Emergency Room Utilization and Methamphetamine Overdose Symptoms Among Syringe Service Program Clients in Washington State

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Abstract

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Background: Methamphetamine overdose, also known as overamping or acute methamphetamine toxicity, can cause severe psychological and physical health issues including psychosis, heart attack, and death. People who use methamphetamine (PWUM) who experience methamphetamine overdose symptoms (MOS) are advised to seek emergency healthcare, however the factors related to seeking this care are not well characterized.

Methods: This study used data from the 2021 Washington State Syringe Service Program Survey, a cross sectional survey administered to syringe service program (SSP) clients at 21 participating SSP's in Washington state. Respondents answered questions related to substance use including ER utilization for methamphetamine use and whether they experienced psychological and physical MOS. We assessed the association between ER utilization for

methamphetamine use, non-fatal opioid overdose, and other key covariates among PWUM who experienced MOS using Poisson regression to calculate crude and adjusted prevalence ratios. We also tested if rurality or housing status modified the relationship between opioid overdose and ER utilization for methamphetamine use.

Results: Methamphetamine use in the last 3 months was reported by 822 (86%) of 955 respondents. Among PWUM, 31% reported psychological MOS, 19% reported physical MOS, and 37% reported at least one MOS. In the regression analysis we found that non-fatal opioid overdose (APR: 2.04, 95% CI 1.38-3.03), main drug of goofballs (APR: 1.92, 95% CI: 1.38-2.67) and recent blood infection/sepsis (APR: 2.07, 95% CI: 1.24-3.46) were associated with ER utilization for methamphetamine use among PWUM who experienced MOS. We found no evidence that rurality or housing status modified the association between opioid overdose and ER utilization for methamphetamine use.

Conclusion: Among PWID in Washington state, methamphetamine use remains high, and MOS are common. Recent non-fatal opioid overdose was associated with higher rates of ER utilization for methamphetamine use among PWUM who experienced MOS, suggesting patients in the ER for MOS should also be screened for opioid use disorder and linked with harm reduction supplies like Naloxone and medications for opioid use disorder (MOUD) like Methadone and Buprenorphine.

Introduction

Methamphetamine overdoses, sometimes called overamping or acute methamphetamine toxicity, can cause potentially fatal physical health outcomes including tachycardia, seizure, stroke, and heart failure as well as severe mental health symptoms including psychosis, anxiety, and depression[1–5]. Nationally there was a 180% increase in deaths involving psychostimulants (mostly methamphetamine) between 2015 and 2019[6]. In Washington state, where methamphetamine use has been more prevalent than other parts of the U.S. since the early 2000's and further increased over the past decade[7], drug poisoning deaths involving methamphetamine have increased from 4.9 per 100,000 residents in 2015 to 10.5 per 100,000 residents in 2020[8].

Compared to opioid overdoses, methamphetamine overdoses may be more difficult to identify and treat in healthcare settings. Opioid overdoses typically present as lethargy, loss of consciousness, and declining respirations or cessation of breathing[9]. Methamphetamine overdose symptoms (MOS) can include a variety of cardiac, neurological, and mental health symptoms. Opioid overdoses can be quickly reversed with the medication naloxone, while no comparable treatment is available for methamphetamine overdoses. Treatment recommendations for patients reporting MOS include evaluation and treatment for seizures, cardiac issues, and other physical symptoms, as well as supportive therapies such as benzodiazepines, antipsychotics, and fluids, which address the symptoms of methamphetamine overdose but are not biological antagonists of methamphetamine[10]. Patients reporting MOS may also present with severe agitation, requiring chemical and/or physical restraints to prevent injury to themselves or others.

Emergency Rooms (ERs) are a setting where overdoses from both methamphetamine and opioids are frequently treated[11,12]. A 2022 study in Massachusetts found that 5.5% of patients discharged from the ER after an opioid overdose died within 12 months[13], and in response, some ERs have started providing additional services after stabilizing patients

