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Overdose and Adverse Drug Event Experiences among Adult Patients in the Emergency Department

Amy S.B. Bohnert[a,b,c], **Maureen A. Walton**[c,d], **Rebecca M. Cunningham**[c,e], **Mark A. Ilgen**[b,d], **Kristen Barry Haenchen**[d], **Stephen T. Chermack**[b,d], and **Frederic C. Blow**[b,d]

[a]Department of Psychiatry, Mental Health Innovations, Services, and Outcomes program, University of Michigan, 2800 Plymouth Rd, Bldg. 16, Ann Arbor, MI 48109

[b]Veterans Affairs Center for Clinical Management Research, 2800 Plymouth Rd, Bldg. 16, Ann Arbor, MI, 48109

[c]University of Michigan Injury Center, 2800 Plymouth Rd, Suite B10-G080, Ann Arbor, Michigan, 48109

[d]Department of Psychiatry, Addiction Center, University of Michigan, 4250 Plymouth Rd, Ann Arbor, MI 48109

[e]University of Michigan, Department of Emergency Medicine, 1500 Medical Center Dr, Ann Arbor, MI 48109

Abstract

Introduction—Overdose is a leading cause of injury and death in the United States. Emergency Department (ED) patients have an elevated prevalence of substance use. This study describes overdose/adverse drug event experiences among adult ED patients to inform strategies to address overdose risk.

Methods—Patients seeking care at a large ED in the city of Flint, Michigan participated in a computerized self-assessment during 2011–2013 (n=4,571). Overdose was assessed with a broad definition and included occurrences that could be considered adverse drug events. Among those with this type of experience, additional items assessed symptoms, outcomes, and intent.

Results—12% reported an overdose history. Of participants' most serious overdoses, 74% were without clear intent for self-harm, although this was true of only 61% of overdoses involving opiates or sedatives, and 52% had symptoms present that indicated that it was life-threatening. Binge drinking on a monthly basis (ORs =1.4) was associated with a medically serious overdose

Corresponding Author: Amy Bohnert, Ph.D., 2800 Plymouth Rd., Bldg. 16, Room 227W, Ann Arbor, MI 48109; phone: 734-845-3638; amybohne@med.umich.edu.

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compared to never having an overdose. Compared to no drug use in the last year, use of one drug was associated with an OR of 1.8, two drugs was associated with an OR of 5.8, three drugs was associated with an OR of 8.4, and four or more drugs was associated with an OR of 25.1 of having had a medically serious overdose (all $p<0.05$).

Conclusions—Most overdose experiences among ED patients were without clear intent of self-harm. The ED may be an appropriate setting for efforts to reduce overdose risk, especially among polysubstance users.

Keywords

overdose; emergency department; substance use; suicide

1. Introduction

The rate of drug overdose death increased 137% between 2000 and 2014 (Rudd et al., 2016). This increase has been driven in large part by prescription opioids, and in the last several years, heroin (Compton et al., 2016). Additionally, in 2007, there were an estimated ~700,000 emergency department (ED) visits due to drug and medication poisonings (Xiang et al., 2011). Non-fatal unintentional overdoses per year also increased 82 to 330 per 100,000 Americans between 2001 and 2013 (Centers for Disease Control and Prevention, 2013).

In addition to changing prescriber behavior, overdose prevention strategies have sought to change the behavior of individuals at risk for overdose or likely to witness an overdose to improve bystander response. This includes programs providing naloxone (an opiate overdose antidote) and training on its use (e.g., Walley et al., 2013). A critical first step in such approaches is to identify which individuals are at greatest risk and where these individuals have contact with the healthcare system or community programs.

Formative survey-based research towards overdose prevention traditionally focused on chronic drug users. In these studies, prior non-fatal overdose history is a strong predictor of future overdose (Caudarella et al., 2016; Coffin et al., 2007), and individuals who have had an overdose themselves have witnessed more overdoses (Bohnert et al., 2012). Consequently, settings that serve individuals with a history of overdose may be well-suited for overdose prevention interventions. To date, interventions to improve overdose witness behavior and reduce overdose risk behavior have been implemented or pilot tested in needle exchange programs, HIV education drop-in centers, addictions treatment programs, and primary care (Albert et al., 2011; Coffin et al., 2016; Huriaux, 2007; Walley et al., 2013).

