Comparison of Opioid-Related Deaths by Work-Related Injury

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Objective *To infer whether work-related injuries may impact opioid-related deaths.*
Methods *Descriptive comparisons were done using data from the Utah Department of Health, the Office of Medical Examiners, and the Labor Commission on all Utah residents who died from opioid-related deaths from 2008 to 2009.*
Results *The majority of decedents (145 of 254, 57%) had at least one prior work-related injury. Demographics were similar regardless of work injury status. However, lack of high school diploma (18% vs. 7%, $P < 0.001$), prevalence of mental illness (50% vs. 15%, $P < 0.001$), tobacco (61% vs. 12%, $P < 0.001$), alcohol (87% vs. 28%, $P < 0.001$), and illicit drug (50% vs. 4%, $P < 0.001$) use were all substantially higher than the background population.*
Conclusion *A detailed history and screening for mental illness and substance abuse, including tobacco use, among injured workers may be helpful in avoiding potential opioid-related deaths.* Am. J. Ind. Med. 56:308–316, 2013.

KEY WORDS: opioids; opioid related deaths; prescription drug overdose; workers; work-related injury

INTRODUCTION

Prescription opioid medications have become the most common cause of fatal poisonings in the US over the past 20 years, and poisonings are the second most likely cause of unintentional deaths in the US [Paulozzi et al., 2006, 2007]. In 2008, there were nearly as many nationwide deaths related to prescription medications (36,450) as to motor vehicle crashes (39,973) [Paulozzi et al., 2011b]. From 1999 to 2002 overall deaths in the US that were associated with prescription opioids increased by 91.2% [CDC, 2004, 2005a,b; Franklin et al., 2005; Paulozzi, 2006; Paulozzi et al., 2006; Piercefield et al., 2010].

Similar to many other states, Utah has seen a dramatic increase in opioid-related deaths [CDC, 2004, 2005a,b, 2010; Franklin et al., 2005; Piercefield et al., 2010; Paulozzi et al., 2011b]. Utah had the fourth highest opioid related drug overdose death rate in 2008 with 18.4 deaths per 100,000 persons compared to the national average of 11.9 deaths per 100,000 persons [CDC, 2010]. There were 2,396 drug-poisoning deaths in the state from 1991 to 2003 and 53% (1,277 cases) of the deaths were due to non-illicit drugs, mostly from prescription narcotics [CDC, 2005a]. The Medical Examiner's office classified 57% (733 cases) of the prescription drug related deaths as unintentional or undetermined intent [CDC, 2005a]. In another study on opioid-related deaths in Utah, the investigators found that the majority of the decedents (63%) were

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unemployed at time of death [Porucznik et al., 2011]. Many studies have shown that workers who use prescription opioids take more days off work, specifically, 2.2 days of work lost per month, which is more than 2.5 times the average worker [Wasan et al., 2005; Strassels, 2009; Volinn et al., 2009; Jamison et al., 2010]. In addition, these issues may affect productivity, presenteeism, and more medical claims resulting in increased economic burdens on the employers [Wasan et al., 2005; Strassels, 2009]. Numerous studies have evaluated opioid-related deaths or opioid use within the workers compensation system individually. However, the relationship between opioid-deaths in people who have accessed the workers compensation system is not well-studied.

This study characterizes the decedents of opioid-related deaths and compares those who have had a workers compensation claim with those who have never had a work-related injury claim in the state of Utah. Comparisons were also made between decedents with a recent work-related injury compared with a more remote work-related injury. The aim of this study is to highlight the potential personal and work-related injury associative factors linked to opioid-related deaths in order to help physicians make accurate and informed decisions in prescribing opioids to patients with work-related injuries.

METHODS

A descriptive analytical study was performed on data gathered from collaborative work between the Utah Department of Health (DOH), the Office of the Medical Examiner (OME), and the Utah Labor Commission (LC). The study was part of a larger project and was approved by the Utah Department of Health Institutional Review Board (Fig. 1).