admitted for an opioid overdose such as medication for opioid use disorder (MOUD) initiation, naloxone distribution, and linkage to services[14]. In contrast to opioid overdoses – which have justifiably received substantial attention from national and local public health systems, healthcare providers, and the media - methamphetamine overdoses and the role of ERs in care and prevention is less understood. This could be due to several reasons including lack of awareness of the potential lethality of methamphetamine overdoses or how methamphetamine overdoses present in the ER. There are also fewer substance use disorder treatment options available specific to methamphetamine use disorder, let alone appropriate for implementation in an ER. While there have been trials of mirtazapine and bupropion/naltrexone as a medications for methamphetamine use disorder, the effects have been mixed or very modest at best[15]. While there is limited data on the risk factors for people discharged from the ER after a methamphetamine overdose, people discharged from the ER after an opioid overdose are known to be at increased risk of death[13]. A recent survey in King County, Washington found that 55.3% of PWID reported using heroin and methamphetamine together in the last 3 months, which means that a large proportion of PWID may be at risk for both a methamphetamine overdose and an opioid overdose[16], however no studies have specifically investigated a connection between ER utilization for methamphetamine use and non-fatal opioid overdoses. An association between the two could motivate future interventions for people reporting non-fatal methamphetamine overdoses. Any investigation should also take into account factors known to be associated with both opioid overdoses and ER utilization, such as rurality and homelessness[17–19].

This analysis used data from a 2021 Washington State survey of syringe service programs (SSPs) to identify the prevalence of MOS and covariates associated with ER utilization for methamphetamine use among PWUM who experienced MOS. Understanding the prevalence of MOS is needed to increase awareness of this issue among providers and to inform harm reduction and health care services. Further, describing covariates associated with

ER utilization for methamphetamine use could help identify groups at high risk for adverse health outcomes, such as people reporting a recent non-fatal opioid overdose, that are not seeking emergency healthcare. What role housing status and rurality play in modifying this relationship may also be of interest to program planners and policy makers.

Methods

Study Design

The 2021 Washington State SSP Health Survey (WA SSP Survey) was a cross-sectional survey conducted at SSPs in Washington State. The survey has been administered every other year since 2015, and is coordinated by the Addictions, Drugs, and Alcohol Institute (ADAI) at the University of Washington and Public Health – Seattle & King County[20]. The 2021 WA SSP Survey collected information on health topics related to substance use and injection drug use. Topics included demographics, substance use frequency, route of drug administration, syringe sharing behavior, health outcomes related to substance use, HIV and hepatitis C virus, healthcare utilization, and COVID-19[20].

Subjects and Setting

In the 2021 survey, 21 SSPs participated from 20 counties in Washington State. Participating SSPs were diverse and included urban and rural sites, fixed and mobile locations, and both health department run and community led non-profits. The eligibility criteria were intentionally broad; anyone seeking services at the SSP was considered eligible even if they did not use substances themselves, although most participants were people who inject drugs (PWID).

Data Collection

Data were collected through an interviewer administered survey that was conducted in-person at participating SSPs. Everyone seeking services during a defined study period (between 2-5 weeks depending on the site) was invited to participate in the survey with the goal of interviewing all participants (i.e., an attempted census). Each participant was allowed to complete the survey once. Responses were either entered directly into REDCap electronically or were collected on paper then later entered by ADAI staff. There was no monetary compensation for participating, although some sites provided candy. Data cleaning and merging was conducted by ADAI staff.

Measures

Methamphetamine Overdose Symptoms

Physical and mental health symptoms of methamphetamine overdose were assessed in two separate questions: “In the last 3 months, have you ever felt like you were having a heart attack, stroke or seizure while on meth?”, and “In the last 3 months, have you ever felt like you were losing your mind, manic, or psychotic while on meth”. A combined exposure variable “Any MOS” was created by combining the psychiatric and physiological symptom variables.

ER Utilization for Methamphetamine Use

The primary outcome was measured by the question: “in the last 3 months, how many times have you been to the ER because of a medical or psychiatric problem from meth”. A binary variable indicating any ER utilization for methamphetamine use was created to compare those who went at least once vs. never.

Covariates

The primary covariate of interest, non-fatal opioid overdose, was a binary measure of the participant experiencing at least one non-fatal opioid overdose in the last 12 months. Main drug

was assessed by a single question, “Which of these is your main drug?”. Only the four most frequently reported substances were included in the regression analysis: heroin, methamphetamine, heroin and methamphetamine together (goofball), and fentanyl. Methamphetamine route of administration (smoking, injecting, or both), any endocarditis, blood clots or blood infections such as sepsis, and abscess or skin infections like cellulitis were assessed through yes/no questions about experiences in the last 3 months. Questions about injection frequency (any drug) and methamphetamine use frequency asked about the number of days in the last 7 days and were categorized as: every day, 4-6 days, 1-3 days, or 0 days.