Individuals with substance use problems are overrepresented in EDs relative to the general community (Cunningham et al., 2003; Fuda and Immekus, 2006). ED physicians treat individuals immediately following overdoses and also prescribe opioids and sedatives, which are substance types implicated in many overdoses (Calcaterra et al., 2013). Additionally, for many individuals who use inner-city EDs, it is their primary source of care (Pane et al., 1991). Consequently, ED-based universal screening methods, particularly in urban areas,

may identify individuals at elevated risk for experiencing or witnessing an overdose and who may not be engaged in ongoing medical care.

The present study was designed to examine the overdose history of adults presenting at an urban ED in order to identify correlates of prior non-fatal overdose, with a focus on types of substance use, and to examine the nature of prior overdose experiences (e.g., intent, symptoms). This data will help inform overdose prevention interventions for the ED, as well as the field more generally. We had two primary hypotheses. First, we hypothesized that prior overdoses more commonly be "unintentional" rather than the result of suicidal behavior because of the relative proportions of overdose deaths in each of these categories (CDC, 2016). Second, we anticipated that past-year use of a greater number of drug types (i.e., polysubstance use) would be associated with overdose history due to the known role of drug-drug interactions in overdose risk (Cone et al., 2004).

2. Methods

2.1 Study Design and Setting

Data were obtained from a screening survey of a randomized controlled trial examining the efficacy of brief interventions to reduce drug use among adult ED patients (Blow et al., 2017). The study occurred at a Level 1 Trauma Center in Flint, Michigan called Hurley Medical Center (HMC). HMC is the only public hospital in Flint. A Certificate of Confidentiality from the National Institute of Drug Abuse (NIDA) was obtained, and the University of Michigan and HMC Institutional Review Boards approved study protocols.

Sampling details are provided in a prior report (Bonar et al., 2014). Recruitment occurred from February 2011 through March 2013, with days of the week covered on a rotating schedule. Recruitment periods were randomly sample and primarily occurred during evening shifts (triage from 4:00 pm to 12:00 am) with a small number of daytime and overnight shifts. Research staff identified initially eligible patients ages 18–60 using the ED's electronic tracking system. Exclusions determined through this screening step included conditions that precluded informed consent (e.g., acute psychosis, unconscious, medically unstable) and acute suicidality. For shifts when potentially more patients would be seen in the ED than could be recruited, random selection procedures (rotating ED sections, pre-selected random digits matched to patient account numbers) were used to select a sub-set of patients to approach to enhance generalizability. In total, 13,230 patients present in the ED during study shifts were not approached, with the most common reasons included random selection (n=6,880), enrollment in other studies or previously being screening for this study (n=1,569), and being too sick to recruit (n=941; see details in Bonar et al., 2014).

Research staff approached potential participants identified through these methods. Of 10,818 patients eligible to approach, 6,160 (57%) were able to be contacted by research staff (e.g., not missed due to discharge). Of those approached, 4,573 (74.2%) patients provided written informed consent and took a 15-minute computerized self-administered screening survey. Compensation was a dollar store gift ($1.00 value).

2.2 Measures

2.2.1 Overdose Experiences—Lifetime overdose experience was assessed via the question "Have you ever taken too much drugs, alcohol, or medications/pills, or more than your body could handle?" This item was intentionally broad in its definition in order to have a sensitive measure of overdose experiences because it was unknown whether ED patients would identify relevant experiences with the term "overdose." Thus, this definition includes what are considered "adverse drug events," as well as alcohol poisoning or "black outs." Participants reporting a history of overdose responded to additional items about the most serious/worst overdose using the following prompt: "Think about your worst experience or when you felt the sickest from taking too much drugs, alcohol, or medications/pills." These items assessed symptoms, treatment received, substances involved, and intent of the overdose.

