Unintentional Poisoning Deaths in Oklahoma, 2007-2012

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Introduction

A poisoning exposure is an ingestion, inhalation, absorption, or contact with a substance resulting in a toxic effect or bodily harm. An unintentional poisoning occurs when an individual does not intend to cause harm to themselves or someone else. The individual may intentionally be exposed to a substance (e.g., a person ingests a medication at higher than prescribed levels) but does not intend to harm themselves.

Unintentional poisoning mortality rates more than doubled in the United States from 1999-2012 and increased nearly fivefold in Oklahoma during the same period. In 2012, Oklahoma had the fifth highest unintentional poisoning mortality rate in the United States (18.6 deaths per 100,000 population). In 2009, unintentional poisoning surpassed motor vehicle crashes as the leading cause of unintentional injury death in Oklahoma. Unintentional poisoning is now the leading cause of injury death for Oklahomans aged 25-64.[1] The dramatic increase in unintentional poisoning deaths paralleled a marked increase in the dispensing of prescription opioid pain relievers for non-cancer pain.[2] Prescription opioid analgesics continue to be the most common substances involved in unintentional poisoning deaths.

Methods

The Office of the Chief Medical Examiner (OCME) serves as the centralized medical examiner system for Oklahoma. Oklahoma is one of 22 states with a centralized medical examiner system.[3] The Injury Prevention Service (IPS) of the Oklahoma State Department of Health (OSDH) receives reports from the OCME for all non-natural deaths occurring in Oklahoma. IPS personnel review all medical examiner reports received. Deaths with a manner of 'Accident' and mention of a poisoning in the cause of death are included as an unintentional poisoning (Table 1).

Exclusions from this definition include: adverse allergic or hypersensitivity reactions, correct drugs properly administered in therapeutic or prophylactic dosages, venomous plants and animals (other than ingestion), bacterial food poisoning, smoke inhalation, injury consequences of substance abuse (motor vehicle crashes, falls, etc.), out-of-state residents, and natural, undetermined, or intentional (e.g., suicide, homicide) manner deaths.

Data were abstracted from medical examiner reports by an epidemiologist regarding types of drugs/substances involved in the poisoning (listed in the cause of death), how and where the injury occurred, decedent demographics, and history of substance abuse, pain, and mental health

Table 1. Example Causes of Death and Inclusion/Exclusion Status

Cause of Death	Other Significant Medical Conditions	Included
Hypoxic encephalopathy due to: Complications of combined drug toxicity due to morphine, midazolam	Seizure disorder, hypothyroidism	Yes
Acute ethanol toxicity		Yes
Acute combined drug toxicity due to: tramadol, paroxetine		Yes
Probable acute methadone toxicity	Atherosclerotic cardiovascular disease	Yes
Toxic effects of 1,1-difluoroethane inhalation		Yes
Multidrug toxicity (hydrocodone, oxycodone, and alprazolam)		Yes
Head and neck injuries due to: blunt and sharp force	Drug abuse (ethanol and cocaine), thermal injury	No
Acute carbon monoxide toxicity*	Hypertension, hypercholesterolemia	No
Complications of smoke inhalation		No
Multiple gunshot wounds	Acute ethanol intoxication	No
Drowning	Methamphetamine and cocaine use	No

*Carbon monoxide toxicity due to smoke inhalation due to combustion of materials indoors

problems. Substances involved in the cause of death are classified using drug categories provided by the OCME. Data collection began with all unintentional poisoning deaths from calendar year 2007 forward. Data collection, abstraction, and entry are complete through 2012, and are ongoing for 2013 and 2014. Cases are crosschecked with Vital Statistics death data (ICD-10 underlying cause of death codes X40-X49) and the OCME annual database to ensure complete case ascertainment.

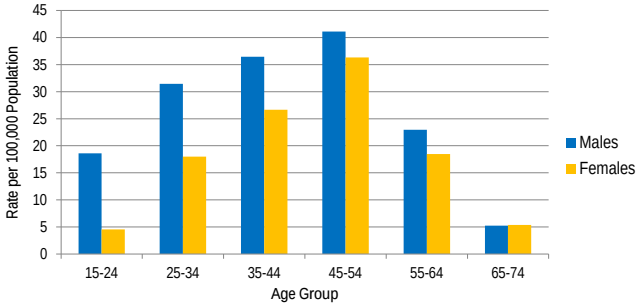
Results

From 2007-2012, 3,873 Oklahomans died as a result of an unintentional poisoning (17.3 per 100,000 population). Overall, unintentional poisoning mortality rates increased 11% from 16.0 per 100,000 in 2007 to 17.7 in 2009, then decreased slightly (2%) from 2009-2011.

Adults 45-54 years of age had the highest mortality rate of any age group (38.7 per 100,000) and children 0-14 had the lowest (0.2 per 100,000). During 2007-2012, unintentional poisoning mortality rates decreased for teens and young adults aged 15-24 and adults aged 35-44 (16% and 10%, respectively). Mortality rates increased 39% for adults aged 45-54. Mortality rates for adults aged 55-64 more than doubled from 2007-2012, and more than tripled for adults aged 65 and older (Table 2).

Males were more likely to die of an unintentional poisoning than females (20.6 and 14.1 per 100,000, respectively). Unintentional poisoning mortality rates increased 6% from 2007-2012 for males. Mortality rates increased 11% for females from 2007-2011, and 20% from 2011-2012. Males had a higher mortality rate than females in all age groups except older adults (65 years and older; Figure 1). During 2007-2012, the largest increase in unintentional poisoning mortality rates for males was in the 55-74 year age group. For females, the largest increase was for adults aged 65-74 and older, where mortality rates increased 79% from 2007-2011, then increased 79% from 2011-2012 alone (Table 1).