Gender was assessed by the question: “What best describes your gender” with the option to answer: Man, Trans Man, Woman, Trans Woman, Non-binary, or Another not listed. Due to small sample size, the answers “Trans Man”, “Trans Woman”, and “Non-binary” were collapsed into a single category “transgender or non-binary” (TGNB). Race/Ethnicity questions were non-mutually exclusive, meaning participants could choose all that applied to them. Each group was analyzed separately by comparing those who said yes vs no. Housing status was assessed in the survey as either “Permanent”, “Temporary/Unstable”, or “Homeless”. This analysis combined “Temporary/unstable” and “Homeless” into a single category “non-permanent housing” creating a binary variable for housing status. Incarceration in jail or prison was defined as any time spent in jail/prison in the last 12 months. Mental health counseling and use of any psychiatric medications were also documented in the last 12 months.

Metropolitan vs non-metropolitan status was assessed by the participant’s reported zip code where they slept the previous night using the United States Department of Agriculture’s 2010 Rural-Urban Community Area (RUCA) codes. RUCA codes categorize zip codes as metropolitan, micropolitan, small town, or rural commuting areas[21]. Based on previous work, it was anticipated that most participants would report a metropolitan zip code, so rurality was estimated as a binary measure comparing metropolitan to non-metropolitan zip codes.

Analysis

Only respondents reporting illicit substance use in the last 3 months were included in the final dataset. Descriptive statistics were calculated for the proportion of respondents who reported recent methamphetamine use, the prevalence of MOS among people who use methamphetamine (PWUM), and ER utilization for methamphetamine use among PWUM.

Crude and adjusted prevalence ratios (PR) estimating the association between covariates and ER utilization for methamphetamine use among PWUM who experienced MOS were calculated using Poisson regression. 95% Confidence intervals and p-values were calculated using cluster robust standard errors to account for heteroskedasticity across SSP's. Adjusted prevalence ratios (APR), 95% confidence intervals, and p-values were also calculated using Poisson regression and cluster robust standard errors, adjusting for covariates identified *a priori* that are known to be associated with ER utilization: age, gender, housing status and mental health service utilization[22].

Effect modification for the association between opioid overdose and ER utilization for methamphetamine use among PWUM who experienced MOS was estimated in two separate models, both using Poisson regression and cluster robust standard errors to calculate PR's, 95% confidence intervals and p-values. PRs for permanent vs. non-permanent housing status and metropolitan vs. non-metropolitan zip code were calculated, testing each as a potential effect modifier for the relationship between non-fatal opioid overdose and ER utilization for methamphetamine use among PWUM who experienced MOS.

The UW IRB determined previous versions of this survey to be exempt, and because the scope and risk of this version is the same, a new IRB exemption application was not submitted.

Results

Methamphetamine use in the last 3 months was reported by 822 (86%) of 955 total respondents. Among PWUM, the majority were male (58%), non-permanently housed (68%),

and reported living in a Metropolitan zip code (81%). The most common race reported was White (84%) followed by American Indian or Alaska Native (9%), Latino (7%), Black (4%), Native Hawaiian or other Pacific Islander (2%), Other (2%), and Asian (1%). Most were daily injectors with 71% reporting injecting 7 out of the last 7 days. The most common main drug reported was heroin by itself (35%) followed by methamphetamine by itself (33%) and goofballs (23%). Fentanyl was reported as a main drug by 4% of PWUM. Most reported going to the ER at least once in the last 12 months for any reason (54%) and 12% reported going to the ER for methamphetamine use in the last 3 months.

Among the 822 respondents who reported methamphetamine use, 816 had valid responses for questions related to MOS. Among PWUM, 31% reported psychological MOS, 19% reported physical MOS, and 37% reported at least one MOS. ER utilization for methamphetamine use in the last 3 months was 24% among people who reported at least one MOS, and 5% among people reporting no MOS.