Several indicators were generated from information about the worst overdose. A "Severe Overdose" event was identified with any of the following symptoms: lost consciousness, difficulty or stopped breathing, skin turned blue or pale, collapsed, could not be woken up, heart attack, and convulsions. Several categorical indicators classified the most serious overdose experiences by the substances involved. For these variables, tobacco and marijuana were not considered due to the lack of evidence that consumption causes fatal overdose. The most serious overdose experience was coded as involving stimulants if the participant reported taking cocaine, methamphetamine, or prescription stimulants, and coded as involving opiates or sedatives if the participant reported taking heroin, prescription sedatives, or prescription pain medications. An additional group was defined as an overdose that only involved alcohol. Participants were able to be classified in multiple categories related to substance type with the exception of the alcohol-only category.

2.2.2 Demographics—Items from the Substance and Outcomes Module-User's Manual (SAOM) (Smith et al., 1996) gathered participant's age, gender, marital status (coded to married/living together verses all others), current employment status (yes/no), and education (coded to less than high school diploma verses high school diploma or higher). Race/ethnicity items were obtained from the National Survey of Drug Use and Health items (NSDUH; Office of Applied Studies, 2009); low frequencies of race options other than African American prompted the creation of a binary variable for race (African-American vs. non-African American). An additional binary variable indicated Hispanic ethnicity. Self-rated health was assessed using one item from the Short Form-12 (Ware et al., 1996), which asks participants, "In general, would you say your health is…" with options of "excellent," "very good," "good," "fair," and "poor." Responses were recoded into a binary variable indicating "fair" or "poor" vs. all other responses, based on the preliminary analysis indicating that this provided a reasonable cut-point in terms of proportion of the sample within each group (34.7% in the fair/poor) and differentiation in the prevalence of overdose experiences (14.7% in fair/poor vs. 10.7% in all others).

2.2.3 Reason for ED visit—Participants reported yes/no to whether or not their ED visit was due to an injury or other reasons.

2.2.4 Alcohol and Drug Use—The Alcohol Use Disorders Identification Test (AUDIT) assessed frequency, quantity, and duration of past twelve month alcohol use (Saunders et al., 1993). For the purposes of this study, regular binge drinking, defined as 5 or more drinks a day on a once monthly basis or more often was the primary variable of interest. This cut-point was based on preliminary analysis indicating that the prevalence of overdose experiences was notably higher among those who reported binge drinking monthly (21.0%), weekly (28.1%) or daily/near daily (36.8%) compared to never (7.6%) or less than monthly (16.3%).

Drug use was measured by the Alcohol, Smoking and Substance Involvement Screening Test (WHO ASSIST Working Group, 2002). For each drug (cocaine, marijuana, prescription opioids, prescription sedatives, prescription stimulants, street opioids/heroin, or other drugs), participants indicated if they had used the drug one or more times in the past twelve months. Responses then generated indicators of any use of each specific drug, as well as number of drugs used within the past twelve months (0, 1, 2, 3, or ≥4).

2.3 Data Analysis

Analyses were conducted using SAS 9.2. Chi-square (χ^2) and independent samples *t*-tests were conducted for demographics, health, and substance use in relation to overdose history. A multinomial logistic regression analyzed the relationship between overdose history (severe, non-severe, and none) and substance use characteristics, adjusting for select key demographic variables (age, gender, race, and health status). Descriptive analyses examined symptoms and outcomes of the worst overdose experience among the subsample of those with one or more lifetime overdose experiences, including within subgroups defined by the substance(s) involved in the worst overdose experience. Bivariate testing compared sub-groups when possible (i.e., when mutually exclusive). Finally, overdose intent was examined in subgroups defined by substances involved in the worst overdose experience. There was no missing data on substance use and overdose history and missing data for one person on variables from the most serious overdose experience.

