	2.17 (1.20-3.92)
American Indian/ Alaska Native	7.00 (3.62-13.56)	13.06 (9.30-18.34)	5.49 (3.73-8.07)	2.79 (1.90-4.09)	7.57 (4.42-12.98)
Age Group in years					
15-24	1.00	1.00	1.00	1.00	1.00
25-34	1.99 (1.27-3.12)	2.13 (1.70-2.66)	2.89 (2.11-3.95)	1.96 (1.15-3.31)	1.88 (1.24-2.85)
35-44	2.93 (1.92-4.48)	2.77 (2.23-3.44)	5.64 (4.20-7.57)	2.81 (1.70-4.65)	2.48 (1.67-3.69)
45-54	3.56 (2.35-5.40)	3.15 (2.54-3.89)	6.41 (4.79-8.58)	2.80 (1.69-4.65)	2.62 (1.76-3.89)
55-64	1.75 (1.10-2.80)	1.44 (1.13-1.83)	3.23 (2.36-4.42)	1.22 (0.64-2.33)	1.25 (0.78-1.98)