Figure 1. Unintentional Poisoning Mortality Rates by Age Group* and Gender, Oklahoma, 2007-2012



*Decedents under age 15 and over age 74 were excluded due to small number of cases (<1% of all UP deaths)
Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database (Abstracted from Medical Examiner reports)

Native American decedents had the highest unintentional poisoning mortality rate of any racial or ethnic group, followed by whites (19.3 and 17.9 per 100,000 population, respectively). African American and Hispanic decedents had lower unintentional poisoning rates (10.3 and 4.9 per 100,000 population, respectively). Native Americans had higher unintentional poisoning mortality rates for adults aged 25-64 years while whites had higher rates for teens and young adults aged 15-24 (Figure 2). African Americans had the lowest mortality rates for all age groups except adults aged 55-64 where the mortality rate for African

Table 2. Annual Unintentional Poisoning Mortality Rates* by Sex and Age Group, Oklahoma, 2007-2012

	Total						Male						Female					
Age group	2007	2008	2009	2010	2011	2012	2007	2008	2009	2010	2011	2012	2007	2008	2009	2010	2011	2012
<15 years	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
15-24 years	13.4	11.8	10.5	11.0	12.7	11.3	21.6	19.7	15.0	16.7	20.3	18.3	4.6	3.5	5.8	5.0	4.6	3.8
25-34 years	26.8	23.7	23.9	24.6	22.9	27.3	33.5	34.4	27.5	32.7	29.7	30.9	19.8	12.6	20.1	16.1	15.8	23.5
35-44 years	32.3	29.7	35.6	34.2	28.7	29.2	37.6	34.2	45.2	44.0	30.7	27.0	26.9	25.1	25.8	24.1	26.7	31.4
45-54 years	31.9	39.8	39.1	34.3	42.8	44.4	33.6	41.4	42.7	38.9	42.6	47.5	30.2	38.2	35.7	29.7	42.9	41.4
55-64 years	12.6	15.1	21.2	26.3	21.0	26.4	12.2	17.8	21.1	30.2	27.5	27.3	12.9	12.6	21.2	22.7	14.8	25.6
65 and older	1.9	2.9	4.2	4.1	3.5	5.8	2.4	**	6.0	4.1	3.1	5.1	**	4.0	2.8	4.2	3.8	6.4
All ages	16.0	16.5	17.7	17.5	17.2	18.8	19.5	20.3	21.0	21.8	20.3	20.5	12.6	12.8	14.4	13.2	14.1	17.1

*Rates per 100,000 population
**Rate not calculated due to small number.

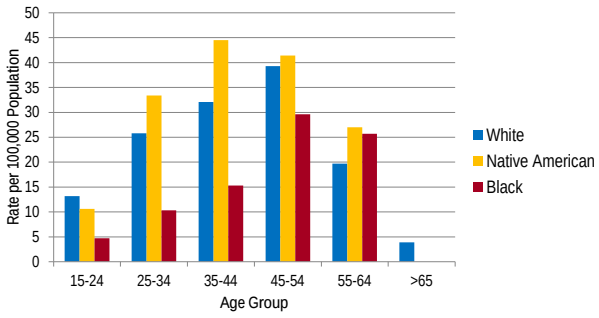
Americans was 30% higher than for their white counterparts (25.7 and 19.7 per 100,000 population, respectively). African American women aged 55-64 had the highest mortality rate of any racial group for that age category. Native American males aged 25-44 had a mortality rate 43% higher than whites of the same age.

Many different substances were involved in unintentional poisoning deaths: medications (both prescription and over-the-counter), alcohol, illicit drugs (e.g., methamphetamine, cocaine, heroin, PCP, ecstasy), chemicals, and inhalants. Deaths may have included multiple substances; therefore, the number of deaths for each substance or category is not mutually exclusive. Fifty-five percent of deaths involved more than one substance. Deaths involved a mean of two substances, but ranged from one to eight substances.

Poisoning by Non-Medication Substances

Alcohol was the most common non-medication substance involved in unintentional poisoning deaths, and 28% of those deaths involved alcohol alone. Nearly all chemical poisonings involved toluene, an industrial solvent commonly found in paint thinners, varnishes, and adhesives. Other chemicals involved included: malathion, a common pesticide; chlorine; and diethyl ether. The most common inhalants involved in unintentional poisoning deaths were carbon monoxide, 1,1-difluoroethane (canned/compressed air, refrigerant), and chlorodifluoromethane (refrigerant, Freon). Other inhalants included tetrachloroethylene, propane, butane, and mercury vapor (Table 3).

Figure 2. Unintentional Poisoning Mortality Rates by Age Group and Race*, Oklahoma, 2007-2012



:cedents under age 15, Asian race, and Other/Unk race were excluded due to small number of cases (<1% of all UP deaths)
urce: OSDH, Injury Prevention Service, Unintentional Poisonings Database (Abstracted from Medical Examiner reports)

Table 3. Number and Rate of Deaths Associated with Non-Medication Substances, Unintentional Poisonings Deaths in Oklahoma, 2007-2012

Substance	Number	Rate*	% of UP deaths	Male decedents (%)	Median age
Alcohol	594	2.65	15%	74%	44
Chemicals	21	0.09	<1%	81%	45
Toluene	18	0.08	<1%	78%	45.5
Other chemicals	3	**	<1%	100%	43
Illicit Drugs	812	3.63	21%	68%	44
Methamphetamine	455	2.03	12%	65%	44
Cocaine	289	1.29	8%	66%	46
Heroin	83	0.37	2%	87%	29
Other illicit drugs	26	0.12	<1%	58%	30
Inhalants	72	0.32	2%	67%	39.5
Carbon monoxide	36	0.16	<1%	61%	53.5
1,1-difluoroethane	23	0.10	<1%	65%	31
Chlorodifluoromethane	5	**	<1%	100%	18
Other inhalants	9	0.04	<1%	78%	43
Other substances	2	**	<1%	50%	18
Total†	*1425*	*6.37*	*37%*	*70%*	*44*

*Rates per 100,000 population

**Rate not calculated due to small number.

†Deaths may have involved multiple non-medication substances, total does not reflect sum of the subcategories.

