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Health Impacts of Methamphetamine Use in Alaska

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Executive Summary

In the midst of a nationwide opioid epidemic, many states are also experiencing a surge in methamphetamine use and methamphetamine-related overdose mortality. This report seeks to provide an overview of methamphetamine use patterns and related health impacts in Alaska.

Methamphetamine use rose in popularity throughout the United States during 2001–2004, and was accompanied by widespread increases in methamphetamine-related chemical incidents, hospitalizations, and overdoses. In response, on March 9, 2006, the Federal Government enacted the Combat Methamphetamine Epidemic Act of 2005 to regulate retail over-the-counter sales of ephedrine, pseudoephedrine, and phenylpropanolamine, which are used in methamphetamine production. Subsequently, states experienced a lull in methamphetamine-related incidents until 2008, after which, methamphetamine producers developed methods to bypass these restrictions (e.g., purchasing permitted quantities of precursor ingredients from different locations using false identification and the assistance of other persons, and using different methods of production that require smaller amounts of the precursor chemicals) and thus continue making the drug. Recently, large quantities of high-purity methamphetamine have been produced in Mexico and smuggled across the southwestern border, allowing the street price of methamphetamine to drop dramatically. As a result, the Drug Enforcement Administration stated in its 2016 National Drug Threat Assessment Summary that although the current opioid crisis has received substantial (and well-deserved) national attention, methamphetamine use continues to pose a considerable threat to the Nation's health.

The rate of hospital care in Alaska due to poisoning by amphetamines (which includes methamphetamine in the ICD-9 and ICD-10 coding) increased by nearly 40% during 2015–2016, and the rate of methamphetamine-related mortality increased 4-fold during 2008–2016. During 2014–2016, mortality rates were highest among persons aged 45–54 years and among persons living in the Gulf Coast region; however, meth-related mortality rates are escalating across a broad spectrum of demographic groups statewide.

Finally, methamphetamine is commonly used in combination with other drugs, such as alcohol, benzodiazepines, cocaine, and heroin and other opioids. As such, it is important to strengthen partnerships between all agencies and organizations in Alaska that work to address substance misuse and abuse.

Background

Methamphetamine (or "meth") is one of the top 10 drugs involved in drug overdose deaths in the United States, and its use has grown substantially in recent years.[1] The age-adjusted rate of overdose deaths related to meth more than doubled during 2010–2014, and the estimated number of emergency department (ED) visits related to meth increased by 66% from 2007 to 2011.[1,2]

Chemically, methamphetamine is very similar to amphetamines, many of which are legally prescribed to treat narcolepsy and attention deficit hyperactivity disorder (ADHD).[3] Both are stimulants that act on the central nervous system to increase alertness, enhance concentration, and elevate heart rate and blood pressure. They create an initial high in the user by flooding the brain with dopamine, a neurotransmitter that plays a key role in emotion, movement, pleasure, and pain.[4,5] However, the structure of meth differs from amphetamines in that it contains a methyl group that makes the molecule less polar and allows it to enter the brain more easily.[6] As a result, the high created by meth is more rapid and intense than that of amphetamines, making meth far more dangerous and addictive.[6] As such, amphetamines are given in low doses to children struggling to focus in school, while meth is largely illegal.[3,7]

However, the health risks of meth extend beyond its potential for addiction. Chronic meth use is associated with extreme weight loss, severe dental problems ("meth mouth"), anxiety, insomnia, paranoia, hallucinations, and violent behavior.[5] The drug also acts to increase libido, reduce inhibitions, and impair judgement–the combination of which can make meth users more susceptible to risky sexual activity and exposure to HIV, viral hepatitis, and other sexually transmitted diseases.[8] Users who inject meth, as opposed to smoking, snorting, or swallowing the drug, are also at increased risk for contracting bloodborne pathogens.[5] Finally, the changes that are made to the body's dopamine system often result in emotional and cognitive problems, many of which persist long after drug use has stopped.[5]

A further danger posed by meth stems from the relative simplicity of its recipe.[9] Only a handful of household products are required for meth production, encouraging many meth users to attempt to cook the substance on their own in discrete, often poorly-ventilated household labs.[9] Because many of the ingredients are toxic and highly flammable, the reaction is prone to combustion even when performed by trained chemists, and more so when conducted by meth users under the influence of the drug while cooking.[9] Additionally, many meth labs have become mobile with the "shake-and-bake" method of production, which gained popularity around 2008.[10] This method involves combining small amounts of precursor chemicals in a 2-liter bottle, which is highly dangerous as the bottle can burst, resulting in burn injuries.[10] Meth ingredients retain their volatility for long periods of time, meaning that even abandoned meth labs are susceptible to explosion, and cleaning up meth labs is both expensive and difficult.[11] The average cost to clean up a single meth lab exceeds $4,000, and every pound of meth produced results in approximately six pounds of toxic waste.[9,11] In this way, meth use affects not only the user, but the entire community.

