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"Bath Salt" Use among A Nationally Representative Sample of High School Seniors in the United States

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Abstract

Background and Objectives—"Bath salts" are new drugs which have received extensive media attention. However, national studies in the US have not investigated prevalence or correlates of use.

Methods—Data were examined from Monitoring the Future, a representative sample of US high school seniors (2012–2013, *N*=8,604).

Results—Only 1.1% of high school seniors used "bath salts" in the last year and the strongest correlate of use was use of other drugs.

Discussion and Conclusions—"Bath salt" use is not very prevalent, but users of other drugs are at highest risk for use.

Scientific Significance—We must continue to monitor new drugs in order to inform prevention and quickly detect potential epidemics.

Keywords

"bath salts"; mephedrone; novel psychoactive drugs; adolescents

INTRODUCTION

In recent years, there has been an unprecedented growth in number and availability of new synthetic psychoactive drugs in the US and worldwide. In 2014, 101 new psychoactive drugs were identified for the first time and new drugs continue to emerge[1]. These drugs are commonly sold as "legal highs", research chemicals, or products "not for human consumption". They are often sold over the Internet or in head shops and many mimic other drugs (e.g., NBOMe mimics LSD and "bath salts" have amphetamine-like effects). "Bath salts" appear to be one of the more prevalent new classes of drugs in the US and at least 77 different "bath salt" drugs are used, worldwide, with 31 identified for the first time in 2014[1].

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Declaration of Interest

The author reports no conflicts of interest. The author alone is responsible for the content and writing of this paper.

However, aside from poison control and seizure data, little is known about the epidemiology of "bath salt" use in the US.

"Bath salts" are a diverse group of "designer" drugs in the phenethylamine chemical class, often in a subclass of phenethylamines called synthetic cathinones, which act similar to cathinone, an amphetamine analogue present in the leaves of khat[2]. "Bath salts" can be ingested, sniffed or injected, and tend to contain mixtures of phenethylamines such as mephedrone (a.k.a.: MCAT, meow meow, Purple Wave, Cloud 9, plant food), and/or alpha-PVP (a.k.a.: Flakka). According to forensic reports, in 2010, mephedrone was the most prevalent "bath salt" in the US, but now methylone, MDPV, and alpha-PVP appear to be the most prevalent "bath salts"[2,3]. Some "bath salts" are now illegal to possess or distribute in the US (at the federal level) and others have been placed under temporary control or are illegal in various states. As "bath salts" become controlled, new versions emerge, which are temporarily "legal". A similar situation is occurring with synthetic cannabinoids (e.g., "Spice", "K2"), which are the most prevalent "legal highs" in the US[4,5].

"Bath salt" use has been found to be associated with numerous adverse cardiac, psychiatric, neurologic, gastrointestinal and pulmonary adverse outcomes, and in 2011, "bath salt" use was related to over 20,000 emergency department visits in the US[6]. Poisonings and deaths related to use have also been occurring at large dance festivals[7]. While surveys utilizing targeted sampling suggest high rates of use among nightlife attendees, very little is known about rates of use in the US other than reports of poisonings. This analysis examines self-reported use of "bath salts" in a national representative sample of high school seniors.

METHODS

Study Procedures and Participants

Monitoring the Future (MTF) is a nationally representative study of US high school students[4]. A cross-section is surveyed every year in approximately 130 public and private schools throughout 48 states, and MTF uses a multi-stage random sampling procedure. Approximately 15,000 high school seniors are surveyed every year. MTF started asking about "bath salt" use in 2012. MTF assesses content through six different survey forms, which are distributed randomly; however, only Forms 3 and 6 assess (last 12-month) use of "bath salts". Therefore, use was only assessed in about a third of the sample during the two most recent years of data collection (2012–2013). All data were thus aggregated into a single cross-section for these analyses. These analyses focus on the 8,604 (weighted *N*) high school seniors who answered whether they have used "bath salts" within the last 12 months. MTF protocols were approved by the University of Michigan Institutional Review Board (IRB) and the author's IRB approved this secondary data analysis.