3. Results

3.1 Recruitment

Over the recruitment period, 4,573 patients completed the survey. Analyses comparing those completing the survey with those who were missed and those who refused showed that both non-completing categories were more likely to be male (χ^2=93.9; p<.0001 and χ^2=31.03; p<.0001). Patients who refused were also more likely to be under 30 years of age (χ^2=16.5; p<.0001). There were no statistically significant differences based on race, and no other data could be collected to assess non-response biases without written informed consent.

3.2 Sample Overdose History

In this ED patient sample, 553 (12.1%) reported ever having an overdose experience, 287 (51.9%) of whom reported a worst overdose experience that was considered a severe overdose. A substantial portion (45.4%) of worst overdose experiences involved only alcohol, 175 (31.6%) involved opiates or sedatives, and 121 (21.9%) involved stimulants; 63

(11.4%) did not involve any of these three types of substances. Medically serious overdose experiences were commonly (n=147) attributed to more than one of the four substances known to be potentially lethal (alcohol, opiates, sedatives, and stimulants). Of the most serious overdose experiences, 58 involved both opiates/sedatives and stimulants. Alcohol was also involved in 44.0% of worst overdose experiences involving opiates or sedatives and 69.4% of worst overdose experiences involving stimulants.

Bivariate analyses (Table 1) indicated that participants with an overdose history were significantly older, more likely to be male and less likely to be African American or to have graduated high school. Participants with an overdose history were also more likely to report fair or poor health status, past year use of all substances, and regular binge drinking over the past year compared to those without an overdose history. Additional bivariate comparisons indicated that African American participants were more likely to have had a worst overdose experience involving only alcohol compared to involving opiates or sedatives. Those whose worst overdose experience involved opiates, sedatives, or stimulants were also less likely to be employed and more likely to report fair or poor health than those whose worst overdose experience was due to alcohol only.

We next estimated a regression model with simultaneous entry of an indicator of the number of drug types used in the past year, a binge drinking indicator, and key demographic characteristics (Table 2). The findings were suggestive of a dose-response association, where the likelihood of having experienced an overdose increased for every additional drug used. This was true for both those participants whose worst overdose experience was classified as severe and those not classified as severe, compared to participants with no prior overdose. Binge drinking was associated with higher odds of both overdose categories compared to no prior overdose in the adjusted model. Male gender and fair/poor health status were significantly associated with severe overdose experiences compared to no prior overdose, but not non-severe overdose experiences. African American participants were not only less likely to have an overdose at all compared to participants identifying as any other race, but among those who had had an overdose, African Americans' overdoses were less likely to be severe.

3.3 Overdose Symptoms, Outcomes, and Intent

Those participants reporting a history of overdose (n=553) were asked additional questions about the worst overdose experienced. The most common symptom experienced regardless of substances involved or severity was nausea and vomiting, followed by blacking out and having no memory of what happened (Table 3). A third of participants also reported loss of consciousness, which was less common in alcohol-only overdoses and more common in opiate/sedatives or stimulant overdoses. Around one-quarter to one-third reported an unusually fast or slow heartbeat, collapsing, or shaking. In terms of outcomes/treatment experienced for the most serious overdose experience (Table 4), one-quarter reported waking up without help, one-quarter were admitted to the hospital, one-third went to the ED, and someone called 911 in one-quarter of the cases. Alcohol-only overdoses were less likely to result in a 911 call, an ED visit, or a hospitalization than overdoses involving to opiates,

sedatives, or stimulants. Overdoses categorized as severe were more likely to result in an ED visit or hospital admission, providing some validation of the classification of this category.

Most overdoses were not clearly a suicide attempt (26% Table 5); however, 21% were unsure of the reason. Overdoses involving alcohol only were less likely to be intentional. Those involving opiates or sedatives and those considered severe were more likely to be intentional.