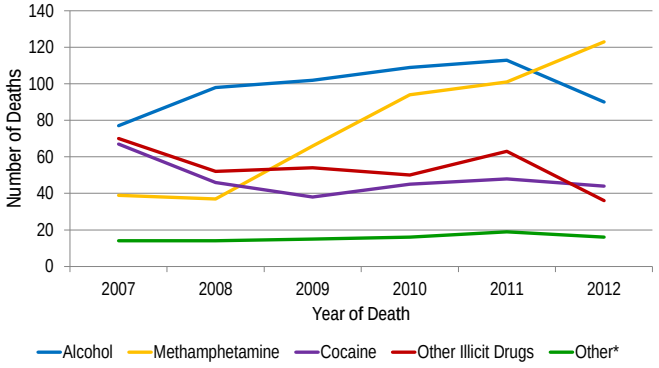
(UP) unintentional poisoning

Methamphetamine was the most common illicit drug involved in unintentional poisoning deaths; more unintentional poisoning deaths involved methamphetamine than all other illicit drugs combined. Cocaine was the second most common illicit drug and was involved in more than three times as many deaths as heroin. Other illicit drugs included benzylpiperazine (Frenzy, Smileys, BZP, PEP pills), bromo-dragonfly, methylenedioxy-methamphetamine (ecstasy, MDMA), phencyclidine (PCP), and methylone (bath salts).

The number of unintentional poisonings involving methamphetamine more than tripled from 2007-2012; the number involving alcohol increased by 47% from 2007-2011, then decreased 22% from 2011-2012 (Figure 3).

The number of heroin deaths increased 10-fold, from three deaths in 2007 to 29 in 2012. Heroin deaths may have been underestimated and misclassified as morphine. Heroin metabolizes completely into morphine; if complete toxicological analyses were delayed or not available, the specific metabolites of heroin would not be identified. The medicolegal investigator assigned to each non-natural death in Oklahoma usually conducts a scene investigation. If a medicolegal investigator is not available to review the scene, local law enforcement investigates the scene and report all findings to the medicolegal investigator. Drug paraphernalia found at the time of death can inform medical examiners if deaths were likely due to heroin versus prescription morphine if full toxicological results were not available.

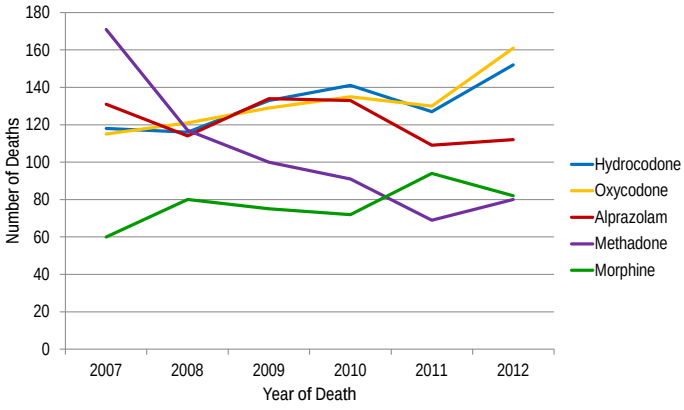
Figure 3. Unintentional Poisoning Deaths by Type of Non-Medication Substance, Oklahoma, 2007-2012



*Includes chemicals and inhalants due to small cell size.

Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database
(Abstracted from Medical Examiner reports)

Figure 4. Five Most Common Substances Involved in Unintentional Poisoning Deaths, Oklahoma, 2007-2012



Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database
(Abstracted from Medical Examiner reports)

Poisoning by Medications

Seventy-nine percent of unintentional poisoning deaths involved at least one prescription drug. The most common types of prescription drugs involved were: opioid analgesics (e.g., oxycodone, hydrocodone, methadone, morphine), anti-anxiety medications (e.g., alprazolam, diazepam, clonazepam), muscle relaxants (e.g., carisoprodol, cyclobenzaprine), antidepressants (e.g., citalopram, fluoxetine), and tricyclic antidepressants (e.g., amitriptyline, trazodone) (Tables 4, 5).

Table 4. Number and Rate of Deaths Associated with Medications by Medication Type, Unintentional Poisonings Deaths in Oklahoma, 2007-2012

Medication Type	Number	Rate*	% of UP deaths	Male decedents (%)	Median age
Prescription medication	3075	13.74	79.4%	56%	44
Opioid analgesic	2677	11.96	69.1%	56%	43
Anti-anxiety	1007	4.50	26.0%	59%	42
Muscle relaxant	305	1.36	7.9%	44%	44
Antidepressant	252	1.13	6.5%	38%	47
Tri-cyclic antidepressant	186	0.83	4.8%	40%	46
Non- opioid analgesic	186	0.83	4.8%	40%	44
Antipsychotic	47	0.21	1.2%	40%	44
Respiratory	52	0.23	1.3%	40%	45.5
Hypnotic/sedative	39	0.17	1.0%	56%	43
Antiemetic	31	0.14	0.8%	26%	47
CNS stimulant	25	0.11	0.6%	48%	42
Other**	56	0.25	1.5%	34%	49
Over the counter	143	0.64	3.7%	28%	45
Total†	*3101*	*13.86*	*80.1%*	*55%*	*44*

*Rates per 100,000 population
**Includes cardiovascular, anticonvulsant, anticholinergic, anesthetic, diabetes, antimanic, and unknown medications
†Deaths may have involved multiple non-medication substances, total does not reflect sum of the subcategories.
(UP) unintentional poisoning, (CNS) central nervous system

The rate of death involving prescription drugs was nearly four times that of illicit drugs (13.74 and 3.63 per 100,000, respectively). For all unintentional poisoning deaths, men had higher mortality rates than women for all age groups except older adults aged 65 years and older. For poisoning deaths involving at least one prescription drug, women aged 45 years and older had higher mortality rates than men. Overall, the most common prescription drugs involved in unintentional poisoning deaths were oxycodone, hydrocodone, alprazolam, methadone, and morphine (Figure 4). The most common opioids dispensed in Oklahoma during the same time period were methadone, hydrocodone, oxycodone, fentanyl, and morphine. The amount of morphine equivalent kilograms of hydrocodone, oxycodone, and morphine dispensed increased more than 40% from 2007-2012 (41%, 48%, and 49%, respectively). Methadone and fentanyl dispensation also increased during the same time period (5% and 17%, respectively) (Figure 5).