Statistical Analyses

These analyses examined 1) prevalence of last 12-month "bath salt" use, and 2) potential correlates of use. Common sociodemographic variables used in previous MTF studies were utilized including sex, age, race/ethnicity, population density, parent level of education, and student weekly income[5]. Lifetime use of 11 drugs that were assessed in both survey forms

were also examined in relation to “bath salt” use. Bivariable analyses were computed using Rao-Scott chi-squares and then sociodemographic covariates were fit into a multivariable logistic regression model, utilizing sample weights and correcting for the complex survey design[8]. Other drug use indicators were not entered into the model in order to avoid multicollinearity.

RESULTS

The majority of the sample identified as white (71.2%) and the modal age was 18. Results suggest that 1.1% (*n*=94) of high school seniors reported using “bath salts” in the last 12 months. Of those who said they used, 32.7% used on 1 or 2 occasions, 22.7% used on 3–5 occasions, 10.2% used on 6–9 occasions, 5.1% used on 10–19 occasions, 10.9% used on 20–39 occasions, and 18.4% used on 40 or more occasions.

Table 1 presents overall sample descriptive statistics, raw proportions of each covariate in relation to “bath salt” use, chi-square tests, which compared raw proportions, and results from the multivariable model. Students who resided with one (AOR = 0.41, p = .009) or two parents (AOR = 0.26, $p < .001$) were at decreased odds for use compared to those residing with no parents. Those who earned >$50 per week from sources other than a job (AOR = 2.08, $p < .001$) or who go out 2–3 (AOR = 2.01, p = .026) or 4–7 nights per week for fun (AOR = 3.03, $p = .002$) were at significantly increased odds for use. According to bivariable statistics, lifetime use of each of the 11 illicit drugs assessed by MTF was a robust risk factor for use (all *p*s < .001). Most (≥90%) “bath salt” users reported lifetime use of alcohol or marijuana, and use of powder cocaine, LSD, crack and heroin was at least ten-times more prevalent among “bath salt” users.

DISCUSSION

This was the first nationally representative study in the US to examine self-reported use of “bath salts”. These analyses focused on a high-risk group—adolescents approaching adulthood. Utilizing the most recent years of the MTF study (2012–2013), results suggest that only one out of a hundred high school seniors reported use of “bath salts” in the last year. Prevalence (1.1%) was identical to lifetime “bath salt” prevalence in a sample of college students and to 12-month prevalence of mephedrone use (a common “bath salt”) in a study of nightlife attendees in New York City[9–10]. Even though use did not significantly change between the two years examined in this study (2012: 1.3%; 2013: 0.9%), according to MTF, perceived risk associated with use increased dramatically from 25% in 2012 to 39% in 2013[4]. While rates of use in the US prior to 2012 are unknown, numerous media reports about the dangers associated with use (e.g., prior to 2012) might have served as a deterrent against use.

Most students who used “bath salts” (33%) reported using only once or twice, which suggests experimentation is most common among users; however, frequent use was also common among users with an alarming 18% of users reporting using 40 or more times in the last year. Results suggest that students who reside with fewer than two parents, who earn > $50 per week from sources other than a job, or who go out multiple nights per week for fun

are at increased risk for use. These tend to be risk factors for use of other illicit drugs in this age group; for example, they are also risk factors for use of synthetic cannabinoids—another emerging synthetic "legal high"[5]. However, the most robust risk factor is use of other illicit drugs. Most "bath salt" users have used alcohol or marijuana, and use of other drugs such as powder cocaine, LSD, crack and heroin was at least ten-times more prevalent among "bath salt" users. While other drug use is strongly related to use, longitudinal research is needed to determine temporal associations. Research is also needed to examine reasons for use; for example, whether these students used these new drugs as a "legal" alternative to other drug use.

This study is not without limitations. MTF content is assessed through different survey forms and common attitudinal variables (e.g., disapproval toward use) were not assessed in the same survey forms so these variables could not be examined in relation to use. Students were not asked about specific "bath salts" (e.g., mephedrone), and results are based on a nationally sample of high school seniors so findings (e.g., low prevalence) may not be generalizable to the rest of the US population. Prevalence may increase with age, and we must keep in mind that self-reported use does not consider unintentional use, which appears to occur as "bath salts" are now often present in ecstasy and "Molly" powder[7], which is marketed as a pure version of ecstasy (MDMA).