In the regression analysis, recent non-fatal opioid overdose, main drug of goofballs, and blood infection/sepsis were found to be significantly associated with ER utilization for methamphetamine use in both the crude and adjusted models. Among people who experienced at least one MOS, recent non-fatal opioid overdose was associated with a higher prevalence of ER utilization for methamphetamine use compared to those who did not experience an opioid overdose (crude PR: 1.91, 95% CI 1.28-2.84, p-value 0.005, APR: 2.04, 95% CI 1.38-3.03, p-value 0.003). Main drug of goofballs was associated with higher prevalence of ER utilization for methamphetamine use compared to those whose main drug was not goofballs (crude PR: 1.93, 95% CI: 1.39-2.69, p-value 0.001, APR: 1.92, 95% CI: 1.38-2.67, p-value 0.002). Blood clot or blood infection such as sepsis was associated with ER utilization for methamphetamine use compared to those not reporting blood clots or blood infections (crude PR: 2.28, 95% CI: 1.33-3.91, p-value 0.011, APR: 2.07, 95% CI: 1.24-3.46, p-value 0.13).

We found no evidence of effect modification of the association between non-fatal opioid overdose and ER utilization for methamphetamine use among PWUM who experienced MOS by permanent vs non-permanent housing (ratio of PR's: 1.65, 95% CI 0.48- 5.68, p-value 0.38) or metropolitan vs non-metropolitan zip code (ratio of PR's: 1.20, 95% CI 0.29-4.89, p-value 0.77).

Discussion

The vast majority of survey respondents reported using methamphetamine in the last 3 months (86%) with nearly half (48%) reporting goofball use. Methamphetamine overdose symptoms were common among PWUM with 31% reporting psychological MOS, 19% reporting physical MOS, and 37% reporting at least one MOS in the last 3 months. Recent non-fatal opioid overdose, main drug of goofballs, and blood infection/sepsis were associated with higher rates of ER utilization for methamphetamine use among PWUM who experienced MOS. We found no evidence of effect modification of the association between opioid overdose and ER utilization for methamphetamine use by housing status or rurality of zip code.

This survey used self-reported MOS to measure the acute consequences of methamphetamine use which has important utility compared to other methods of studying this phenomenon. Other studies have described stimulant overdose/toxicity through medical record abstractions or through mortality data[1,5,11], which may detect severe and fatal cases, however it might miss self-treated overdoses that do not result in death or clinical presentations not coded as related to methamphetamine use. These studies do show a substantial increase in stimulant related ER visits over time; a national study of ER visit data from 2008-2018 found that psychostimulant-related ER visits increased from 2.2 per 10,000 to 12.9 per 10,000[11]. A cohort study of homeless or unstably housed women who use stimulants found a stimulant overdose rate of 117.4 per 100 person years, however most were crack cocaine users (81%) and only 48% used methamphetamine[2]. Our analysis found that 37% of PWUM experienced MOS in the

last 3 months, but only 24% of those individuals reporting having gone to the ER because of methamphetamine. In the context of very high and increasing methamphetamine use among people who use drugs (PWUD) in Washington state[7,8], this is a significant public health issue and suggests that many PWUM are not seeking emergency care when they experience MOS. Unfortunately, methods and strategies for reducing methamphetamine use and preventing MOS are limited. Medications for methamphetamine use disorder have shown some promise[15,23], however none so far have shown the high efficacy of MOUD such as methadone or buprenorphine[24]. Contingency management and cognitive behavioral therapy have been shown to be effective at treating methamphetamine use disorder (MUD) in specialty addiction treatment settings[25,26], and should be expanded across Washington state and studied for their effectiveness in low barrier, community based care settings. The majority of respondents in this survey were homeless or unstably housed (68%), and other research has shown that some people use methamphetamine to stay awake when they have no safe place to sleep at night[27]. Supportive housing, an intervention that has long been shown to decrease substance use, should be expanded in Washington state[28].

This analysis identified three factors that were independently associated with ER utilization for methamphetamine use among PWUM who experienced MOS, all of which may have public health implications. Reporting a previous non-fatal opioid overdose in the last 12 months, reporting goofballs as a main drug, and blood infection/sepsis in the last 3 months were each associated with higher rates of ER utilization for methamphetamine use among PWUM who experienced MOS. Non-fatal opioid overdose was pre-specified as the primary covariate of interest because it is such a significant predictor of mortality[13]. The positive association between non-fatal opioid overdose and ER utilization for methamphetamine use suggests that patients who go to the ER and experience MOS should also be screened for opioid use disorder and connected with harm reduction services including naloxone and MOUD like buprenorphine or methadone. Main drug of goofballs may be a residual association between opioid overdose and

ER utilization for methamphetamine use, because other studies have shown goofball users are at significantly higher risk of opioid overdose compared to those who use heroin by itself[16]. Implications for the association between recent blood infection/sepsis and ER utilization for methamphetamine use is less clear. It is likely that people who have significant health issues associated with injecting may go to the ER more frequently and are therefore more familiar with the ER and more likely to go when they experience MOS. Our analysis did not find a similar association for abscesses or endocarditis; however this could be due to statistical power considering endocarditis is rare and because abscesses are so common among PWID that they are not a good indicator of high healthcare utilization.