Table 5. Common Generic/Brand Name Prescription Drugs Involved in Unintentional Poisoning Deaths

Generic	Brand Name
Alprazolam	Niravam, Xanax, Xanax XR
Amitriptyline	Elavil, Endep, Vanatrip
Carisoprodol	Soma, Vanadom
Citalopram	Celexa
Clonazepam	Klonopin
Cyclobenzaprine	Amrix, Fexmid, Flexeril
Demerol	Meperidine
Diazepam	Valium
Fentanyl	Fentora, Onsolis, Duragesic patches
Fluoxetine	Prozac, Rapiflux, Sarafem, Selfemra
Hydrocodone and Acetaminophen	Hycet, Liquicet, Lorcet, Lortab, Norco, Polygesic, Vicodin
Hydromorphone	Dilaudid
Methadone	Diskets, Dolophine, Methadose
Morphine	Avinza, Kadian, MS Contin, MSIR, Roxanol
Oxycodone	OxyContin, Oxyfast, Percolone, Roxicodone
Oxycodone and Acetaminophen	Endocet, Oxycet, Percocet, Roxicet, Roxilox, Tylox
Oxymorphone	Opana
Propoxyphene	Darvocet, Darvon, Darvon-N, PP-Cap
Tramadol	Rybix, Ryzolt, Ultram
Venlafaxine	Effexor
Zolpidem	Ambien, Edluar, Intermezzo, Zolpimist

Sixty-nine percent of all unintentional poisoning deaths involved at least one opioid analgesic (e.g., hydrocodone, oxycodone, and methadone). More deaths involved hydrocodone or oxycodone than alcohol, methamphetamine, cocaine, heroin, and all other illicit drugs combined (Figure 6).

Decedents whose deaths involved at least one prescription drug had, on average, twice as many substances listed in the cause of death compared to decedents whose deaths did not involve prescription drugs (mean number of substances were 2.2 and 1.1, respectively). More than three-fourths (77%) of substances involved in unintentional poisoning deaths were prescription drugs (Figure 7).

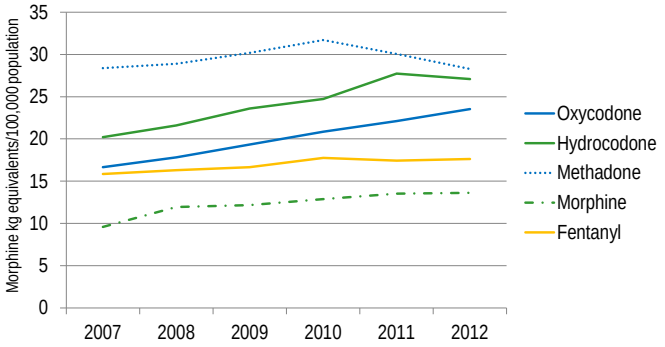
Combinations of Substances

Sixty-nine percent of unintentional poisoning deaths involved at least one opioid analgesic, and 29% (n=1128) involved opioid analgesics alone. Of deaths involving only opioid analgesics, 78% involved one opioid analgesic and 22% involved more than one opioid analgesic (range: 2-5). The most common substances involved with opioid analgesics were anti-anxiety medications (33%), muscle relaxants (10%), alcohol (10%), illicit drugs (10%), and antidepressants (9%).

Twenty-six percent of unintentional poisoning deaths involved an anti-anxiety medication, but less than 1% (n=28) involved anti-anxiety medications alone. Nearly 90% (n=875) of anti-anxiety medication-related unintentional poisoning deaths also involved an opioid analgesic. Other common substances involved with anti-anxiety medications were muscle relaxants (16%), alcohol (12%), antidepressants (10%), and illicit drugs (10%).

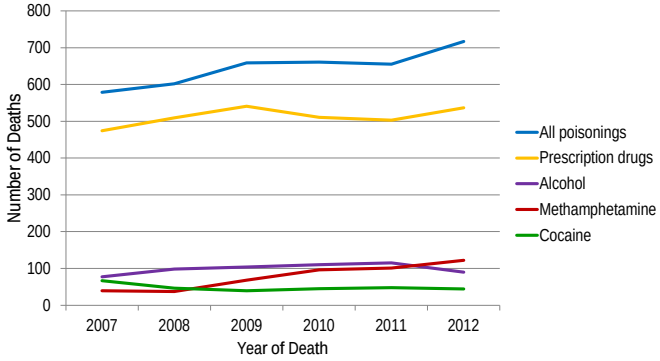
Fifty-eight percent of illicit drug-related unintentional poisoning deaths involved only illicit drugs, compared to 28% of unintentional alcohol poisoning deaths that involved only alcohol. One-third of illicit drug-related deaths also involved an opioid analgesic, compared to nearly half (46%) of unintentional alcohol poisoning deaths. Twelve percent and 21% of illicit drug and alcohol unintentional poisoning deaths involved an anti-anxiety medication, respectively.

Figure 5. Rate of Opioid Sales by Year in Morphine Equivalent Kilograms for Most Common Opioids Sold, Oklahoma, 2007-2012



U.S. Department of Justice, Drug Enforcement Administration, Office of Diversion Control, Automation of Reports and Consolidated Orders System (ARCOS) Reports, Retail Drug Summary Reports by State, Cumulative Distribution Reports (Report 4).