Despite these limitations, the results of this analysis of a nationally representative sample of high school seniors should inform prevention and harm reduction among those at greatest risk for use. Results suggest that while "bath salt" use has been covered extensively by the media, use is not particularly prevalent among high school seniors in the US. However, it is important that we continue to monitor new drugs such as "bath salts" in order to inform prevention and quickly detect potential epidemics.

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TABLE 1

Sample characteristics and comparisons of characteristics according to bath salt use (Weighted N = 8,604)

	Raw Proportions			Model-Based Results	
	Full Sample, %	**No Bath Salt Use (98.9%)**	**Bath Salt Use (1.1%)**	**AOR**	**95% CI**
Sex					
Male	49.3	49.3	55.9	1.00	
Female	50.7	50.7	44.1	0.84	(0.50, 1.42)
Age, years					
<18	42.6	42.6	42.0	1.00	
≥18	57.4	57.4	58.0	0.87	(0.54, 1.40)
Race					
White	71.2	71.3	63.4	1.00	
Black	11.0	10.9	17.6	1.17	(0.60, 2.36)
Hispanic	17.8	17.8	19.0	1.02	(0.49, 2.10)
Population Density					
Non-MSA	20.2	20.2	22.6	1.00	
Small MSA	49.5	49.5	48.2	1.03	(0.59, 1.80)
Large MSA	30.3	30.3	29.2	0.93	(0.51, 1.70)
Family Structure***					
0 Parents	5.3	5.2	17.9	1.00	
1 Parent	26.8	26.7	34.5	0.41**	(0.21, 0.80)
2 Parents	67.9	68.1	47.6	0.26***	(0.13, 0.50)
Parent Education					
Low	30.2	30.1	41.7	1.00	
Moderate	28.6	28.6	25.0	0.69	(0.35, 1.34)
High	41.2	41.3	33.3	0.73	(0.39, 1.40)
Weekly Income from Job					
$10 or Less	46.5	46.5	48.6	1.00	
$11–50	12.2	12.2	11.3	0.92	(0.41, 2.06)
$51 or More	41.2	41.2	40.1	0.79	(0.45, 1.39)
Weekly Income from Other Source***					
$10 or Less	56.4	56.5	46.8	1.00	
$11–50	33.4	33.4	28.0	0.91	(0.50, 1.66)
$51 or More	10.2	10.1	25.2	2.08*	(1.11, 3.91)
Evenings Out Per Week for Fun**					
0–1	29.4	29.5	15.8	1.00	
2–3	48.7	48.8	47.7	2.01*	(1.09, 3.71)
4–7	21.9	21.8	36.5	3.03**	(1.52, 6.01)

	Raw Proportions			Model-Based Results	
	Full Sample, %	**No Bath Salt Use (98.9%)**	**Bath Salt Use (1.1%)**	**AOR**	**95% CI**
Lifetime Drug Use					
Alcohol***	68.9	68.7	92.5		
Marijuana***	45.6	45.2	90.1		
Stimulants (nonmedical use)***	12.2	11.7	58.1		
Opioids (nonmedical use)***	11.4	11.0	47.3		
Powder Cocaine***	4.4	4.0	40.0		
Sedatives (nonmedical use)***	7.8	7.5	38.2		
LSD***	3.6	3.2	37.9		
Hallucinogens (other than LSD)***	6.0	5.7	36.7		
Tranquilizers (nonmedical use)***	8.4	8.2	36.4		
Crack***	1.8	1.6	22.4		
Heroin***	0.9	0.7	16.0		

Note. AOR = adjusted odds ratio, CI = confidence interval, MSA = metropolitan statistical area. Weighted percentages are rounded so they do not always add up to exactly 100%. Raw proportions were first compared using Rao-Scott chi-squares and then all covariates were entered into a multivariable model simultaneously, producing AORs. Significance for chi-squares is noted by stars next to the variable name and significance for each covariate in the multivariable model are noted by stars next to the significant AOR.

* $P < .05$,

** $P < .01$,

*** $P < .001$.