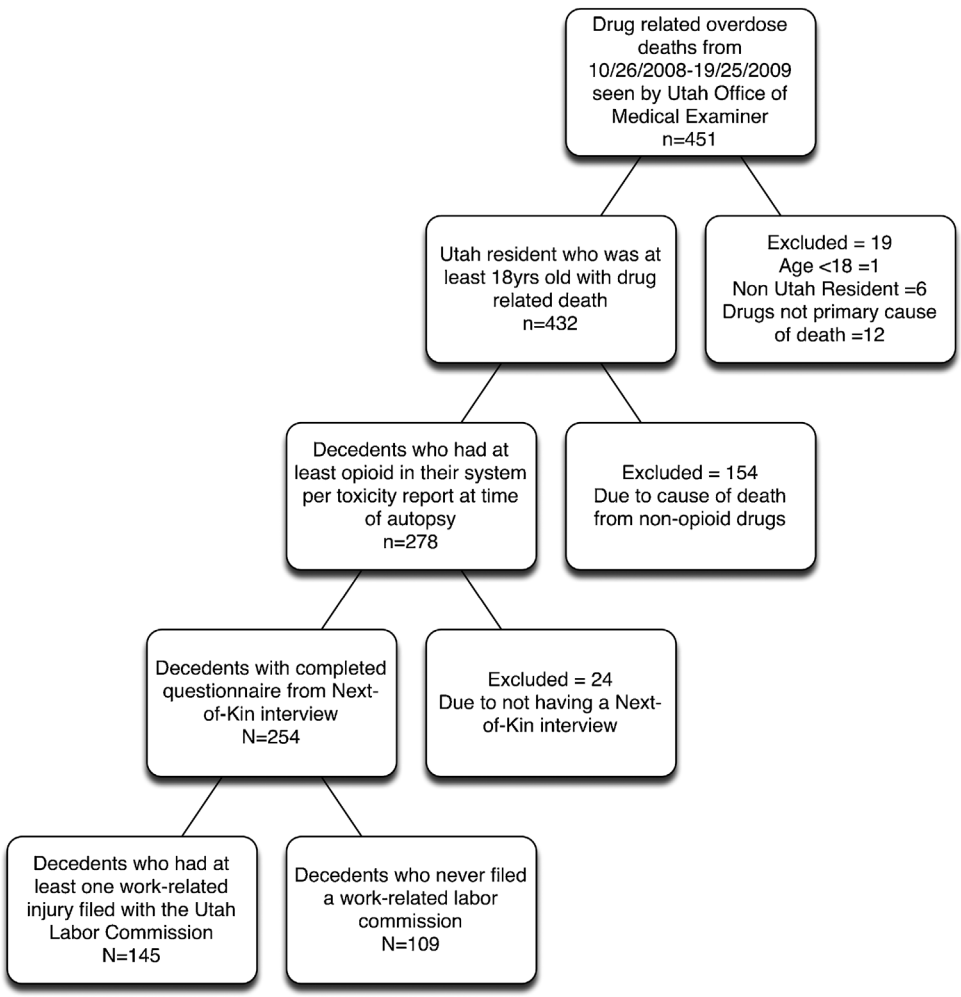

FIGURE 1. Decedent selection schematic.

Prescription Pain Medication Program Dataset

In 2008, DOH and OME started the Prescription Pain Medication Dataset (PPM), which included information from OME findings and the Next-of-Kin interviews. The OME investigates sudden and unexpected deaths for the entire state of Utah, including scene-of-death investigation, autopsy and toxicology tests. The PPM dataset includes all Utah residents over the age of 12, who had died of an unintentional or undetermined (in intent) drug overdose, plus their psychosocial and medical history. For a more detailed description of the methodology see ''Studying adverse events related to prescription opioids: the Utah experience'' by Porucznik et al. [2011].