The purpose of this review is to characterize the problem of meth use and its associated health impacts in Alaska.

Methods

Data were obtained from multiple surveillance systems and databases to provide insight into the prevalence, morbidity, and mortality associated with methamphetamine use in Alaska. Youth Risk Behavior Survey (YRBS) data were obtained using the 'Explore Datasets' query module in the Alaska Indicator Based Information System (AK-IBIS).[i] Through this tool, the 'YRBS – Statewide' dataset was queried to determine the percentage of traditional high school students who answered affirmatively to having used meth one or more times during their lifetime. Further queries allowed for stratification of this population by sex, race, and grade. This dataset was also used to obtain the prevalence of lifetime use among Alaska alternative high school students. An additional query of the 'YRBS – Local' dataset was conducted to obtain the prevalence of lifetime use among students in correctional high schools, as well as regional estimates of lifetime use among traditional high school students.

YRBS statewide data are weighted to the statewide high school population from which they were drawn. Prevalence estimates for Alaska traditional, alternative, and correctional high school students are representative of these populations.[12] As the YRBS is conducted biennially, statewide traditional high school data were available for 2007, 2009, 2011, 2013, and 2015. Statewide alternative high school data were available for 2009, 2011, 2013, and 2015, and correctional high school data were available for 2007-2015, although a statewide correctional high school survey was not fully implemented until 2011.

[i] http://ibis.dhss.alaska.gov/query/Introduction.html

Emergency medical service run data were obtained from the Anchorage Fire Department (AFD), which provided data on patients transported by AFD Emergency Medical Services (EMS) to local hospitals in 2016. Meth-related EMS runs were isolated by performing key word searches in the text fields of the electronic Patient Care Reports. Patients were included in the study if they admitted to using meth within 24 hours of the event, or if reports from bystanders or law enforcement suggest meth use.

Data on amphetamine-related hospital care during 2015–2016 were obtained from the Health Facilities Data Reporting Program. Due to transitioning in the system from voluntary to mandated reporting of discharge data by hospitals in December 2014, only the 2015–2016 data were available for analysis. Hospital care attributed to poisoning by amphetamines (including meth) were identified using ICD-9-CM codes (969.72, poisoning by amphetamines) and ICD-10-CM codes (T43.621–624, poisoning by amphetamines; ICD-9-CM coding changed to ICD-10-CM coding on October 1, 2015). Because diagnosis codes represent the more general category of amphetamines and thus are not specific to meth, we are unable to determine the proportion of poisonings by amphetamine that involved meth. Discharge records with a primary or secondary diagnosis of poisoning by amphetamines were further analyzed by patient demographics, discharge status, length of stay, medical costs, and the involvement of alcohol and other drugs in the poisoning event using ICD-9-CM codes (980 – toxic effect of alcohol; 960-979 – poisoning by drugs, medicinals, and biological substances) and ICD-10 codes (T51 – toxic effect of alcohol; T36-50 – poisoning by drugs, medicaments, and biological substances).

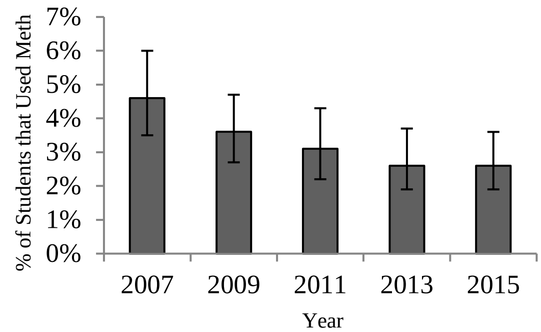
Death certificates from the Alaska Health Analytics and Vital Records (HAVR) Section were analyzed for meth-related deaths during 2008–2016. Meth-related deaths were broken down into two subcategories: a) non-overdose deaths, defined as non-overdose deaths having "meth" or "methamphetamine" listed in the *underlying or contributory cause* of death field, in the text entry of the *description of injury* field, or in the text entry of the *significant conditions contributing to death* field of the death certificate, and b) overdose deaths, defined as overdose deaths having "meth" or "methamphetamine" listed in the *underlying or contributory cause* of death field, in the text entry of the *description of injury* field, or in the text entry of the *significant conditions contributing to death* field of death certificates that were ICD-10-coded as unintentional drug poisoning (X40–44), suicide drug poisoning (X60–64), homicide drug poisoning (X85), or drug poisoning of undetermined intent (Y10–Y14). (Note: meth was not necessarily the cause of death among overdose decedents with multiple substances listed on their death certificate).

Results

Youth Methamphetamine Use in Alaska

From 2007–2015, YRBS estimated that an average of 3.3% of traditional high school students had used meth one or more times in their lifetime, with the percentage ranging from 4.6% in 2007 to 2.6% in 2015 (Figure 1).