The concept of a “Methamphetamine overdose” is not clearly defined, and may be used differently by researchers, healthcare providers, and PWUM[4]. Medical texts refer to this phenomenon as “acute methamphetamine intoxication” or “methamphetamine toxicity”[29,30] while drug users sometimes call this “overamping”[4]. The 2021 WA SSP survey authors decided to focus these questions on the specific physiological and psychological symptoms associated with an acute methamphetamine adverse event, rather than directly asking if someone has overamped or experienced a methamphetamine overdose, which may differ in definition or familiarity between participants. Future studies should try to validate a measure of self-reported MOS. Systematic reviews investigating healthcare utilization for methamphetamine use have run into inconsistent definitions in part because ICD utilizes a broad category of psychostimulants that includes, but does not specify methamphetamine, and because many studies simply relied on urine toxicology regardless of the reason for the ER visit, which can cause substantial misclassification of PWUM that go to the ER for reasons wholly unrelated to MOS[5]. The two questions in the 2021 WA SSP survey assessing MOS could provide a foundation for a future validated measure or could be used by other studies for comparability with these findings.

This study has several additional important limitations. First, the cross-sectional study design prevents direct estimation of causal associations between ER utilization for methamphetamine and MOS. Second, the survey took place at SSP's which limits the generalizability of the results; individuals who use methamphetamine but don't inject may be less likely to utilize services at an SSP than people who inject, and they may experience MOS and seek ER services at different rates. Third, in the adjusted analysis we adjusted for gender, housing status, and age; however, this had little impact on the results. It is possible that there are covariates that we did not adjust for that are confounding the association between some of the covariates of interest and ER utilization for methamphetamine use. Fourth, all covariates that were significantly associated with ER utilization for MOS in this study are also consistent with high rates of ER utilization in general. PWUM who frequently go to the ER for serious health issues that also experience MOS may have reported that at least some of those visits were for methamphetamine use, even if that was not their chief complaint. It is possible that some or all of the associations found in this analysis are because people who go to the ER more often are more likely to go when they experience MOS.

Conclusion

MOS among people who use methamphetamine in Washington state were common (37%), which is a significant public health issue in the context of very high and increasing methamphetamine use among PWUD. ERs are often used by PWUD for healthcare and can be an important location for treating MOS and initiating treatment for MUD. Recent non-fatal opioid overdose was associated with higher rates of ER utilization for methamphetamine use among PWUM who experienced MOS, suggesting patients in the ER for MOS should also be screened for opioid use disorder and linked with harm reduction supplies like naloxone and MOUD including methadone and buprenorphine. Further research is needed to develop a validated measure to assess MOS, and additional harm reduction, engagement, and treatment options for

MUD are desperately needed. Public health officials, healthcare providers, and PWUD should not discount the potentially severe outcomes associated with MOS, even in midst of an opioid/fentanyl overdose crisis.

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Table 1. Physical, Psychological, or Any Methamphetamine Overdose Symptom (MOS) Among Respondents Reporting Methamphetamine Use in the Last 3 Months: 2021 Washington State SSP Survey