4. Discussion

Our findings show that a history of overdose and/or adverse drug event is relatively common among ED patients, with 12.1% of a large sample of adults presenting to an urban ED reporting a prior event. This study used a definition of overdose that was intended to capture a wide range of overdose-like experiences. Slightly over half (51.9%) of overdose events had symptoms indicating a severe overdose. A more restrictive definition of overdose that would have greater precision could be based on meeting this threshold of severity, in which case the prevalence of overdose would be considered to be 6.3% in the sample..

Given the relatively small amount of research on overdose experiences in samples not recruiting specifically based on substance use, these findings provide novel information on non-fatal overdose experiences as well as present a strategy for survey data collection on overdose in general clinical samples. These data demonstrate that the ED may be particularly well-suited to identifying and intervening with individuals at risk for future overdose. Furthermore, only delivering overdose prevention services to those who are admitted for medical treatment of an overdose could miss this relatively large, and potentially important, subgroup of overdose survivors who may be identified through general screening.

A number of patient characteristics were associated with overdose history. Specifically, those who were older were more likely to have experienced an overdose. This is consistent with national data, in which the rate of non-fatal overdose peaks during ages 40 to 55 (Centers for Disease Control and Prevention, 2013). This may reflect the longer period of opportunity since substance use initiation to experience an overdose. Participants who identified as African-American or as female were less likely to have had an overdose, which is also consistent with national overdose mortality statistics (Centers for Disease Control and Prevention, 2016).

Individuals with use of more types of substance were more likely to have an overdose history. Additionally, more overdoses were attributed to a combination of opiates, sedatives, stimulants, and alcohol than to any one of these substances alone, with the exception of alcohol. Both findings may reflect the role of co-ingestion of multiple substances in causing overdose (Cone et al., 2004; Park et al., 2015). A recent study demonstrated the efficacy of a single session behavioral intervention delivered in the ED for reducing overdose risk behaviors among individuals reporting recent non-medical prescription opioid use (Bohnert et al., 2016), and findings from the present study support adapting the intervention to address a wider range of ED patients, with particular attention to polysubstance use.

Few prior studies have devoted attention to alcohol overdoses since the increase in overdose rates (e.g., White et al., 2011). Binge drinking was associated with overdose history after accounting for other substance use, and 45% of worst overdose experiences involved alcohol without opiates, sedatives, or stimulants. Although a large proportion of overdose deaths (Calcaterra et al., 2013) and non-fatal overdoses that result in ED visits (Substance Abuse & Mental Health Services Administration, 2013) are due to prescription opioids, alcohol may contribute to more overdose experiences across the spectrum of severity than indicated through these surveillance systems. While overdose prevention efforts have often focused on opiate overdoses (Albert et al., 2011; Dwyer et al., 2015; Huriaux, 2007; Walley et al., 2013), strategies for preventing alcohol-related overdose have generally received less attention, particularly outside of college campus settings. The present findings indicate that the ED may be well-suited to identifying individuals at risk for alcohol-related overdoses specifically.

The intent of overdoses has not been examined extensively outside studies recruiting individuals based on chronic drug use. In the present study, slightly over half of participants reported that their worst overdose experience was unintentional. Notably, 21% reported being unsure about their intent, potentially reflecting ambivalence. Individuals receiving ED care for a suicide attempt were excluded from this study, and results should be interpreted with caution when generalizing to all ED patients regarding suicidal behaviors. Nonetheless, the fairly high proportion reporting suicidal intent for a previous overdose in this sample indicates efforts to screen for overdose risk could incorporate assessment of past and present suicidal ideation. This is particularly relevant for preventing the most medically serious overdoses and those involving opiates or sedatives because these overdoses were more likely to be intentional. Additionally, overdose prevention interventions provided in the ED setting could incorporate content from suicide prevention approaches with established efficacy in ED settings (Brown et al., 2005) or provide referrals for acute suicide risk.