Labor Commission Data

The LC database houses all reported work-related injuries in Utah from 1926 to the present. All work-related injuries and diseases are required to be reported by a standard form to the state within 7 days of occurrence per 122 Employer's First Report of Injury or Illness. Division of Industrial Accidents, per Section §34 A-2-407 and §34 A-3-10B, Utah Code Annotated (U.C.A). To determine who among the decedents had at least one reported work-related injury, we cross-linked the DOH/OME dataset to the LC database by name, date of birth, and social security number. If the decedent had at least one work-related injury filed with the LC regardless of when the accident took place and had a completed ''Next-of-Kin'' questionnaire, s/he was included in this study.

For each decedent in the LC database, the following data were obtained for each injury: date of injury, nature of injury, injury description, type of benefits paid, and total amount of benefits paid. Due to the inconsistent and sometimes contradictory information about the type of injury within the dataset, we classified the diagnosis for each injury from the gathered information. The types of injuries included: slips/trips/falls; contusions, lacerations or punctures; burns; strains/sprains; fractures; eye injuries; low back pain; carpal tunnel syndrome; motor vehicle crashes; being struck; being crushed; radiation; dermatitis; poisoning; hernia; and multiple injuries. If the mechanism of injury could not be determined, it was classified as unknown.

Utah Demographic Data

We gathered certain background population data for Utah to compare demographic information with the decedents. Specifically, US census data were used for information on race/ethnicity, and Behavioral Risk Factor Surveillance System (BRFSS) data were used for comparative data for weight, marriage, education, smoking, tobacco use, mental health and chronic health issues [DHHS 2008].

Analytical Approach

The primary analyses compared decedents who ever had a work-related injury with decedents who did not have a work-related injury in Utah. The Student's *t*-test was used to compare continuous data including age. Categorical variables were compared by calculating the Mantel–Haenszel estimate of the common odds ratio (OR) and 95% confidence interval (95% CI). The 95% CI was calculated with the estimated variance of the log odds ratio given by Robins, Breslow, and Greenland (1986).

For the analyses of prior work-related injuries, we compared age, gender, average number of injuries, and types of injuries by time relative to death. We studied whether recent injuries, (within the last 1, 2, and 3 years of life) differed by numbers of injuries and types of injuries when compared to more remote injuries. The chi-square test was used to compare the two groups.

The descriptive and statistical analyses were performed with SAS Version 9.2 (SAS Institute, Cary, NC).

RESULTS

There were 432 unintentional and/or undetermined drug-poisoning deaths in Utah from October 26, 2008 to October 25, 2009. The DOH successfully administered 385 (89.1%) next-of-kin interviews. The remaining 47 were not obtained due to refusal (N = 10), inability to contact (n = 34) and language barriers (n = 3). Among the 385 cases, 254 (66.0%) had at least one opioid in their system at time of death. The majority of the cases—221 decedents (87%)—were non-illicit drugs only and the remaining 33 cases (13%) had a combination of illicit and non-illicit drugs. Out of the 254 decedents, 145 (57%) had at least one prior work-related injury (hereafter referred to as ''work-injured''), and 109 (43%) had no work- related injury claim (hereafter ''non-work-injured'').

Autopsy Report

Work-injured and non-work-injured decedents had similar types of drugs at time of death. Of the 254 opioid-related deaths, the second and third most frequent medication classes identified in the toxicology test were benzodiazepines (34%) and histamine-1 antagonist (18%; see Table I).

TABLE I. Autopsy Results of Opioid-Related Deaths by Reported Work-Related Injury