	Total	Physical MOS	No Physical MOS		Psychological MOS	No Psychological MOS		Any MOS[3]	No MOS[3]	
Characteristic	n=822	n=157 (19%)	n=662 (81%)	p-value[4]	n=253 (31%)	n=562 (69%)	p-value[4]	n=302 (37%)	n=514 (63%)	p-value[4]
Race[5]										
American Indian/Alaska Native	76 (9%)	19 (12%)	57 (9%)	0.175	26 (10%)	49 (9%)	0.477	35 (12%)	41 (8%)	0.086
Asian	9 (1%)	1 (1%)	8 (1%)	1*	1 (0%)	8 (1%)	0.287*	2 (1%)	7 (1%)	0.497*
Black/African American	33 (4%)	3 (2%)	30 (5%)	0.133	12 (5%)	21 (4%)	0.500	13 (4%)	20 (4%)	0.772
Latino/Hispanic	57 (7%)	10 (6%)	46 (7%)	0.796	16 (6%)	38 (7%)	0.816	19 (6%)	35 (7%)	0.774
Native Hawaiian/Pacific Islander	17 (2%)	1 (1%)	16 (2%)	0.220*	6 (2%)	10 (2%)	0.590*	7 (2%)	9 (2%)	0.573
White	689 (84%)	134 (85%)	553 (84%)	0.578	210 (83%)	476 (85%)	0.540	251 (83%)	435 (85%)	0.567
Other	14 (2%)	1 (1%)	13 (2%)	0.490*	8 (3%)	6 (1%)	0.042*	8 (3%)	6 (1%)	0.116
Gender				0.295*			0.005*			0.026
Man	476 (58%)	99 (63%)	376 (57%)		156 (62%)	317 (57%)		185 (61%)	290 (57%)	
Woman	331 (40%)	57 (36%)	272 (41%)		88 (35%)	239 (43%)		108 (36%)	218 (42%)	
TGNB[6]	14 (2%)	1 (1%)	13 (2%)		9 (4%)	5 (1%)		9 (3%)	5 (1%)	
Age Category				0.002			<0.001			<0.001
18-29	142 (17%)	38 (24%)	104 (16%)		63 (25%)	78 (14%)		71 (24%)	71 (14%)	
30-39	318 (39%)	50 (32%)	266 (40%)		93 (37%)	220 (39%)		111 (37%)	202 (39%)	
40-49	192 (23%)	47 (30%)	145 (22%)		60 (24%)	132 (23%)		76 (25%)	116 (23%)	
50-59	127 (15%)	18 (12%)	108 (16%)		29 (12%)	97 (17%)		36 (12%)	90 (18%)	
60+	42 (5%)	3 (2%)	39 (6%)		7 (3%)	35 (6%)		7 (2%)	35 (7%)	
Housing Status				0.025			<0.001			<0.001
Permanent	264 (32%)	36 (23%)	226 (34%)		55 (22%)	205 (37%)		70 (23%)	190 (37%)	
Temporary/Unstable	228 (28%)	50 (32%)	178 (27%)		69 (27%)	158 (28%)		86 (28%)	142 (28%)	
Homeless	329 (40%)	71 (45%)	257 (39%)		129 (51%)	198 (35%)		146 (48%)	181 (35%)	
Rurality				0.339			0.951			0.489
Metropolitan	654 (81%)	121 (79%)	530 (82%)		199 (82%)	450 (81%)		235 (80%)	415 (82%)	
Not Metropolitan	150 (19%)	33 (21%)	117 (18%)		45 (18%)	103 (19%)		58 (20%)	90 (18%)	
Main Drug				0.044*			0.417*			0.156*
Heroin by itself	290 (35%)	49 (31%)	241 (36%)		80 (32%)	208 (37%)		99 (33%)	189 (37%)	
Methamphetamine by itself	272 (33%)	57 (36%)	213 (32%)		85 (34%)	185 (33%)		98 (32%)	172 (33%)	
Goofballs	189 (23%)	37 (24%)	152 (23%)		67 (26%)	121 (22%)		77 (25%)	111 (22%)	
Crack cocaine by itself	2 (0%)	0 (0%)	2 (0%)		0 (0%)	2 (0%)		0 (0%)	2 (0%)	
Powder cocaine by itself	4 (0%)	1 (1%)	3 (0%)		0 (0%)	3 (1%)		1 (0%)	3 (1%)	
Heroin and cocaine together	7 (1%)	3 (2%)	4 (1%)		3 (1%)	4 (1%)		5 (2%)	2 (0%)	
Fentanyl	29 (4%)	4 (3%)	25 (4%)		8 (3%)	21 (4%)		9 (3%)	20 (4%)	
Methadone or Buprenorphine	5 (1%)	4 (3%)	1 (0%)		1 (0%)	4 (1%)		4 (1%)	1 (0%)	
Prescription opiate medications	4 (0%)	0 (0%)	4 (1%)		2 (1%)	2 (0%)		2 (1%)	2 (0%)	
Benzodiazepines	4 (0%)	2 (1%)	2 (0%)		2 (1%)	2 (0%)		2 (1%)	2 (0%)	
Alcohol	4 (0%)	0 (0%)	4 (1%)		0 (0%)	4 (1%)		0 (0%)	4 (1%)	