Figure 1. Percentage of Traditional High School Students who Reported Using Meth One or More Times During Their Lifetime — Alaska, 2007–2015



Past or current meth use was comparable among male students and female students (3.7% and 2.6%, respectively; Table 1). Meth use by race was most common among Black students (6.8%) and least common among Asian students (1.0%; Table 1). By region, Southeast Alaska experienced the highest percentage of traditional high school students answering positively to having used meth, closely followed by the Gulf Coast region (4.3% and 4.2%, respectively), while the Interior, Southwest, and Northern regions experienced the lowest percentages (2.5%, 2.5%, and 2.1%, respectively; Table 1).

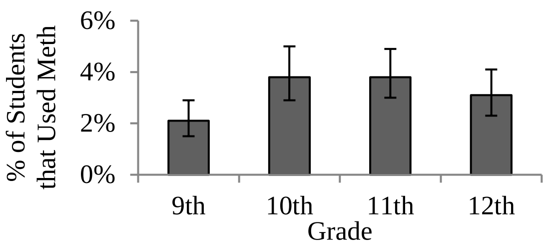
Table 1. Percentage of Traditional High School Students Who Reported Using Meth One or More Times During Their Lifetime — Alaska, 2007–2015

Sex	Percent	95% CI*
Male	3.7%	3.1 - 4.4%
Female	2.6%	2.1 - 3.3%
Race[†]	**Percent**	**95% CI**
Alaska Native	2.3%	1.5 - 3.6%
Asian	1.0%	0.4 - 2.9%
Black	6.8%	4.1 - 11.2%
Native Hawaiian/PI	2.9%	1.3 - 6.3%
White	3.0%	2.5 -3.7%
Hispanic	6.2%	4.5 - 8.5%
Multiple Races	4.6%	3.1 - 6.8%
Region	**Percent**	**95% CI**
Anchorage	3.6%	3.0 - 4.2%
Mat-Su	3.3%	2.4 - 4.4%
Gulf Coast	4.2%	3.6 - 4.8%
Interior	2.5%	1.9 - 3.4%
Northern	2.1%	1.6 - 2.7%
Southeast	4.3%	3.8 - 4.9%
Southwest	2.5%	1.8 - 3.4%

**CI = Confidence Interval.*
[†]*Alaska Native is defined as any mention of Alaska Native descent, and individuals in this category are not counted in the Hispanic or Multiple Races categories.*

Methamphetamine use by grade was highest among traditional high school students in grades 10 and 11 (Figure 2).

Figure 2. Percentage of Traditional High School Students Who Reported Using Meth One or More Times During Their Lifetime, by Grade Level — Alaska, 2007–2015



Youth methamphetamine use also varied dramatically by school setting, with correctional facilities reporting the highest percentages of high school student methamphetamine use, followed by alternative high schools, and traditional high schools (28.6%, 14.4%, and 3.3%, respectively).

Meth-related EMS Runs (Anchorage)

In 2016, 19,335 patients were transported to local hospitals by AFD EMS. Of these, 221 (1%) were suspected to have been using meth within 24 hours of transport. Of the patients involved in meth-related EMS runs, 117 (53%) were male and 196 (89%) were either AI/AN or White (Table 2). People aged ≤39 years comprised 86% of the patient population, and people aged 25–34 years comprised 52% of the patient population (Table 2). Polydrug use was common among these patients, with alcohol (55, 25%) being the substance most used in combination with meth, followed by heroin (39, 18%) and spice (22, 10%; Table 2).

Table 2. Characteristics of Meth-Related AFD EMS Runs — Anchorage, 2016 (N=221)

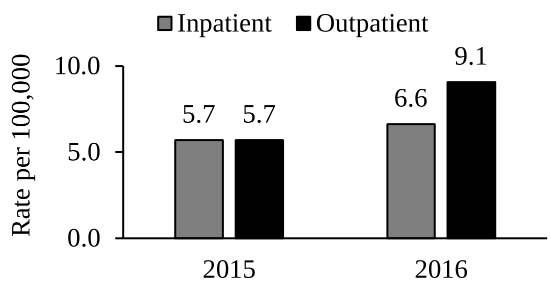
Sex	Count	Percent
Male	117	53%
Female	104	47%
Race	**Count**	**Percent***
AI/AN	97	44%
White	99	45%
Black	6	3%
Asian/PI	2	1%
Other	4	2%
Unknown	13	6%
Age Group (years)	**Count**	**Percent***
15–19	12	5%
20–24	31	14%
25–29	59	27%
30–34	55	25%
35–39	32	14%
40–44	11	5%
45–49	6	3%
50–54	13	6%
60–64	1	0%
65–69	1	0%
Drug Combinations	**Count**	**Percent***
Alcohol	55	25%
Heroin	39	18%
Synthetic Cannabinoids (spice)	22	10%
Cocaine	12	5%
Other opioids	6	3%
Bath salts	2	1%

**Percentages do not sum to 100% due to rounding.*

Hospital Care for Amphetamine-Related Poisonings

During 2015–2016, a total of 200 hospital discharge records were identified with a primary or secondary diagnosis of poisoning by amphetamines, including meth; 91 were inpatient and 109 were outpatient. The rate of amphetamine-related (including meth) hospital care increased by 38% from 11.4 per 100,000 persons in 2015 to 15.7 per 100,000 persons in 2016. This was largely attributable to an increase of outpatient care from 5.7 per 100,000 persons in 2015 to 9.1 per 100,000 persons in 2016, which coincided with a data coding change in the final quarter of 2015 (Figure 3).