Figure 6. Unintentional Poisoning Deaths Involving Prescription Drugs, Illicit Drugs, or Alcohol by Year of Death, Oklahoma, 2007-2012



Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database (Abstracted from Medical Examiner reports)

Autopsy/Toxicology

An autopsy was performed on 51% (n=1987) of unintentional poisoning decedents, a rate nearly five times that of *all deaths* certified by the OCME and 1.6 times that of *all non-natural deaths* during the same time period (11% and 32%, respectively, Table 6). Male decedents were more likely to undergo an autopsy compared to female decedents (56% and 45%, respectively). The percent of unintentional poisoning decedents autopsied decreased with age. Ninety-five percent of decedents aged 0-34 years underwent an autopsy, compared to 63% of adults aged 35-44 and 19% of adults aged 45 and older. Nationally, 76% of unintentional poisoning deaths underwent an autopsy. From 2007-2012, Oklahoma ranked 47th in the nation for the percentage of unintentional poisoning deaths that underwent an autopsy. Oklahoma has lower percentages of decedents autopsied

compared to other states. Oklahoma was one of seven states to autopsy less than 25% of suicide decedents, and one of four states to autopsy less than 50% of undetermined manner deaths.[4]

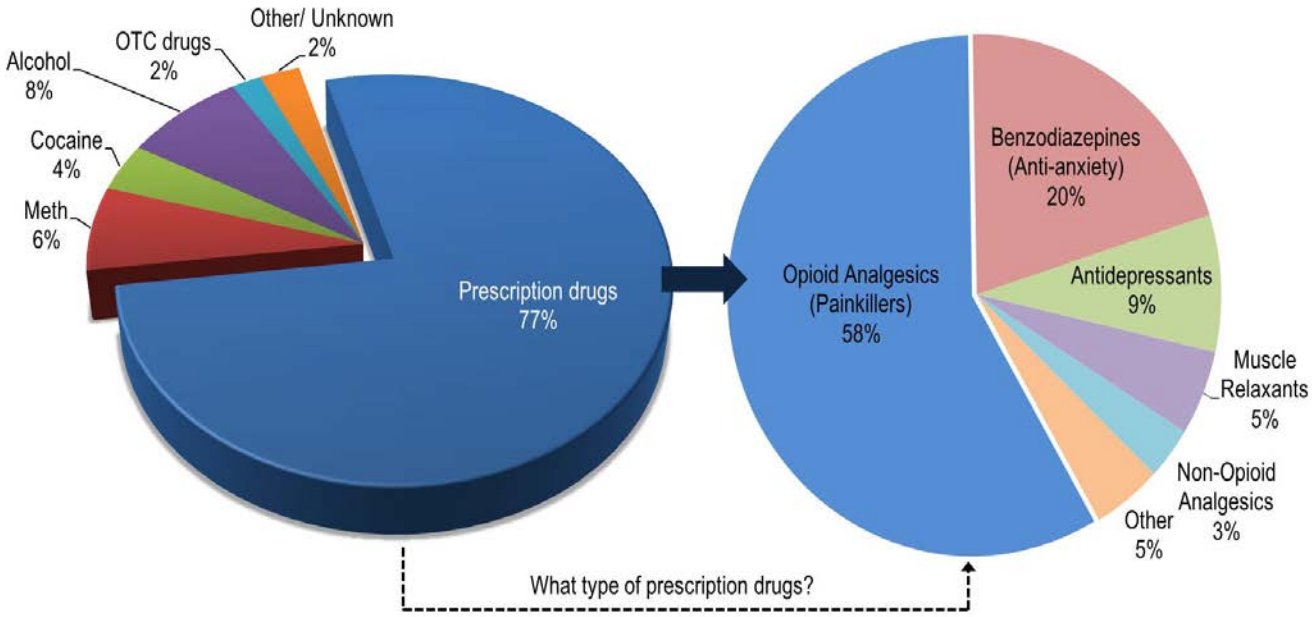
Ninety-six percent (n=3722) of decedents had a toxicology test for ethyl alcohol, compared to 22% of all deaths certified by the OCME and 63% of all non-natural deaths. Although 594 decedents had alcohol listed as part of the cause of death, 925 decedents (24%) were definitely/likely drinking alcohol prior to their deaths (positive result for ethyl alcohol in toxicology results or a mention of recent alcohol use elsewhere in the medical examiner's report). The median ethyl alcohol level for decedents who were definitely/likely drinking before their death was 0.11 g/dL (range: 0.00-0.88 g/dL). Decedents whose deaths involved at least one prescription drug were less likely to drink alcohol prior to death (21%). Decedents whose deaths involved no prescription drugs were more likely to drink alcohol prior to death (35%).

Childhood Poisoning

From 2007-2012, there were 44 unintentional poisoning deaths to children under 18 years of age. Seventy-five percent (n=33) of childhood poisoning deaths were teens aged 15-17.

Seventy-three percent (n=32) of childhood unintentional poisoning deaths involved at least one prescription drug, and two-thirds (n=29) involved at least one opioid analgesic. Other common substances involved in childhood poisoning deaths were alcohol (n=4), anti-anxiety medications (n=7), illicit drugs (n=5), and inhalants (n=4).

Figure 7. Substances Involved in Unintentional Poisoning Deaths, Oklahoma, 2007-2012



Supplemental Surveillance Information

Decedents whose deaths involved at least one prescription drug were more than twice as likely to have had contact with the medical profession in the three months preceding their death compared to decedents with no prescription drugs involved (38% and 16%, respectively).

Forty-six percent of decedents whose deaths involved prescription drugs had a prescription for at least one of the drugs involved in the death. Fourteen percent of decedents did not have a prescription for at least one of the drugs involved in the death (medical examiner report indicated decedent bought it on the street, on the internet, or took it from a friend or relative). Prescription status was unknown for all drugs involved for 41% of decedents. These data were documented solely from available information in the medical examiner report.