Another not listed	10 (1%)	0 (0%)	9 (1%)		5 (2%)	4 (1%)		5 (2%)	4 (1%)	
Refuse to answer	2 (0%)	0 (0%)	2 (0%)		0 (0%)	2 (0%)		0 (0%)	2 (0%)	
Methamphetamine Use Frequency, days/week[7]				0.094			0.032			0.013
7	411 (50%)	91 (58%)	318 (48%)		134 (53%)	275 (49%)		164 (54%)	244 (48%)	
4-6	166 (20%)	32 (20%)	134 (20%)		58 (23%)	106 (19%)		66 (22%)	99 (19%)	
1-3	202 (25%)	28 (18%)	173 (26%)		46 (18%)	153 (27%)		55 (18%)	145 (28%)	
0	39 (5%)	6 (4%)	33 (5%)		15 (6%)	24 (4%)		17 (6%)	22 (4%)	
Injection Frequency, days/week[7]				0.096			0.031			0.0235
7	544 (71%)	108 (72%)	435 (71%)		171 (71%)	370 (71%)		205 (72%)	335 (71%)	
4-6	67 (9%)	17 (11%)	49 (8%)		29 (12%)	36 (7%)		33 (12%)	33 (7%)	
1-3	119 (16%)	15 (10%)	104 (17%)		28 (12%)	91 (18%)		33 (12%)	86 (18%)	
0	35 (5%)	9 (6%)	25 (4%)		12 (5%)	22 (4%)		14 (5%)	20 (4%)	
Methamphetamine Route of Administration										
Smoking	660 (80%)	125 (80%)	533 (81%)	0.746	204 (81%)	450 (80%)	0.927	244 (81%)	412 (80%)	0.910
Injecting	573 (70%)	123 (79%)	447 (68%)	0.008	196 (77%)	373 (67%)	0.003	230 (76%)	339 (67%)	0.003
Smoking and Injecting	424 (52%)	93 (60%)	329 (50%)	0.032	150 (59%)	271 (49%)	0.005	176 (58%)	246 (48%)	0.005
Opioid outcomes										
Opioid Overdose	166 (20%)	49 (32%)	116 (18%)	<0.001	71 (28%)	94 (17%)	<0.001	86 (29%)	79 (15%)	<0.001
MOUD	117 (14%)	20 (13%)	96 (15%)	0.561	42 (17%)	74 (13%)	0.202	51 (17%)	65 (13%)	0.096
Healthcare Utilization										
ER Utilization for Methamphetamine	97 (12%)	48 (31%)	49 (8%)	<0.001	67 (27%)	29 (5%)	<0.001	73 (24%)	23 (5%)	<0.001
ER visit – any reason	435 (54%)	100 (66%)	334 (51%)	0.001	173 (69%)	257 (47%)	<0.001	198 (67%)	233 (46%)	<0.001
Ever tested for HIV	720 (88%)	137 (89%)	581 (88%)	0.782	222 (88%)	493 (88%)	0.9180	265 (89%)	450 (88%)	0.659
Ever tested for HCV	269 (36%)	62 (44%)	207 (35%)	0.039	93 (42%)	175 (34%)	0.0442	113 (43%)	155 (33%)	0.009
Injection related health Outcomes										
Abscess	275 (36%)	59 (40%)	216 (35%)	0.327	108 (45%)	165 (32%)	<0.001	126 (44%)	148 (31%)	<0.001
Endocarditis	16 (2%)	8 (5%)	8 (1%)	0.006*	7 (3%)	8 (2%)	0.259*	10 (4%)	6 (1%)	0.036
Blood Infection/Sepsis	46 (6%)	16 (11%)	29 (5%)	0.005	25 (11%)	20 (4%)	<0.001	30 (11%)	15 (3%)	<0.001
Mental Health										
Mental Health Counseling	185 (24%)	40 (28%)	144 (23%)	0.198	67 (29%)	116 (22%)	0.0416	80 (29%)	103 (21%)	0.0156
Mental Health medication	136 (18%)	32 (21%)	103 (17%)	0.169	60 (25%)	74 (14%)	<0.001	70 (25%)	64 (13%)	<0.001
Jail or Prison	214 (27%)	51 (33%)	163 (25%)	0.041	82 (33%)	130 (23%)	0.003	93 (32%)	121 (24%)	0.016