Figure 3. Rates of Amphetamine-Related Hospital Care — Alaska, 2015–2016 (N=200)



During 2015–2016, rates of amphetamine-related hospital care were higher among males than females overall (14.3 and 12.8 per 100,000 persons, respectively; Table 3). Rates for outpatient care more than doubled among females in 2016 (6.8 compared to 7.9 per 100,000 males and 4.5 compared to 10.3 per 100,000 females).

Rates by race were highest among AI/AN people followed by Blacks (26.9 and 11.0 per 100,000 persons, respectively; Table 3). The rate of amphetamine-related hospital care among AI/AN people increased by over 30% from 2015 to 2016 (23.3 per 100,000 persons in 2015 compared to 30.5 per 100,000 persons in 2016).

Rates of amphetamine-related hospital care by region were highest in Anchorage, followed by the Northern, Matanuska-Susitna, and Gulf Coast regions (18.2, 14.4, 13.8 and 9.3 per 100,000 persons, respectively; Table 3). Compared to 2015, outpatient care increased in all of the aforementioned regions; of these, the Mat-Su region experienced the largest increase.

Rates of amphetamine-related hospital care by age group were highest among people aged 25–29 years and 35–39 years during 2015–2016 (35.3 and 29.8 per 100,000 persons, respectively; Table 3). Twelve (6%) hospital discharge records involved children aged 0–4 years (Table 3).

Table 3. Demographic Characteristics of Amphetamine-Related Hospital Care — Alaska, 2015–2016

Demographic	Rate per 100,000 (count)		
	Inpatient (N=91)	Outpatient (N=109)	Total (N=200)
Sex			
Total	6.2 (91)	7.4 (109)	13.5 (200)
Male	6.9 (53)	7.3 (56)	14.3 (109)
Female	5.3 (38)	7.4 (53)	12.8 (91)
Race			
AI/AN	11.6 (29)	15.3 (38)	26.9 (67)
White	3.6 (37)	4.5 (46)	8.0 (83)
Black	(5)	(3)	11.0 (8)
Asian/PI	(3)	(2)	(5)
Other/ Unknown	(17)	(20)	(37)
Region of Injury			
Anchorage	8.2 (49)	10.0 (60)	18.2 (109)
Mat-Su	4.9 (10)	8.9 (18)	13.8 (28)
Gulf Coast	4.9 (8)	4.3 (7)	9.3 (15)
Interior	4.0 (9)	3.1 (7)	7.1 (16)
Northern	(3)	(5)	14.4 (8)
Southeast	4.1 (6)	4.7 (7)	8.8 (13)
Southwest	(0)	(2)	(2)
Other/ Unknown	(6)	(3)	(9)
Age Group (years)			
0–4	(4)	7.5 (8)	11.3 (12)
10–14	(0)	(3)	(3)
15–19	(4)	8.3 (8)	12.5 (12)
20–24	8.7 (9)	16.4 (17)	25.1 (26)
25–29	14.6 (17)	20.7 (24)	35.3 (41)
30-34	7.0 (8)	10.5 (12)	17.5 (20)
35–39	16.4 (16)	13.3 (13)	29.8 (29)
40–44	12.7 (11)	12.7 (11)	25.4 (22)
45–49	6.7 (6)	6.7 (6)	13.3 (12)
50–54	10.7 (11)	(1)	11.7 (12)
55–59	(3)	(3)	5.7 (6)
60+	(2)	(3)	(5)

**Rates based on fewer than 20 observances are statistically unreliable and should be used with caution; rates based on ≤5 occurrences are not reported.*

Of the 200 hospital discharge records identified during 2015–2016, 66 (33%) indicated poisoning due to amphetamines plus at least one additional drug. The most common additional drugs involved in amphetamine-related poisonings included opioids, heroin, hallucinogens (such as synthetic cannabinoids or "spice"), cocaine, benzodiazepines, and alcohol (Table 4). At least two other drugs were identified in 22 (11%) instances of hospital care, and at least three other drugs were identified in 4 (2%) instances of hospital care (Table 4).