Characteristics	All deaths (N = 254) No. (%)	Ever had a work-related injury (N = 145) No. (%)	Never had a work-related injury (N = 109) No. (%)	Odds ratio	95% confidence interval	
Drugs per toxicology report on autopsy						
Benzodiazepines	87 (34.3)	45 (31)	42 (38.5)	0.81	0.57	1.14
Muscle relaxants	37 (14.6)	20 (13.8)	17 (15.6)	0.88	0.49	1.61
Opioids	254 (100)	145 (100)	109 (100)	1	—	—
Selective serotonin reuptake inhibitor	15 (5.9)	8 (5.5)	7 (6.4)	0.86	0.32	2.27
Sleep agents	14 (5.5)	10 (6.9)	4 (3.7)	1.89	0.61	5.88
Tricyclic antidepressant	12 (4.7)	8 (5.5)	4 (3.7)	1.49	0.47	4.76
Methamphetamine	10 (3.9)	5 (3.5)	5 (4.6)	0.75	0.22	2.56
Histamine 1 antagonist	46 (18)	28 (19.3)	18 (16.5)	1.16	0.68	2
Antitussive	17 (6.7)	9 (6.2)	8 (7.3)	0.85	0.34	2.13
Death classification per OME report						
Non-illicit drugs only	221 (87)	128 (88.3)	93 (85.3)	1.03	0.93	1.14
Combination	33 (13)	17 (11.7)	16 (14.7)	0.8	0.42	1.52

Comparing All Decedents to the General Utah Population

The decedents were more likely to be adults ranging in ages 25–54 years old compared to the overall Utah population. Nearly all decedents were White (98%), which is higher than the overall state (87% White). Decedents were less likely to be married (39% of workers and 26% of non-workers) compared to the state average of 68%. Almost 19% of the decedents had less than a high school degree, which is 2.5 times higher than the state average of 7% of people over the age of 18 without a high school diploma or GED [2010 Census Data]. Decedents were also more likely to be unemployed (64% vs. 5%, *P*-value <0.001) [2009 U.S Bureau of Labor Statistics]. Half of all decedents (52%) were reported to be members of the Latter-day Saints (LDS) faith, which is slightly lower than the reported 58% by the Pew Forum on Religion and Public Life, 2008. Decedents were approximately five times more likely to be current smokers (64% and 57.8% in work-injured and non-work-injured, respectively) compared with the overall Utah adult smoking rate of 11.7%. Decedents were three times more likely to drink alcohol (85.5% and 89% in work-injured and non-work-injured, respectively) compared with the state rate among adults (27.5%). In addition, decedents had higher rates of reported marijuana (50%) and cocaine (30%) use compared to Utah general population (4.2% and 2.3%, respectively). While one-half of all decedents received prior treatment for substance abuse, the vast majority (77% work-injured vs. 84% non-work-injured) was still using some type of illicit drug as recently as the last two months prior to death, most commonly marijuana. Half of all decedents in both groups were previously diagnosed with a mental illness. They also had a similar distribution in the types of mental illness, depression being the most common followed by anxiety, bipolar, and schizophrenia. Although there are no direct comparative data, the decedents had higher than the surrogate measure of mental illness by UDOH BRFSS for Utah. According to the UDOH BRFSS, 15% of Utah adults self reported they had ''poor mental health,'' which is defined as ''stress, depression and problems with emotions for 7 days in the past 30 days'' (Table II).

Comparing Decedents With Work-Related Injuries to Never Had a Work-Related Injury

Work-injured and non-work-injured were fairly alike. They had similar distribution in regards to race, gender, education, religion, church attendance, substance abuse, and psychiatric illness. However, we did find subtle but significant differences. All decedents were more likely to be single compared to the general population, and work-injured were more likely to be married than non-work-injured (39% of work-injured and 26% of non-work-injured). Both groups had greater alcohol use, but non-work-injured had significantly more trouble with alcohol use causing interference with daily function (7% of work-injured vs. 15% non-work-injured). While not statistically significant, work-injured were more likely to have