[1] "…felt like you were having a heart attack, stroke or seizure while on meth?" in the last 3 months
[2] "…felt like you were losing your mind, manic, or psychotic while on meth?" in the last 3 months
[3]Reported at least one methamphetamine overdose symptom (MOS) in the last 3 months
[4]Person's X^2 test used except where noted otherwise
[5]Respondents were able to choose all races that applied to them, and therefore may show up in multiple rows
[6]Transgender & non-binary: includes trans-man, trans-woman, and non-binary which were combined due to small cell counts
[7]Days of use reported in the last 7 days
*Fisher's exact test used when expected cell count were <5

Table 2: Factors Associated with ER Utilization for Methamphetamine Use Among PWUM Who Reported At Least One MOS: 2021 Washington State SSP Survey

	Crude			Adjusted[1]		
Characteristic	PR	95% CI[2]	p-value[2]	PR	95% CI[2]	p-value[2]
Opioid Overdose[3]	1.91	1.28 - 2.84	**<0.01**	2.04	1.38 - 3.03	**<0.01**
Age	1.02	0.99 - 1.05	0.30			
Race[4]						
American Indian/Alaska Native	1.10	0.68 - 1.78	0.66	1.07	0.57 - 2.01	0.79
Black/African American	1.62	0.96 - 2.71	0.06	1.61	0.93 - 2.8	0.08
Latino/Hispanic	1.56	0.47 - 5.17	0.36	1.52	0.54 - 4.26	0.32
Native Hawaiian/Pacific Islander	1.18	0.14 - 9.71	0.73	1.25	0.14 - 10.9	0.62
White	0.93	0.57 - 1.5	0.72	0.96	0.6 - 1.54	0.84
Other	0.51	0.02 - 10.78	0.42	0.46	0.05 - 4.41	0.27
Gender						
Man	1.16	0.66 - 2.04	0.56			
Woman	0.87	0.46 - 1.63	0.62			
TGNB[5]	0.91	0.05 – 15.24	0.88			
Main Drug[6]						
Methamphetamine	0.73	0.46 – 1.17	0.17	0.71	0.44 – 1.15	0.15
Heroin	0.71	0.5 – 1	0.05	0.73	0.51 – 1.04	0.08
Goofball	1.93	1.39 – 2.69	**<0.01**	1.92	1.38 – 2.67	**<0.01**
Fentanyl	1.87	0.44 – 7.96	0.22	2.26	0.6 – 8.5	0.14
Methamphetamine Use						
Smoking[7]	0.74	0.35 – 1.57	0.37	0.76	0.36 – 1.64	0.43
Injecting[7]	1.29	0.72 – 2.32	0.35	1.28	0.74 – 2.24	0.34
Smoking and Injecting[7]	0.97	0.57 – 1.63	0.88	0.99	0.59 – 1.68	0.98
Daily Meth Use[8]	0.80	0.49 – 1.32	0.34	0.81	0.47 – 1.39	0.40
Daily Injection (any drug)[8]	1.21	0.57 – 2.57	0.57	1.25	0.62 – 2.5	0.47

Healthcare Utilization[3]						
Mental Health Counseling	1.34	0.69 – 2.62	0.34	1.35	0.72 – 2.57	0.30
Mental Health Medication	1.32	0.66 – 2.65	0.38	1.31	0.68 – 2.54	0.37
MOUD	0.72	0.41 – 1.25	0.18	0.72	0.42 – 1.22	0.16
Housing						
Metropolitan Zip Code	0.80	0.36 – 1.8	0.54	0.85	0.36 – 2	0.66
Permanent vs Non-Permanent Housing	1.16	0.59 – 2.29	0.63			
Other Health Outcomes[7]						
Abscess	1.14	0.77 – 1.69	0.48	1.12	0.75 – 1.68	0.54
Endocarditis	1.83	0.63 – 5.32	0.19	1.61	0.52 – 5	0.29
Blood Infection/Sepsis	2.28	1.33 – 3.91	**0.01**	2.07	1.24 – 3.46	**0.01**
Jail[3]	1.44	0.73 – 2.81	0.26	1.53	0.83 – 2.81	0.15

[1]Adjusted for gender, housing status, and age
[2]Using cluster robust standard errors clustered on SSP
[3]In the last 12 months
[4]Transgender & non-binary, including trans-man, trans-woman, and non-binary, combined due to small cell counts
[5]Asian removed due to small cell counts
[6]Each category treated independently as a binary measure
[7]In the last 3 months
[8]In the last 7 days