The ED has been the setting of screening, brief intervention, and referral to treatment approaches (SBIRT) (Murphy et al., 2013; Substance Abuse & Mental Health Services Administration, 2012). Brief interventions provided during a medical visit could capitalize on a “teachable moment” when patients may be more receptive to health interventions. Prior studies have demonstrated efficacy of this approach for alcohol and marijuana use (Cunningham et al., 2009). The present findings indicate that strategies to screen for alcohol and drug use in SBIRT protocols may be able to concurrently identify and intervene with individuals with elevated overdose risk. ED-based overdose prevention may be particularly important for economically-deprived areas, given the association of income inequality and environmental disorder with overdose mortality (Nandi et al., 2006).

There are several notable limitations of this study. First, data from this study were collected at a single ED and may not generalize to other EDs. Second, the data collection’s retrospective nature does not allow for causal inferences. In particular, overdose events reported in this study may have occurred many years prior to assessment, and substance use reported in the past year may or may not reflect substance use proximal to the overdose events. Third, ED visits related to acute suicidality were excluded, thus, the prevalence of overdose history is likely to be higher, and overdoses of suicidal intent are likely under-

represented. Fourth, available data does not allow for examination of psychiatric conditions, which are related to both intentional and unintentional overdose (Bohnert et al., 2013; Bohnert et al., 2010). Fifth, the overdose assessment measure in this study is novel, and greater validation is still needed. Finally, males were more likely to refuse participation, which may influence study generalizability.

4.1 Conclusions

Overdose experiences were relatively common among patients in this study conducted at an urban ED. Overdose prevention is an important health concern, but strategies for reducing overdose risk in the community are still emerging. The ED is a potentially important location for identifying individuals with prior overdose experiences at risk for future overdoses. Developing and providing ED-based overdose prevention strategies by screening ED patients has potential to make critical steps towards reducing overdose morbidity and mortality, particularly among individuals with polysubstance use.

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Highlights

- Prior overdose and adverse drug events are common for emergency department patients
- Prior overdose was associated with a greater number of drugs used in the past year
- Intent to self-harm was more common for overdoses involving opiates or sedatives
- Drug use screening in the emergency department could also address overdose risk

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Table 1

Bivariate associations of overdose (OD) history and patient characteristics.

	Entire Screening Sample (n=4,571)			Characteristics of Worst OD Experience, Among those with an OD History (n=553)			
	OD History N/mean (%/SD)	**No OD History N (%)**	**χ^2(df) or *t***	**Severe OD**	**OD involved Alcohol only**	**OD involved Opiates or Sedatives [a]**	**OD involved Stimulants [a]**
N in group	**553**	**4018**		**287**	**251**	**175**	**121**
Demographic Characteristics							
Age (mean)	35.3 (11.7)	34.1 (12.1)	−2.10 *	36.3 (12.2)	35.6 (11.9)	35.2 (12.0)	36.1 (11.1)
Female	291 (52.6)	2,752 (68.5)	55.0(1) *	146 (50.9)	136 (54.2)	94 (53.7)	58 (47.9)
Hispanic Ethnicity	35 (6.3)	213 (5.3)	1.0(1)	20 (7.0)	19 (7.6)	12 (6.9)	9 (7.4)
African-American Race	203 (36.7)	2,174 (54.1)	58.9(1) *	88 (30.7)	104 (41.4)	46 (26.3)^	43 (35.5)
High School Education	294 (53.2)	2,348 (58.4)	5.5(1) *	164 (57.1)	122 (48.6)	95 (54.3)	52 (42.9)
Currently Employed	184 (33.3)	1,493 (37.2)	3.2(1)	81 (28.2)	116 (46.2)	36 (20.6)^	25 (20.7)^
Health-Related Characteristics							
ED visit Injury	173 (31.3)	1156 (28.8)	1.5(1)	104 (36.2)	77 (30.7)	57 (32.6)	44 (36.4)
Health status: fair or poor	233 (42.1)	1,351 (33.6)	15.5(1) *	131 (45.6)	93 (37.0)	83 (47.4)^	61 (50.4)^
Substance Use (past 12 month)							
5+ drinks on one occasion	178 (32.2)	514 (12.8)	142.3(1) *	95 (33.1)	93 (37.0)	44 (25.1)^	49 (40.5)
Cocaine use	90 (16.3)	114 (2.8)	205.8(1) *	58 (20.1)	13 (5.2)	48 (27.4)^	57 (47.1)^
“Street” Opiates	40 (7.2)	31 (0.8)	132.7(1) *	30 (10.4)	1 (0.4)	35 (20.0)	17 (14.0)
Marijuana	252 (45.6)	1008 (25.1)	102.1(1) *	130 (45.3)	106 (42.2)	86 (49.1)	66 (54.5)^
Prescription Stimulants (non-med.)	25 (4.5)	16 (0.4)	92.9(1) *	16 (5.6)	4 (1.6)	16 (9.1)	9 (7.4)
Prescription Sedatives (non-med.)	61 (11.0)	66 (1.6)	158.6(1) *	35 (12.2)	9 (3.6)	45 (25.7)	29 (24.0)
Prescription Opioids (non-med.)	82 (14.8)	90 (2.2)	212.7(1) *	51 (17.8)	13 (5.2)	54 (30.9)^	37 (30.6)^