TABLE II. Comparing All Decedents Versus General Utah Population

Characteristics	Opioid-related deaths % (N = 254)	Utah population % State of Utah 2009 population > 18 years old (N = 1,939,721)	*P*-value chi-square test
Age[a]			
18–24	7.9	16.9	<0.001
25–34	26.4	23.9	0.37
35–44	23.2	17.6	0.04
45–54	29.5	16.3	<0.001
>55	13	24.9	<0.001
Race/ethnicity[b]			
White (C)	98.3	87	<0.001
Black (B)	0.4	0.8	0.47
Other (N)	0.8	8.9	<0.001
Marital status[c]			
Married	33.9	68.2	<0.001
Never married	28.0	20.1	0.001
Divorce, separated, or widow	37.8	11.7	<0.001
Education[d]			
1 (less than high school)	18.5	6.9	<0.001
2 (High School)	37.4	28.7	0.005
3 (College)	35.4	34.5	1
4 (Graduate)	8.7	29.9	<0.001
Employment[e]			
Yes	36.2	65.3	<0.001
Religion[f]			
Protestant	3.2	13	<0.001
Catholic	6.7	10	0.11
LDS	51.6	58	0.05
Jewish	0.4	<0.5	0.82
Other or unaffiliated	33.1	19	<0.001
Current tobacco use[g]			
Yes	61.4	11.7	<0.001
No	11.4	88.3	<0.001
Current alcohol use[g]			
Yes	87.0	27.5	<0.001
No	11.4	72.5	<0.001
Mental illness[h]	50	15	<0.001
Illicit substance use[i]			
Use marijuana	50	4.2	<0.001
Use cocaine	30.3	2.3	<0.001

[a]According to BRFSS Utah 2001–2005—The percentage of Utahans who had a BMI > 25 was 55.2%.

[b]Utah demographics in 2010—86.1% White persons, 13% Hispanic or Latino origin, 2.0% Asian, American Indian, or Alaska Native 1.2%, 1.1% Black persons, an Pacific Islander or Native Hawaiian 0.9%. http://quickfacts.census.gov/qfd/states/49000.html

[c]Per BRFSS Utah 2009—66.8% of adults were married, 20.1% never married, 6.2% divorced, 4% widowed, 2% partnered and 0.9% separated.

[d]Per BRFSS 2009—5.9% of the adults have less than a high school education, 27.8% have at least a high school diploma or GED, 36% have some post high school education and 30.3% have bachelor's degree or higher.

[e] http://quickfacts.census.gov/qfd/states/49000.html

[f]Per U.S. Religious Landscape Survey by Pew Forum on Religion and Public Life February 2008—The religious make-up of Utah was 58% Mormon, 10% Catholic, 7% Evangelical Protestant Church, 6% Mainline Protestant Church, 1% Black Protestant Church, 16% unaffiliated, and 2% other.

[g]Per Utah Statewide Substance Abuse Epidemiology Profile 2009: (i) 11.7% of adults are current smokers and (ii) 27.5% of Adults are current alcohol users. www.dsamh.utah.gov

[h]Per Utah BRFSS small area report 2001–2005, 15% of Utah adults have "poor mental health" defined as stress, depression and problems with emotions for more than 7 days in the past 30 days.

[i]Per [Utah Statewide Substance Abuse Epidemiology, 2010]: (i) 4.2% of adults are current marijuana users and (ii) 2.3% of adults have used cocaine in the past year.

[j]Per [Utah BRFSS small area report 2001–2005]: (i) 5% of Utah adults have diabetes and (ii) 24.8% of Utah adults have arthritis.

sustained physical abuse and non-work-injured were more likely to have had sexual abuse. Many of the decedents had prior financial, employment, work and legal problems, but non-work-injured had slightly more difficulties than work-injured. Non-work-injured were more likely to be unemployed than work-injured (60% work-injured vs. 70% non-work-injured) in the final 2 months of life. Non-work-injured had more legal problems compared to work-injured (26% work-injured vs. 38% non-work-injured).