Overall, nearly all *injuries* (91%, n=3493) occurred at a home, and 88% (n=3088) of decedents' injuries occurred at their own home. More than two-thirds (68%, n=2614) of *deaths* occurred in a home, and 27% (n=1037) of deaths occurred in a hospital. Two percent (n=77) of deaths occurred in a hotel/motel. Prescription drug-related deaths were more likely to occur in a home compared to deaths not involving prescription drugs (72% and 52%, respectively).

An estimated 22% of adults in Oklahoma have a diagnosable mental illness.[5] Reports for one-third (n=1260) of decedents mentioned a current or past mental health

Table 6. Unintentional Poisoning Surveillance Findings by Medication Involvement, Oklahoma, 2007-2012

	All UP		No Rx Meds		At least one Rx med	
	N	%	N	%	N	%
Autopsy	1987	51%	401	50%	1586	52%
Alcohol use prior to death (definite/likely)	925	24%	282	35%	643	21%
Death occurred at a residence	2614	68%	412	52%	2202	72%
History of prior overdose	366	10%	24	3%	342	11%
History of pain	1216	31%	66	8%	1150	37%
Attended drug rehab/therapy	172	4%	19	2%	153	5%
Contact with medical profession in prev. 3 months	1292	33%	131	16%	1161	38%
Snoring loudly/breathing slowly	384	14%*	28	6%*	356	16%*
Current or past substance use/abuse	2359	61%	495	62%	1864	61%
Alcohol	694	29%	209	42%	485	26%
Prescription drugs	1241	53%	62	13%	1179	63%
OTC drug and other substances of abuse (e.g. spray paint)	42	2%	36	7%	6	<1%
Illicit drugs	582	25%	224	45%	358	19%
Unspecified drug	509	22%	93	19%	416	22%
Current or past mental health problem	1260	33%	104	13%	1156	38%
Depression/bipolar disorder	905	72%	59	57%	846	73%
Schizophrenia	65	5%	7	7%	58	5%
Suicide attempt/ideation	316	25%	25	24%	291	25%
Post-traumatic stress disorder	34	3%	3	3%	31	3%
Anxiety disorder	210	17%	8	8%	202	18%
Panic disorder	6	<1%	1	1%	5	<1%
Other/unspecified problem	149	12%	21	20%	128	11%
Total	3873	100%	798	100%	3075	100%

*Percentage calculated using subset of decedents who were not home alone at the time of death.

problem. Decedents whose deaths involved at least one prescription drug were over 2.5 times as likely to have a current or past mental health problem as decedents whose deaths did not involve prescription drugs (38% and 13%, respectively).

Thirty-one percent (n=1216) of decedents had a documented history of pain (i.e., chronic pain, problems with pain/pain management, or a history of pain). Decedents whose deaths involved at least one opioid were nearly five times as likely to have a history of pain compared to decedents whose deaths did not involve prescription drugs (37% and 8%, respectively).

Ten percent (n=366) of decedents had a history of an overdose. Decedents whose deaths involved at least one prescription drug were more likely to have had mention of a previous overdose (11% and 3%, respectively) compared to deaths with no prescription drugs involved. Four percent (n=172) of decedents had attended drug rehab/therapy.

More than half (61%, n=2359) of decedents had a current or past substance abuse problem (including problems with using or abusing drugs, alcohol, and/or other substances). Decedents whose deaths did not involve prescription drugs were most likely to have a substance abuse problem involving alcohol or illicit drugs. However, decedents whose deaths involved prescription drugs were more likely to have a substance abuse problem involving prescription drugs.

Snoring loudly or breathing slowly (agonal respirations) are a common sign of respiratory distress. Among decedents who were not alone at the time of death (i.e., someone was in the home with them), snoring loudly or breathing slowly was more commonly reported prior to deaths involving prescription drugs compared to deaths with no prescription drugs involved (16% and 6%, respectively).

Unintentional poisoning mortality rates varied by county of residence. The highest rates were in the eastern and southern areas of Oklahoma. The lowest rates were in the northwestern area of the state (Figure 8). Counties with the highest mortality rates were (in order): Pawnee, Pontotoc, Coal, McCurtain, and Pittsburg. Pawnee County had the highest unintentional poisoning mortality rate; nearly twice the state rate and nearly 30% higher than the second highest county rate (34.2 per 100,000 compared to 26.9 per 100,000).

Limitations

By collecting mortality data only, this study underestimates the true burden of poisoning injury in Oklahoma. More than 4,000 Oklahomans are hospitalized each year for an unintentional poisoning; many more are treated and released from an emergency room, by emergency medical services (EMS), or by a primary care physician, or do not seek any medical attention.

This study includes unintentional poisoning deaths, but excludes intentional (suicide, homicide) and undetermined manner deaths. From 2007-2011, unintentional manner poisoning deaths accounted for more than 80% of all poisoning deaths in Oklahoma; undetermined manner deaths accounted for 7% of poisoning deaths, and suicide 11%.[1]

Decedent history (mental health, substance use/abuse, medical, etc.) was abstracted from the OCME Report of Investigation and was limited to the results of the medicolegal investigator's findings. The findings of the medicolegal investigator are limited to scene reporting by friends, family, law enforcement, or EMS and any follow up information that might be obtained from the decedent's physician(s). These estimates are likely underreported, especially for substance abuse and mental health history. A decedent's family may have been unlikely to report current/past problems. A decedent may have been under the supervision of multiple physicians, and health histories might have been incomplete.

This study included only Oklahoma residents who died within the state. Resident deaths outside of Oklahoma or out-of-state residents that died in Oklahoma were excluded.

Prescription drug monitoring programs are a promising intervention to prevent diversion of prescription drugs and to assist practitioners in appropriate prescribing decisions.[6] Oklahoma has a nationally-recognized, real-time prescription monitoring program (PMP). In 2013, legislation was enacted that allows the OSDH and the Oklahoma Department of Mental Health and Substance Abuse Services to access identified PMP data. The IPS currently

has web query access to the PMP, and will have access to the full PMP database for linkage with unintentional poisoning deaths by January 2015. This linkage will provide a more accurate prescription history as well as identification of decedents with a history of opioid analgesic use versus opioid analgesic-naïve patients.