[a] With or without other types of drugs present.

* $p < 0.05$ for comparison between those with and without a history of overdose

^ $p < 0.05$ for comparison between OD involved alcohol only and OD involved opiates/sedatives or OD involved stimulants, not tested if any cell n < 10

Table 2

Multinomial logistic regression model of overdose (OD) history (n=4,571).

	Severe OD vs. No OD		Non-severe OD vs. No OD		Severe OD vs. Non-severe OD	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Female	**0.74** *	0.57, 0.97	0.81	0.62, 1.06	0.92	0.64, 1.32
African American (vs. all others)	**0.38** *	0.29, 0.50	**0.66** *	0.51, 0.85	**0.57** *	0.39, 0.82
Age (years)	1.02	1.01, 1.03	1.00	0.99, 1.01	1.02	1.00, 1.03
Health status: fair or poor	**1.45** *	1.11, 1.89	1.14	0.87, 1.50	1.30	0.91, 1.86
5+ drinks on one occasion, monthly or more	**1.40** *	1.26, 1.56	**1.49** *	1.33, 1.65	0.97	0.84, 1.12
Number of substances used (0 is referent)						
1	**1.84** *	1.37, 2.49	**2.07** *	1.55, 2.76	0.92	0.62, 1.38
2	**5.81** *	3.67, 9.18	**3.37** *	1.99, 5.71	1.80	0.97, 3.37
3	**8.39** *	4.12, 17.1	**4.49** *	1.94, 10.4	1.70	0.68, 4.26
4 or more	**25.1** *	13.1, 48.4	**13.8** *	6.60, 29.0	1.87	0.93, 3.76

Note: generalized logistic model fitted because proportional odds assumption did not hold.

* $p < 0.05$

Table 3

Symptoms experienced during the most serious overdose (OD) experience.

	History of any OD (n=553)	OD involved Alcohol only (n=251)	OD involved Opiates or Sedatives (n=175)	OD involved Stimulants (n=121)	Severe OD [b] (n=287)
	N (%)	N (%)	N (%)	N (%)	N (%)
Symptoms Experienced					
Nausea/vomiting	416 (75%)	225 (89%) *	119 (68%) *^	91 (75%) ^	223 (78%)
Loss of consciousness	194 (35%)	66 (26%) *	88 (50%) *^	61 (50%) *^	194 (68%)
Blacked out	285 (52%)	127 (51%)	107 (61%) *^	80 (66%) *^	197 (69%)
Awake, but no memory of what happened	235 (43%)	112 (45%)	80 (46%)	62 (51%) *	159 (55%)
Difficulty breathing/stopped breathing	110 (20%)	28 (11%) *	50 (29%) *^	48 (40%) *^	110 (38%)
Skin turned blue or pale	44 (8%)	12 (5%) *	24 (14%) *^	20 (16%) *^	44 (15%)
Collapsed	120 (22%)	39 (15%) *	56 (32%) *^	44 (36%) *^	120 (42%)
Could not be awakened	127 (23%)	46 (18%) *	62 (35%) *^	38 (31%) *^	127 (44%)
Heartbeat was too fast or too slow	164 (30%)	56 (22%) *	63 (36%) *^	64 (53%) *^	126 (44%)
Had a heart attack	13 (2%)	3 (1%)	6 (3%)	8 (7%) *	13 (4%)
Had convulsions	34 (6%)	8 (3%) *	20 (11%) *	18 (15%) *	34 (12%)
Had fever or felt too cold	97 (18%)	32 (13%) *	43 (25%) *^	38 (31%) *^	81 (28%)
Had hallucinations	73 (13%)	21 (8%) *	28 (16%) ^	36 (30%) *^	58 (20%)
Was shaking	153 (28%)	57 (23%) *	65 (37%) *^	49 (40%) *^	114 (40%)
None of these	36 (6%)	5 (2%) *	7 (4%)	4 (3%)	1 (0.3%)