Work-injured were more likely to take prescription pain medication in the last year of life (91% in work-injured vs. 83% in non-work-injured). According to the next-of-kin, work-injured were more likely to receive their prescription pain medications from a health care professional (86% work-injured vs. 70% non-work-injured). They were also less likely to visit more than one doctor to get pain medication (19% work-injured vs. 32% non-work-injured) and less likely to procure pain medication from a friend or relative, or purchase from a dealer compared to non-work-injured. In addition, work-injured were more likely to have had someone, either health care professional, friend, or family member raise concerns about their pain medication use. And they were also significantly less likely to use prescription medications for fun or getting high compared to non-work-injured (7% work-injured vs. 18% non-work-injured). Work-injured reported more musculoskeletal pain, specifically arthritis (6% vs. 4%) and back pain (49% vs. 39%) than non-work-injured (Table III).

Work-Injury Analysis

Further analyses of people with work-related injury showed that the average number of reported injuries in a decedent's lifetime is three. The three most common injuries were strains or sprains (18%), unknown (15%), and laceration or punctures (13%). The majority of the accidents (78%) occurred more than 3 years from time of death. There were 32 work-related injuries that occurred within the last three years of life and half of them (16) occurred within the last year of life. We compared time of injury (1-, 2-, and 3-years from death), and it failed to reveal any meaningful differences by demographics or injury characteristics in comparing the times of injury from death.

DISCUSSION

The majority of decedents of opioid-related deaths (57%) had at least one work-related injury. Those with at least one work-related injury were similar to decedents of an opioid-related drug overdose without a work-related injury in race, education level, infrequent church attendance, mental illness, financial, legal and work problems, and high alcohol, tobacco, and illicit drug use. However, both groups differ substantially from the overall population of Utah by those same characteristics. These findings suggests that providers should screen for mental health problems and substance abuse that includes tobacco use, before prescribing an opioid, and potentially using these characteristics for determining the intensity of monitoring during opioid treatment for higher risk populations both within and outside of the workers compensation system.

Significant differences were found between the work-injured and non-work-injured groups. Work-injured tend to be older, have more family support, be more likely to have used opioids recently, and have obtained their opioid from a health care professional. In addition, they were less likely to visit more than one health care provider for more opioids, and had more musculoskeletal pain. Non-work-injured were more likely to use opioids for getting high or feeling good, and obtained them by diversion or visiting more than one health care provider.

Several studies have found that individuals with a history of substance abuse, legal problems, psychiatric disorders and heavy smoking might experience more subjective pain leading to increased opioid tolerance and abuse [Franklin et al., 2005; Wysowski, 2007; Hall et al., 2008; Jamison et al., 2009; Log et al., 2011; Passik and Lowery, 2011; Webster et al., 2011]. It has been reported that patients with chronic pain with a mood disorder and a negative affect have less benefit from opioids [Pincus et al., 2002; Wasan et al., 2005; Becker et al., 2008; Ruetsch, 2010; Passik and Lowery, 2011]. It is unclear whether the high unemployment rate is related to a work-related injury or from an inability to hold a job due to a substance abuse problem.

In this study, many factors associated with prescription drug-related deaths were similar to prior reports [CDC, 2005a, 2010; Paulozzi et al., 2006; Becker et al., 2008; Hall et al., 2008; Jamison et al., 2009; Piercefield et al., 2010; Passik and Lowery, 2011]. The strongest associated factors were: age, race, infrequent church attendance, history of substance abuse, current alcohol use, tobacco use, illicit drug use, and chronic pain. Some studies have reported associations between tobacco-use and risk of becoming a non-medical prescription opioid user [Becker et al., 2008; Log et al., 2011]. Our study's findings, which extend this line of research into the workers compensation system, appear to validate similar outcomes from other studies, and suggest that workers are being included within the epidemic of opioid-related deaths.

