

# Pattern and characteristics of ecstasy and related drug (ERD) presentations at two hospital emergency departments, Melbourne, Australia, 2008–2010

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## ABSTRACT

**Objective** To describe patterns and characteristics of emergency department (ED) presentations related to the use of ecstasy and related drugs (ERDs) in Melbourne, Australia.

**Methods** Retrospective audit of ERD-related presentations from 1 January 2008 to 31 December 2010 at two tertiary hospital EDs. Variation in presentations across years was tested using a two-tailed test for proportions. Univariate and multivariate logistic regressions were used to compare sociodemographic and clinical characteristics across groups.

**Results** Most of the 1347 presentations occurred on weekends, 24:00–06:00. Most patients arrived by ambulance (69%) from public places (42%), private residences (26%) and licensed venues (21%). Ecstasy-related presentations decreased from 26% of presentations in 2008 to 14% in 2009 ( $p<0.05$ );  $\gamma$ -hydroxybutyrate (GHB) presentations were most common overall. GHB presentations were commonly related to altered conscious state (89%); other presentations were due to psychological concerns or nausea/vomiting. Compared with GHB presentations, patients in ecstasy-related presentations were significantly less likely to require intubation (OR 0.04, 95% CI 0.01 to 0.18), but more likely to result in hospital admission (OR 1.77, 95% CI 1.08 to 2.91). Patients in amphetamine-related cases were older than those in GHB-related cases (median 28.4 years vs 23.9 years;  $p<0.05$ ), and more likely to have a history of substance use (OR 4.85, 95% CI 3.50 to 6.74) or psychiatric illness (OR 6.64, 95% CI 4.47 to 9.87). Overall, the median length of stay was 3.0 h (IQR 1.8–4.8), with most (81%) patients discharged directly home.

**Conclusions** Although the majority of ERD-related presentations were effectively treated, with discharge within a short time frame, the number and timing of presentations places a significant burden on EDs. ERD harm reduction and improved management of minor harms at licensed venues could reduce this burden.

## BACKGROUND

The lifetime use of ecstasy and related drugs (ERDs, eg, 3,4-methylenedioxymethamphetamine (ecstasy), cocaine and  $\gamma$ -hydroxybutyrate (GHB)) is reported by 10%, 7% and 1%, respectively, of people in Australia aged 14 years and older.<sup>1</sup> Among regular (at least monthly) ecstasy users, around a quarter report using ecstasy more than weekly,<sup>2</sup> despite reports of recent decreases in ecstasy availability and use.<sup>2–4</sup> Polydrug use, particularly amphetamines, cocaine and cannabis, is

also common among this group.<sup>2–5</sup> Further, systematic reviews suggest that amphetamine use in Australia is among the higher levels of use globally,<sup>6–7</sup> with recreational use common among nightclub patrons.<sup>8–9</sup> Harms related to the use of ERDs vary across drug types; whereas ecstasy use is generally associated with acute harms such as heart palpitations, loss of consciousness and dizziness,<sup>10–11</sup> GHB intoxication is associated with loss of consciousness, respiratory depression, bradycardia and hypothermia<sup>12–14</sup> and carries significant risk of overdose and death,<sup>12–15–17</sup> because of the fine line between 'desired' dose and 'overdose'.<sup>18</sup> Among amphetamine users, harms are particularly prevalent among those who inject, and include overdose, psychotic symptoms and dependence.<sup>6–19</sup>

The emergency department (ED) is a common site for responding to ERD-related harms. Data from the Victorian Ambulance Clinical Information System indicate that, in metropolitan Melbourne, there were around 700–800 ecstasy- or GHB-related ambulance attendances per million population annually in 2008–2010, with the vast majority of attendances resulting in transportation to hospital.<sup>20</sup> In a recent sample of regular ecstasy users, 6% reported having accessed an ED because of their drug use in the past 6 months.<sup>2</sup>

The demand for emergency healthcare more generally is also rising. A recent review of presentations to Melbourne's public hospital EDs reported an average 3.6% annual increase in the rate of attendance over the period 1999–2009, even after adjustment for population changes.<sup>21</sup> Against this background of increasing pressure on the ED system, it is important that we are able to identify and better understand the characteristics of potentially preventable causes of ED attendance, which include ERD-related presentations.