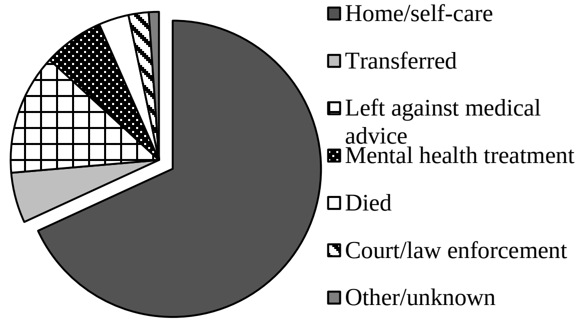
Table 4. Other Substances Involved in Amphetamine-Related Hospital Care — Alaska, 2015–2016 (N=200)

	Count	Percent
Amphetamines Alone	134	67%
Amphetamines in Addition to		
≥1 other drug	66	33%
1 other drug	44	22%
2 other drugs	18	9%
≥3 other drugs	4	2%
Amphetamines in Addition to		
Any opioid (incl. heroin)	25	13%
Heroin	18	9%
Hallucinogens	13	7%
Cocaine	11	6%
Benzodiazepines	10	5%
Alcohol	7	4%
Antidepressants	7	4%
Antipsychotics	5	3%

Of the 91 individuals admitted for inpatient care, 62 (68%) were admitted for emergency (necessary to reduce the risk of loss of life) care, 26 (29%) for urgent (quick but not immediate action to reduce risk of loss of life) care, and 2 (2%) for elective care. This information was unavailable for 1 (1%) inpatient.

Most (62, 68%) patients involved in amphetamine-related hospitalizations returned home after hospitalization; 5 (5%) were transferred for further care, 12 (13%) left against medical advice, 6 (7%) entered a mental health treatment facility, 3 (3%) died, 2 (2%) entered the custody of the court/law enforcement, and 1 (<1%) was of other/unknown final disposition (Figure 4). The length of hospital stay for amphetamine-related hospitalizations ranged from 1–24 days (median: 2 days). The cost of hospital care ranged from $425 to $655,027 (median cost: $34,649) for hospitalizations and from $254 to $34,203 (median cost: $4,605) for outpatient hospital services. The total inpatient cost associated with amphetamine poisoning during 2015–2016 exceeded $5.3 million, and the total outpatient cost exceeded $657,000.

Figure 4. Final Disposition of Patients Involved in Amphetamine-Related Hospitalizations — Alaska, 2015–2016 (N=91)



Meth-Related Fatalities

During 2008–2016, 233 meth-related fatalities were identified; 193 (83%) were overdose fatalities and 40 (17%) were non-overdose fatalities. The highest number of meth-related fatalities identified in one year was 65 in 2016; of which, 53 (82%) were due to overdose (Table 5). The 3-year moving average number of meth-related fatalities increased steadily over the 9-year time period (Figure 5).

Of the 233 meth-related fatalities identified during 2008–2016, 204 (88%) were unintentional, 6 (3%) were suicides, 1 (<1%) was a homicide, 14 (6%) were the result of natural causes, and 8 (3%) were of undetermined manner of death. Of the 193 meth overdose fatalities, 182 (94%) were unintentional, 6 (3%) were suicides, and 5 (3%) were of undetermined manner of death.

Of the 193 meth overdose fatalities, 43 (22%) were due to meth alone and 150 (78%) involved at least one substance in addition to meth (Table 6). Opioids (including heroin) were involved in 54% of meth overdose deaths; amphetamines and cocaine were also frequently used in combination with meth among the meth-related fatality decedents identified here (Table 6).

Of the 40 non-overdose meth fatalities identified during 2008–2016, the most common underlying causes of death were heart disease (10, 25%), exposure to excessive heat/cold (4, 10%), asthma (2, 5%), drowning (2, 5%), falls (2, 5%), and heart attack (2, 5%).

Table 5. Number of Meth-Related Fatalities, by Year and Type of Death — Alaska, 2008–2016 (N=233)

Year	Overdose Deaths (N=193)	Non-Overdose Deaths (N=40)	Total
2008	5	0	5
2009	12	5	17
2010	5	4	9
2011	17	2	19
2012	23	5	28
2013	22	1	23
2014	30	3	33
2015	26	8	34
2016	53	12	65

Figure 5. Three-Year Moving Average Number of Meth-Related Fatalities, by Year and Type of Death — Alaska, 2008–2016 (N=233)

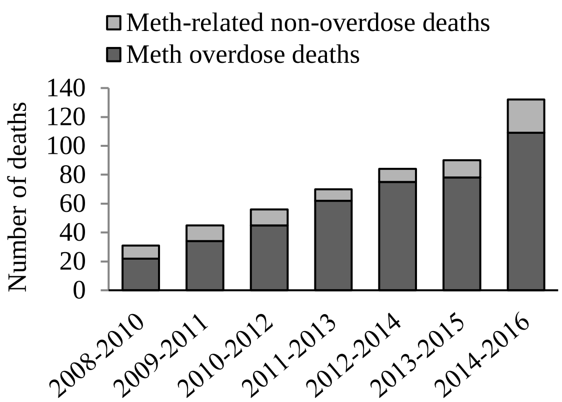
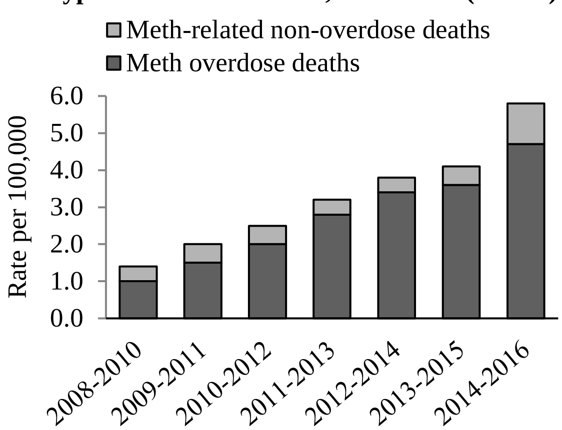