* $p < 0.05$ for comparison between those in each group and all others with a history of OD

^ $p < 0.05$ for comparison between OD involved alcohol only and OD involved opiates/sedatives or OD involved stimulants, not tested if any cell n < 10. OD involved Opiates or Sedatives and OD involved Stimulants not compared because they were not mutually exclusive.

[b] No tests conducted in this category because the category was defined by the symptoms measure.

Table 4

Outcomes experienced from the most serious overdose (OD) experience.

	History of any OD (n=553)	OD involved Alcohol only (n=251)	OD involved Opiates or Sedatives (n=175)	OD Involved Stimulants (n=121)	Severe OD (n=287)
	N (%)	N (%)	N (%)	N (%)	N (%)
Outcomes of overdose [a]					
Woke up without help	139 (25%)	70 (28%)	47 (27%)	36 (30%)	76 (26%)
Someone called 911	137 (25%)	33 (13%) *	78 (45%) *^	40 (33%) *^	113 (40%) *
I went to the emergency department	180 (33%)	51 (20%) *	80 (46%) *^	49 (40%) *^	137 (48%) *
I was admitted to the hospital	140 (25%)	30 (12%) *	76 (43%) *^	44 (36%) *^	113 (40%) *
None of the above	211 (38%)	120 (48%) *	38 (22%) *^	35 (29%) *^	70 (24%) *

[a] Participants may report having more than one outcome

* $p < 0.05$ for comparison between those in each group and all others with a history of OD

^ $p < 0.05$ for comparison between OD involved alcohol only and OD involved opiates/sedatives or OD involved stimulants, not tested if any cell n < 10.

OD involved Opiates or Sedatives and OD involved Stimulants not compared because they were not mutually exclusive.

Table 5

Self-reported intent of the most serious overdose experience.

	History of any OD (n=553)	OD involved Alcohol only (n=251)	OD involved Opiates or Sedatives (n=175)	OD involved Stimulants (n=121)	Severe OD (n=287)
	N (%)	N (%)	N (%)	N (%)	N (%)
Intent of Overdose [a]					
On Purpose: wanted to die or didn't care about risks	145 (26%)	49 (19%)	68 (39%)	37 (31%)	99 (34%)
Accidentally: I didn't know what effect would be	238 (43%)	120 (48%)	65 (37%)	54 (45%)	115 (40%)
Accidentally: I lost track of the amount	48 (9%)	31 (12%)	10 (6%)	6 (5%)	25 (9%)
Accidentally: I combined drugs and/or alcohol	7 (1%)	1 (0.4%)	5 (3%)	2 (2%)	4 (1%)
Unsure of reason	114 (21%)	50 (20%)	27 (15%)	22 (18%)	44 (15%)
CMH χ^2: General association, p-value		20.2(4), <0.01	28.6(4), <0.01	4.30(4), 0.37	24.9(4), <0.01

[a]Categories of overdose intent are mutually exclusive.

OD involved Opiates or Sedatives and OD involved Stimulants were not mutually exclusive.