Even though we were unable to determine whether the work-related injury contributed to opioid misuse and death, our data support the need for screening and more conservative treatment particularly in patients with a history of substance abuse, psychiatric illness or tobacco use. Additionally, there may be a subpopulation of workers with a reported history of uncontrolled pain that died from

TABLE III. Characteristics of Opioid-Related Deaths by Reported Work-Related Injury

Characteristics	All deaths (254) No. (%)	Ever had a work-related injury (145) No. (%)	Never had a work-related injury (109) No. (%)	Odds ratio	95% confidence limits	
Age (mean)	41	42.3	39.3*			
18–24	20 (7.9)	5 (3.5)	15 (13.8)	0.25	0.09	0.67
25–34	67 (26.4)	32 (22.1)	35 (32.1)	0.68	0.46	1.03
35–44	59 (23.2)	41 (28.3)	18 (16.5)	1.72	1.04	2.78
45–54	75 (29.5)	49 (33.8)	26 (23.9)	1.41	0.94	2.13
>55	33 (13)	18 (12.4)	15 (13.8)	0.9	0.48	1.69
Marital status					0.68	1.01
Married	86 (33.9)	57 (39.3)	29 (26.6)	1.47	1.02	2.13
Never married	71 (28)	29 (20)	42 (38.5)	0.52	0.35	0.76
Divorce, separated, or widow	96 (37.8)	59 (40.7)	37 (33.9)	1.2	0.86	1.67
In the past 2 months, did drinking interfere with his/her ability to function daily?						
Yes	26 (10.2)	10 (6.9)	16 (14.7)	0.47	0.22	0.99
No	101 (39.8)	61 (42.1)	40 (36.7)	1.15	0.84	1.56
Ever received treatment for substance abuse?						
Yes	129 (50.8)	76 (52.4)	53 (48.6)	1.08	0.84	1.39
No	114 (44.9)	62 (42.8)	52 (47.7)	0.89	0.68	1.19
2 months prior to death use any illicit drugs	203 (79.9)	111 (76.6)	92 (84.4)	0.91	0.81	1.02
Marijuana	127 (50)	64 (44.1)	63 (57.8)	0.76	0.6	0.97
Heroin	52 (20.5)	26 (17.9)	26 (23.9)	0.75	0.46	1.22
Methamphetamines	67 (26.4)	36 (24.8)	31 (28.4)	0.87	0.58	1.32
Cocaine	77 (30.3)	39 (26.9)	38 (34.9)	0.77	0.53	1.12
Hallucinogens	36 (14.2)	16 (11)	20 (18.4)	0.6	0.33	1.11
Any other	127 (50)	72 (49.7)	55 (50.5)	0.98	0.77	1.27
Diagnosed with a mental illness by a health care professional	127 (50)	73 (50.3)	54 (49.5)	1.02	0.79	1.29
History of:						
Physical abuse	73 (28.7)	46 (31.7)	27 (24.8)	1.28	0.85	1.92
Sexual abuse	51 (20.1)	27 (18.6)	24 (22)	0.85	0.52	1.39
2 months prior to death have:						
Financial problems	149 (58.7)	89 (61.4)	60 (55.1)	1.11	0.9	1.39
Employment	92 (36.2)	59 (40.7	33 (30.3)	1.35	0.95	1.89
Work problems	30 (11.8)	21 (14.5)	9 (8.3)	1.75	0.83	3.7
Legal problems	78 (30.7)	37 (25.5)	41 (37.6)	0.68	0.47	0.98
Take prescription medications for pain within						
1 year before death	222 (87.4)	132 (91)	90 (82.6)	1.1	1	1.22
Last month of life	199 (78.4)	119 (82.1)	80 (73.4)	1.12	0.98	1.28
Pain medication obtained by:						
Health care professional	201 (79.1)	125 (86.2)	76 (69.7)	1.23	1.07	1.28
Free from friend or relative	54 (21.3)	28 (19.3)	26 (23.9)	0.81	0.51	1.3
From someone else without that person's knowledge	41 (16.1)	20 (13.8)	21 (19.3)	0.71	0.47	1.25
Purchasing from friend, relative or acquaintance	37 (14.6)	21 (14.5)	16 (14.7)	0.99	0.54	1.79
Purchasing from a dealer	26 (10.2)	15 (10.3)	11 (10.1)	1.02	0.49	2.13
Purchasing online	7 (2.8)	2 (1.4)	5 (4.6)	0.3	0.06	1.52
Visit more than one doctor to get pain medication						
Yes	62 (24.4)	28 (19.3)	34 (31.2)	0.62	0.4	0.95
No	134 (52.8)	88 (60.7)	46 (42.2)	1.43	1.11	1.85