Figure 6. Rate of Meth-Related Mortality, by Year and Type of Death — Alaska, 2008–2016 (N=233)



During this period, the meth-related mortality rate increased over 4-fold (from 1.4 per 100,000 persons during 2008–2010 to 5.8 per 100,000 persons during 2014–2016; Figure 6). Rates of meth-related mortality by sex increased during 2008–2016 for both sexes, with males experiencing consistently higher rates than females (Table 7). Rates by race also increased across all races during this time period, with AI/AN people experiencing the highest rates, generally followed by Whites (Table 7).

By region, the Gulf Coast experienced the highest rates of meth-related mortality, ranging from 3.8 per 100,000 persons during 2009–2011 to 9.5 per 100,000 persons during 2014–2016 (Table 7). Southeast Alaska generally experienced the second highest rates of meth-related mortality, ranging from 3.3 per 100,000 persons during 2010–2012 to 6.2 per 100,000 persons during 2014–2016 (Table 7). The Northern and Southwest regions of Alaska experienced the lowest burden of meth-related mortality (Table 7).

Mortality rates by age group increased among all people aged 15–64 years, with people aged 35–44 years experiencing the highest rates of meth-related mortality from 2011–2015 (Table 7). Rates among people aged 25–34 and 45–54 years increased dramatically from 2013–2015 to 2014–2016 (from 6.1 to 9.8 per 100,000 persons among people aged 25–34 years and from 6.9 to 11.9 per 100,000 persons among people aged 45–54 years; Table 7).

Table 6. Other Substances Involved in Meth-Related Fatalities — Alaska, 2008–2016

Single or Multi-drug Categorization	Count (%)		
	Overdose (N=193)	Non-Overdose (N=40)	All Meth-Related (N=233)
Meth Alone	43 (22%)	25 (63%)	68 (29%)
Meth in Addition to			
≥1 other drug	150 (78%)	15 (38%)	165 (71%)
1 other drug	69 (36%)	7 (18%)	76 (33%)
2 other drugs	38 (20%)	6 (15%)	44 (19%)
≥3 other drugs	43 (22%)	2 (5%)	45 (19%)
Meth in Addition to			
Any opioid (incl. heroin)	104 (54%)	6 (15%)	110 (47%)
Heroin	54 (28%)	1 (3%)	55 (24%)
Amphetamine	98 (51%)	5 (13%)	103 (44%)
Cocaine	25 (13%)	2 (5%)	27 (12%)

Table 7. Demographic Characteristics of Meth-Related Decedents, by 3-Year Interval — Alaska, 2008–2016 (N=233)

Demographic	Rate per 100,000 persons (# of victims)						
	2008–2010	2009–2011	2010–2012	2011–2013	2012–2014	2013–2015	2014–2016
Sex							
Male	1.4* (16)	2.2 (26)	3.3 (39)	4.4 (50)	4.8 (55)	5.1 (59)	7.3 (87)
Female	1.4* (15)	1.8* (19)	1.6* (17)	1.8* (19)	2.7 (28)	3.0 (30)	4.2 (45)
Race							
AI/AN	3.0* (11)	3.8* (13)	4.8* (16)	5.1* (16)	7.1 (22)	6.8 (22)	7.3 (33)
White	1.2* (19)	1.9 (31)	2.2 (37)	3.0 (48)	3.3 (54)	3.9 (61)	4.1 (89)
Black	(1)	(1)	(1)	(0)	(1)	(1)	3.6* (6)
Asian/PI	(0)	(0)	(2)	3.6* (6)	4.0* (7)	3.2* (6)	(4)
Region							
Anchorage	1.5* (14)	2.0* (19)	2.5 (22)	2.7 (24)	3.1 (28)	3.6 (34)	5.3 (51)
Mat-Su	(5)	(5)	(5)	2.6* (7)	3.9* (10)	3.5* (9)	4.0* (11)
Gulf Coast	(5)	3.8* (9)	4.2* (10)	6.6* (15)	7.5* (17)	7.6* (17)	9.5 (23)
Interior	(4)	2.0* (7)	2.2* (8)	2.4* (8)	2.9* (11)	4.3* (15)	6.1 (22)
Northern	(0)	(0)	(1)	(2)	(2)	(1)	(1)
Southeast	(3)	(5)	3.3* (9)	4.5* (12)	4.8* (13)	4.7* (12)	6.2* (15)
Southwest	(0)	(0)	(1)	(1)	(1)	(0)	(2)
Age Group (years)							
0–14	(1)	(2)	(1)	(1)	(0)	(0)	(1)
15–24	(4)	(3)	(3)	(4)	2.2* (7)	3.5* (11)	4.2* (13)
25–34	3.0* (9)	5.1* (16)	6.2 (20)	6.3 (21)	6.5 (22)	6.1 (21)	9.8 (34)
35–44	2.8* (8)	3.9* (11)	4.3* (12)	7.5 (21)	8.6 (24)	9.7 (27)	10.1 (28)
45–54	2.6* (9)	3.3* (11)	4.9* (16)	5.3* (17)	7.7 (24)	6.9 (21)	11.9 (35)
55–64	(0)	(2)	(4)	(5)	2.0* (6)	3.0* (9)	6.4* (19)
65+	(0)	(0)	(0)	(1)	(1)	(1)	(2)