Conclusion

Unintentional poisoning deaths have increased dramatically since the late 1990s, both in Oklahoma and the United States. Oklahoma has one of the highest unintentional poisoning rates in the United States. In general, in Oklahoma from 2007-2012, men were more likely than women to die of an unintentional poisoning, and mortality rates were highest among adults 35-54 years of age. Women aged 45 years and older had higher rates of unintentional prescription drug-related poisoning mortality than men.

Of the five most common substances involved in unintentional poisoning deaths in Oklahoma from 2007-2012, all were prescription drugs, and four of the five were opioid analgesics. Oklahoma is one of the leading states in painkiller prescriptions per capita.[7] From 2007-2012, Oklahoma ranked highly for the distribution of many common opioids, including hydrocodone, fentanyl, morphine, and meperidine.[8]

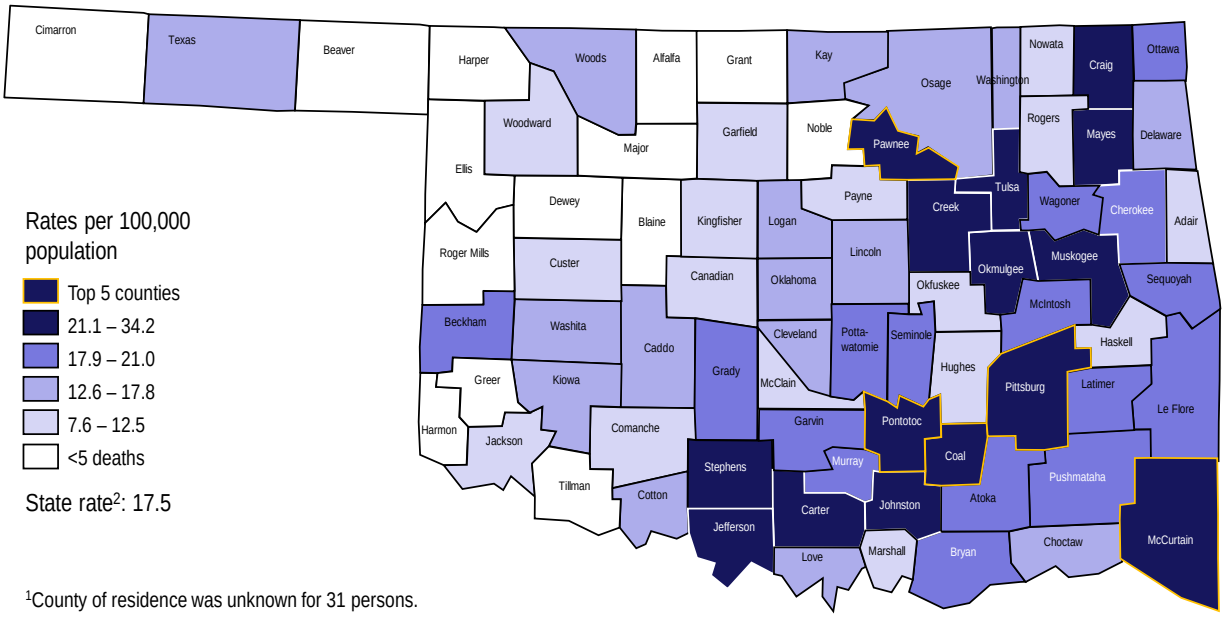
This study supports previous research that indicated an increased risk of overdose death for individuals with a history of mental illness, chronic pain, and/or substance abuse.[9]

Prescription Drug Planning Workgroup

In September 2012, the Prescription Drug Planning Workgroup was commissioned by the Oklahoma Prevention Leadership Collaborative, as a Governor's initiative, to develop a state plan to reduce prescription drug abuse in Oklahoma. The workgroup includes members from multiple state agencies and stakeholders, including:

- Oklahoma State Department of Health
- Oklahoma Department of Mental Health and Substance Abuse Services
- Oklahoma Bureau of Narcotics and Dangerous Drugs Control
- State regulatory boards
- Oklahoma Hospital Association
- Oklahoma Health Care Authority (state Medicaid agency)
- Other public safety and law enforcement agencies
- Other education and health agencies

Figure 8. Unintentional Poisoning Death Rates by County of Residence[1], Oklahoma, 2007-2012



[1]County of residence was unknown for 31 persons.

Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database (Abstracted from Medical Examiner reports)

The workgroup created a state plan, *Reducing Prescription Drug Abuse in Oklahoma*. The plan includes seven recommended focus areas and associated commitments to action at the state and community levels (examples in Table 7). The recommended focus areas include community/public education; provider/prescriber education; disposal/storage of medication, for the public and for providers; tracking and monitoring of prescriptions; regulations and enforcement; and treatment/interventions. Each commitment to action includes an expected date of completion and a responsible party.

Table 7. Selected Statewide Commitments to Action from *Reducing Prescription Drug Abuse in Oklahoma*