(*Continued*)

TABLE III. (*Continued*)

Characteristics	All deaths (254) No. (%)	Ever had a work-related injury (145) No. (%)	Never had a work-related injury (109) No. (%)	Odds ratio	95% confidence limits	
Anyone concerned with his or her use of Rx pain meds						
Spouse	45 (17.7)	31 (21.4)	14 (12.8)	1.64	0.93	2.94
Sig. other	12 (4.7)	8 (5.5)	4 (3.7)	1.49	0.47	4.76
Children	46 (18.1)	33 (22.8)	13 (11.9)	1.92	1.05	3.33
Sibling	56 (22.1)	34 (23.5)	22 (20.2)	1.16	0.72	1.85
Relative	25 (9.8)	11 (7.6)	14 (12.8)	0.59	0.28	1.25
Friend	22 (8.7)	7 (4.8)	15 (13.8)	0.35	0.15	0.83
Use Rx pain medication for reasons other than to treat pain						
Yes	64 (25.2)	31 (21.4)	33 (30.3)	0.7	0.46	1.08
Induce sleep	3 (1.2)	2 (1.4)	1 (0.9)	1.49	0.14	16.7
Relieve anxiety	10 (3.9)	5 (3.5)	5 (4.6)	0.75	0.22	2.56
Relieve depress	16 (6.3)	9 (6.2)	7 (6.4)	0.97	0.37	2.65
Prevent or relieve withdrawal symptoms	2 (0.8)	0	2 (1.8)	0	—	—
Fun, good feeling, getting high	31 (12.2)	11 (7.6)	20 (18.4)	0.41	0.21	0.83
History of:						
Arthritis	13 (5.1)	9 (6.2)	4 (3.7)	1.69	0.53	5.26
Back pain	113 (44.5)	71 (49)	42 (38.5)	1.32	0.95	1.69
Suffer from pain	224 (88.2)	135 (93)	89 (81.7)	1.14	1.03	1.25

*0.05 *t*-test's *P* value.

opioid overdose, which suggests the need for adequate pain management approaches that focus on non-opioid measures. Finally, these data suggest the ability to maintain employment is not a useful indicator for opioid abuse and misuse, as a large fraction of opioid-related deaths occurred in individuals with current employment.

The strengths of this study include a population-based study with complete capture of all opioid-related deaths, work-related injuries and comparative data from BRFSS. Utah's OME provides a single location within which the four forensic pathologists conduct autopsies, thus ensuring consistency, coordination, and a thorough depiction of all opioid related deaths. In addition, the next-of-kin questionnaire provided unique information beyond the basic demographics available in other studies.

The primary limitation of this study stemmed from our inability to follow the work injured from time of injury until death. From these data it is unclear whether the injury initiated the opioid use that resulted in death or if the work injury was a result of a history of opioid abuse. Other limitations included potential misclassification within next-of-kin survey. Even though this was a population level analysis some comparisons resulted in sparse data and were likely underpowered. Some decedents may have had a work-related injury in another state or had experienced work-related injuries that were never filed, although those events would presumably be non-differential.

CONCLUSION

There is an elevated risk of opioid-related death among workers with: a psychiatric disorder, current or prior substance abuse problem (including prescription pain medicine, illicit drugs, tobacco and alcohol), lack of religious support, poor education and an unmarried status. These data suggest that a detailed history and screening for these risks, is needed to help identify patients who have an increased potential to abuse or misuse the opioid in the course of accessing the workers compensation system. In addition, utilizing the state prescription drug monitoring program or controlled substance database before, and concurrent with, prescribing opioids may be beneficial, especially when these risk factors are present.

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