While there have been a number of case series describing ERD-related ED presentations internationally,<sup>10–15–22–23</sup> and in Australia,<sup>12–24–25</sup> these have generally focused on one ERD type only, and have not been conducted at the same time or place, thus making it difficult to understand contexts of harms experienced in a particular setting. To date, there has been only one comprehensive review of ERD-related presentations at Australian EDs. In their 3-year review of drug- and alcohol-related presentations at two Sydney EDs, Indig *et al*<sup>26</sup> found that ERD-related presentations were relatively uncommon, with ecstasy-related presentations making up just 12% of the 5148 illicit-drug-related presentations. However, case identification in that

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study was based on nursing triage notes only, and, with drug type unspecified in 44% of presentations, it is likely that this is an underestimate. In addition, only basic patient demographic and clinical variables were extracted, making it difficult to understand the nature of these presentations.

In this paper, we describe 3-year trends in ERD-related presentations at two EDs in Melbourne, Australia, using multiple data sources to better capture all ERD presentations and collect more complete data on presentation characteristics. We compare patient sociodemographic and clinical characteristics across different ERD types, and explore correlates of repeat ERD-related presentation at the ED.

## METHODS

A retrospective audit of ERD presentations occurring between 1 January 2008 and 31 December 2010 was conducted at the EDs of two major inner-city teaching hospitals in Melbourne, Australia, which are attended by an estimated 42 000 and 55 000 patients annually.<sup>27</sup> Cases were identified through electronic searching of medical records (triage notes, discharge diagnosis) using a list of key terms related to ERD use (table 1). All presentations involving ERDs were included in the study, regardless of the presenting complaint. Complete medical records of cases were obtained electronically where available, or in paper form, and patient demographic characteristics, relevant medical history, and pre-hospital and in-hospital clinical information were extracted and entered into a database using Questionnaire Development System V2.5 (NOVA Research Company). The study was approved by ethics committees at both hospitals, as well as the Monash University Human Research Ethics Committee.

Patients were categorised according to the 'main drug of effect' as recorded in the ED documentation, based on patient/carer self-report or physician assessment. Univariate logistic regression was used to measure differences in characteristics across main drug groups. Individual patients who presented more than once were identified using unique hospital Unit Record (UR) numbers, and coded as 'repeat presenters' accordingly. Univariate and multivariate logistic regression were used to identify independent correlates of repeat presentation. Variations in ERD presentations across study years were measured using a two-tailed test for proportions. Analyses were conducted using Stata V.11.1, with a significance level of  $p < 0.05$ .

**Table 1** List of search terms used to identify cases

Drug names	Street/slang drug names	Additional terms
Amphetamine	Acid	IVDU
Amyl nitrite	Coke	OD
Cocaine	Fantasy	Overdose
Ecstasy	GBH	Pharmaceutical stimulants
GHB	Ice	Pill
Ketamine	Liquid E	Spiked
LSD	Mushrooms	
MDA	Speed	
MDMA	XTC	
Methamphetamine	1,4B	
Nitrous oxide		
Ritalin		

GHB,  $\gamma$ -hydroxybutyrate; LSD, d-lysergic acid diethylamide; MDA, 3,4-methylenedioxyamphetamine; MDMA, 3,4-methylenedioxymethamphetamine (ecstasy).

## RESULTS

### Characteristics of ERD-related presentations

A total of 1347 ERD-related presentations occurred across the 3-year period. While there was a significant difference in the number of presentations at each site (median of 22 presentations per month (range 10–44) at site 1, compared with 13 (4–32) at site 2;  $p < 0.05$ ), the two sites showed broadly comparable patterns of presentations across the 3-year period, with attendances appearing to peak during the summer months (figure 1).