<table>
<tr>
<td>Community/Public Education
- Statewide comprehensive media campaign
- Create and deliver educational presentations on prescription drug abuse consequences and prevention
- Encourage the Certified Healthy Oklahoma Programs to add prescription drug abuse to application criteria</td>
<td>Provider/Prescriber Education
- Develop curriculum to educate health care students on prescribing practices and diversion
- Develop and require overdose prevention training curriculum completion to obtain prescribing authority for controlled substances
- Develop and promote opioid prescribing guidelines
- Promote policies that discourage drug-seeking/doctor-shopping behavior</td>
</tr>
<tr>
<td>Disposal/Storage for the Public
- Increase number of medication disposal drop boxes (at least one in each county)
- Create a website with drop box locations and proper use information
- Provide proper medication storage information to patients, including the use of lock boxes</td>
<td>Disposal/Storage for Providers
- Establish a medication disposal unit under a law enforcement agency
- Dedicate resources to develop and administer training curriculum for non-prescribing staff on appropriate storage, transfer, and disposal of medications</td>
</tr>
<tr>
<td>Tracking and Monitoring
- Enhance PMP to identify trends and reduce fraud
- Increase use of the PMP by prescribers
- Examine required provider PMP queries
- Share record level de-identified PMP, Medicaid, and other state payer source data for research purposes</td>
<td>Regulatory/Enforcement
- Prevention of opioid deaths and diversions selected as a state priority by Governor’s office
- Limit the number of hydrocodone refills
- Increase number of CLEET-certified investigators on regulatory boards
- Review, strengthen, and expand lock-in programs by prescription claim payers</td>
</tr>
<tr>
<td colspan="2">Treatment/Interventions
- Implement and evaluate a pilot naloxone program
- Promote a registry of assessment/treatment service providers
- Conduct a statewide needs assessment on substance abuse treatment options
- Increase funding and expand use of community-based services for treatment
- Increase Screening, Brief Intervention, and Referral to Treatment (SBIRT) by primary care and ED providers
- Establish “Good Samaritan” legislation
- Establish legislation to authorize dispensing of naloxone to family members, first responders, etc.</td>
</tr>
</table>

References

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Appendices

Appendix Table 1. Deaths Involving* Prescription Drugs, Illicit Drugs, or Alcohol by Year of Death
Unintentional Poisonings, Oklahoma, 2007-2012

Drug	2007	2008	2009	2010	2011	2012	Total
All unintentional poisoning	579	602	659	661	655	717	3873
Prescription drugs	474	509	541	511	503	537	3075
Opioid analgesics	438	446	472	445	416	460	2677
Anti-anxiety	152	153	176	177	180	169	1007
Alcohol	77	98	104	110	115	90	594
Methamphetamine	39	37	68	96	101	122	463
Cocaine	67	46	39	45	48	44	289

*Substances listed in cause of death
Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database
(Abstracted from Medical Examiner reports)

Appendix Table 2. Most Common Substances* by Year of Death
Unintentional Poisonings, Oklahoma, 2007-2012

Drug	2007	2008	2009	2010	2011	2012	Total
Hydrocodone	118	116	133	141	127	152	787
Oxycodone	115	121	129	135	130	161	791
Alprazolam	131	114	134	133	109	112	733
Methadone	171	117	100	91	69	80	628
Morphine	60	80	75	72	94	82	463
Fentanyl	44	56	77	51	48	57	333
Diazepam	24	32	41	40	44	31	212
Carisoprodol	13	46	34	35	38	32	198
Tramadol	11	24	22	23	30	40	150
Citalopram	12	20	22	27	22	13	116
Alcohol	77	98	104	110	115	90	594
Methamphetamine	39	37	68	96	101	122	463
Cocaine	67	46	39	45	48	44	289
Heroin**	<5	11	18	6	16	29	80

*Substances listed in cause of death
**Heroin was not one of the most common substances, but was included for comparison.
Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database
(Abstracted from Medical Examiner reports)

Appendix Table 3. Unintentional Poisoning Death Rates by County of Residence,** Oklahoma, 2007-2012

Rank	County of residence	Number of deaths	Rate per 100,000
1	Pawnee	34	34.2
2	Pontotoc	60	26.9
3	Coal	9	25.5
4	McCurtain	48	24.1
5	Pittsburg	65	23.8
6	Jefferson	9	23.3
7	Muskogee	98	23.1
8	Creek	96	23.0
9	Johnston	15	22.9
10	Stephens	61	22.7
11	Tulsa	806	22.4
12	Carter	63	22.1
13	Okmulgee	51	21.4
14	Craig	19	21.2
15	Mayes	52	21.1
16	Latimer	14	21.1
17	LeFlore	62	20.6
18	Cherokee	58	20.6
19	Bryan	51	20.2
20	Grady	63	20.1
21	McIntosh	24	19.8
22	Ottawa	37	19.3
23	Seminole	29	19.1
24	Wagoner	82	18.9
25	Pushmataha	13	18.9
26	Atoka	16	18.8
27	Murray	15	18.7
28	Beckham	25	18.6
29	Sequoyah	46	18.3
30	Garvin	30	18.2
31	Pottawatomie	75	18.0
32	Oklahoma	765	17.9
33	Caddo	31	17.7
34	Kiowa	10	17.6
35	Choctaw	15	16.5
36	Osage	44	15.5
37	Woods	8	15.3
38	Washington	44	14.4
39	Washita	10	14.4
40	Love	8	14.2
41	Delaware	35	14.1
42	Lincoln	28	13.7
43	Cotton	5	13.5
44	Cleveland	204	13.4
45	Texas	16	13.1
46	Logan	32	12.9
47	Kay	35	12.6
48	Nowata	8	12.5
49	Okfuskee	9	12.3
50	Kingfisher	10	11.2
51	Adair	15	11.1
52	Rogers	57	11.0
53	McClain	22	10.7
54	Garfield	37	10.3
55	Woodward	12	9.9
56	Payne	45	9.8
57	Comanche	68	9.3
58	Haskell	7	9.2
59	Canadian	63	9.2
60	Hughes	7	8.5
61	Marshall	8	8.5
62	Custer	13	7.9
63	Jackson	12	7.6
64	Grant	0	0.0
65	Harper	0	0.0
	Harmon	*	*
	Greer	*	*
	Roger Mills	*	*
	Beaver	*	*
	Alfalfa	*	*
	Tillman	*	*
	Ellis	*	*
	Dewey	*	*
	Cimarron	*	*
	Blaine	*	*
	Major	*	*
	Noble	*	*
		3842	17.2

*Data suppressed due to small number of deaths.
**31 decedents had an unknown county of residence
Source: OSDH, Injury Prevention Service, Unintentional Poisonings Database
(Abstracted from Medical Examiner reports)