**Rates based on <20 observances are statistically unreliable and should be used with caution; rates based on ≤5 occurrences are not reported here.*

Discussion

Methamphetamine use represents an important cause of morbidity and mortality in Alaska, and the prevalence of meth-related adverse health outcomes is increasing. During 2008–2016, 233 meth-related fatalities were identified, and the rate of meth-related mortality increased 4-fold. Moreover, during 2015–2016, 200 hospital discharge records were identified with a primary or secondary diagnosis of poisoning by amphetamines (including meth), and the rate of amphetamine-related outpatient hospital services in Alaska increased by nearly 60%.

Meth-related mortality rates increased over time across all regions, races, and age groups, suggesting that meth use is becoming more broadly pervasive in Alaska. That said, several disparities were apparent in the data presented here, providing insight into the groups and regions that may benefit most from interventions. For example, the Southeast and Gulf Coast regions experienced the highest proportions of high school students who reported using meth during 2007–2015, the Anchorage and the Northern regions had the highest rates of amphetamine-related hospital care during 2015–2016, and the Gulf Coast region experienced the highest rates of meth–related mortality during 2009–2016. People aged 25–29 years accounted for the highest rates of amphetamine-related hospital care, by age, for all years reviewed, and AI/AN people accounted for the highest rates of amphetamine-related hospital care and mortality, by race, for all years reviewed.

Meth use is associated with numerous adverse health consequences, including emotional and cognitive problems that continue even after long periods of abstinence from the drug.[5] Meth use tends to begin during late adolescence to early adulthood nationally, with the mean age at first use ranging from 17–22 years (2002–2012 data).[13] From 2007–2015, an average of 3.3% of Alaska traditional high school students reported using meth, slightly less than the national average of 3.7%.[14] Alaska traditional high school students during 2007–2015 were more likely to use meth than use heroin (3.3% compared to 2.3%), but less likely to use meth than use cocaine (6.1%), ecstasy (6.2%), or prescription drugs without a prescription or differently than a doctor prescribed (16.3%; note: the Alaska YRBS did not ask about prescription drug misuse in 2007, so this percentage is an average over 2009–2015).[15]

The likelihood of high school students using meth during their lifetime was highest among 10th graders and 11th graders, underscoring a need for investing in early prevention interventions and maintaining them throughout a student's academic career. Additionally, the results presented here showed a substantial disparity among students in different school settings, with the percentage of students in correctional facilities having used meth being >8-fold higher than that of students in traditional high schools. This suggests that addiction treatment and prevention programs must be made available to students in correctional settings, with resources and support available to students after they are released to prevent relapse. However, it may also be worthwhile to investigate the number of students in correctional facilities for crimes related to drug use, and whether there is a more sustainable option for these students. For instance, many states have had success in enrolling these students in schools designed specifically for students recovering from addiction.[16]

Rates of amphetamine-related hospital care rose nearly 40% during 2015–2016, due primarily to an increase in amphetamine-related outpatient hospital services. As a result, outpatient visits represent an important opportunity to link persons who are using meth to care. Making social workers or case managers available to link patients to resources for substance abuse treatment can be particularly helpful for patients who might not seek routine care outside of their scheduled hospital visit.[17] Additionally, of the 200 amphetamine-related discharge records identified here, 33% involved at least one more drug in addition to amphetamines, with the most common being opioids (including heroin), hallucinogens (such as synthetic cannabinoids or "spice"), and cocaine. Polydrug use was even more common in meth-related fatalities, where 71% of meth-related fatalities involved at least one more drug in addition to meth. As such, it is important to fortify collaborative partnerships between the range of agencies and organizations in Alaska that work to address all forms of substance abuse to prevent meth-related morbidity and mortality.

Meth-related mortality rates showed a steady increase in deaths over the last decade. This increase should be interpreted in light of increased specificity in the reporting of specific drugs in overdose deaths over this period. Prior to 2008, very few overdose death certificates identified the substances involved in the death, generally stating "multidrug overdose" or something similar without providing further detail on specific substances of abuse. Death certificate coding of specific substances has improved markedly; now death certificates list the individual substances involved in the vast majority of overdose deaths. This limitation aside, the data described here illustrate that Alaska is experiencing a high burden of meth-related fatalities, most of which are due to overdose situations where meth was the sole drug identified (22%) or was one of multiple drugs identified (78%).

Alaska's Good Samaritan overdose prevention statutes were implemented with the intention of reducing overdose deaths by granting bystanders immunity from prosecution if they provide aid in the event of an overdose.[18] Bystander intervention benefits first responders and drug-users alike, as bystanders can provide medical and law enforcement personnel with information on the drugs involved in the overdose, streamlining treatment and improving the chances of survival for the individual who is overdosing. However, the Alaska Good Samaritan laws as they stand are limited in that they provide immunity from prosecution, but not from arrest, charge, or violations to probation/parole or restraining orders, which may still dissuade bystanders from taking action.[18] In light of Alaska's high drug overdose death burden, it may be beneficial to review these laws to determine if they could further encourage bystander intervention.

Limitations

YRBS data on meth use are limited in that the survey relies on high school students reporting truthfully on their use of an illegal drug. While survey responses are de-identified, students taking the survey may not feel comfortable admitting to past or current meth use, resulting in underreporting.

Data from the Anchorage Fire Department on EMS runs are limited in that no patient information is available after the patient arrives at the hospital. As a result, toxicology testing on patients is not available and suspected meth use must be derived from patient, bystander, and law enforcement accounts. Additionally, it is difficult to track patients and therefore the same individuals may be involved in multiple EMS runs, skewing the demographic information presented here.

The Health Facilities Data Reporting Program relies on ICD-9-CM and ICD-10-CM codes to describe patient injury and disease. ICD-9-CM codes were used prior to October 2015, after which the program switched over to ICD-10-CM. Both classification systems are limited in their ability to differentiate between the specific drugs involved in poisoning events, with separate codes existing for only heroin, cocaine, and methadone.[1] Meth shares an ICD-9-CM and ICD-10-CM code with amphetamines, and therefore the two drugs cannot be distinguished in hospital discharge records. Additionally, while ICD-10-CM codes allow for the separation of drug poisoning from adverse reactions of a drug (often following its administration in a medical setting), ICD-9-CM codes do not have this capability. As a result, data prior to October 2015 include both amphetamine poisonings and deaths resulting from adverse effects of amphetamines. Discharge records are also limited in that the ICD-9-CM and ICD-10-CM classification system does not capture toxicology information on patients beyond categories of drug poisonings, making it impossible to assess the role that meth plays in hospitalizations of other underlying cause. Finally, the dataset is limited in that it does not include hospital records from Southeast Alaska Regional Health Corporation, PeaceHealth Ketchikan, or military hospitals in Alaska, as these data were not available at the time of this report.

Death certificates use ICD-10 codes to describe the underlying and contributory causes of death among decedents. ICD-10 codes imported into the mortality database do not include a 5th digit of the code; therefore, meth shares an ICD-10 code with amphetamines, meaning that meth must be specified in the literal text of the death certificate for these cases to be identified. Although the reporting of specific drugs in the literal text of death certificates has improved over time, earlier death certificates may indicate the cause of death as "multidrug overdose" without providing further detail, resulting in missed methamphetamine deaths in earlier years of the report. Also, because of the increases in reporting specificity, it is impossible to say whether the rise in meth overdose mortality rates displayed here is the result of an increase in meth overdoses or an increase in reporting over time, or both.

The identification of meth overdose deaths is limited in that, in cases involving other substances in addition to meth, the relative role of each substance in causing the overdose cannot be determined. As a result, meth may not have caused some of the overdoses identified here that involved other substances, even though meth appeared on the death certificate. Finally, meth-related deaths not resulting from overdose may be underestimated here, as meth-associated mortality likely extends beyond the information listed on death certificates. For instance, for fatalities resulting from motor vehicle accidents, the death certificate would not indicate whether the crash was the result of a drugged driver, making it impossible to attribute these deaths to meth. Additionally, medical examiners generally do not perform toxicology testing beyond what is needed to determine cause and manner of death, meaning that the role of meth in a death would go unnoticed if there is not a strong suspicion of its involvement to encourage testing be performed. As a result, 233 deaths likely represents an underestimate of Alaska's total meth mortality over the time period examined.

Conclusion

In conclusion, meth use has been increasing in Alaska over the last decade, and the burden of meth-related morbidity and mortality extends statewide across a broad range of societal demographics. Given that meth users are frequently taking additional addictive substances concurrently with meth, it is important to strengthen partnerships between all agencies and organizations in Alaska that work to address substance misuse and abuse.

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