ERD-related presentations most commonly occurred on weekends (60%), between 24:00 and 06:00 (41%). Patients were predominantly male (64%), Australian-born (90%) and had no recorded history (ie, self-reported history or previous hospital attendance) of previous physical illness (80%) or psychiatric illness (80%). Of the 1325 patients for whom data were collected, 478 (36%) had a recorded history of substance use, most commonly related to misuse of alcohol (44%), amphetamines (36%) and/or ecstasy (29%). Female patients were significantly younger than male patients (median 24.1 (IQR 21.2–27.6) vs 25.9 (IQR 22.4–31.7) years,  $p < 0.05$ ). Of the 989 patients for whom last location before hospital attendance was recorded, most reported being in a public place (42%), a private residence (26%) or licensed premises or event (21%). Fewer than 10% of patients reported their last location as a dance party or music festival.

Presentations were most commonly related to GHB (36%,  $n=480$ ), amphetamines (19%,  $n=255$ ) or ecstasy (18%,  $n=236$ ). Other ERDs (cocaine, ketamine, d-lysergic acid diethylamide (LSD), magic mushrooms, amyl nitrate) accounted for 89 presentations, 224 presentations involved multiple ERDs, with no 'main drug of effect' identified, and the main drug implicated was unknown in 63 cases. Patterns of presentation over time varied by drug type (figure 2): ecstasy-related presentations declined from 26% of all presentations in 2008 to 14% in 2009 ( $p < 0.05$ ), and then remained stable in 2010 (14%,  $p > 0.05$ ); amphetamine-related presentations decreased between 2008 and 2009 (21% vs 13% of all ERD-related presentations,  $p < 0.05$ ), before increasing again (23%,  $p < 0.05$ ); and GHB-related presentations peaked in 2009 (25% vs 46% vs 35%,  $p < 0.05$ ).

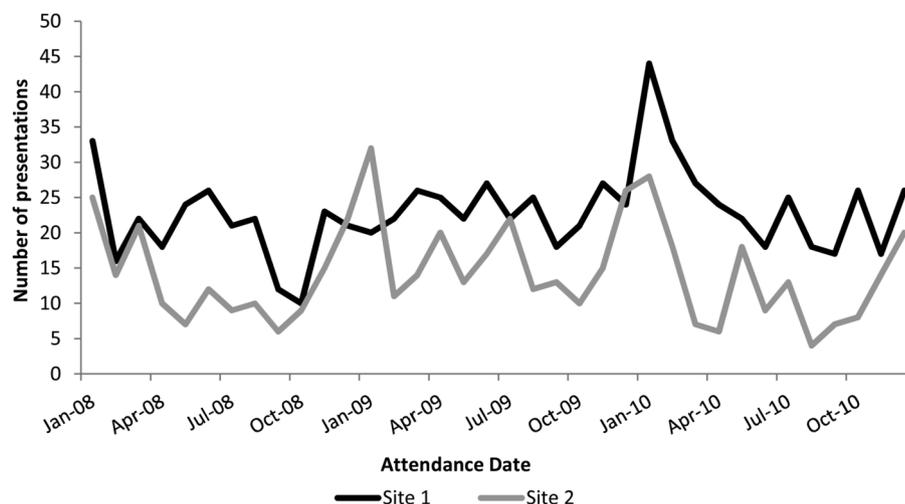
The median length of stay in the ED was 3.0 h (IQR 1.8–4.8). Treatment predominantly consisted of patient observation, with medical intervention limited to the administration of fluids and paracetamol in most cases. Complications were recorded in 237 cases and were most commonly related to psychiatric concerns (45%), vomiting (14%) and hypothermia (12%). Hospital admission was the result in 149 presentations (14%), predominantly to the emergency short stay unit (ESSU, 65%). One fatality, in a case of extensive polydrug use, was recorded.

### Sociodemographic and clinical characteristics by main ERD type implicated

The sociodemographic and clinical characteristics of presentations by main ERD type are summarised in table 2. The majority of patients in GHB-related presentations arrived via ambulance (86%) and in a low conscious state (55% had a Glasgow Coma Score (GCS) of 8 or less on hospital arrival). Furthermore, 46% were coded as Category 1 on the Australasian Triage Scale, indicating a need for immediate resuscitation. Eighty patients who had used GHB (17%) underwent endotracheal intubation in the ED. Despite this, only 39 patients were admitted to hospital, predominantly to the ESSU.

Compared with GHB presentations, patients in ecstasy-related presentations were significantly less likely to arrive via

**Figure 1** Number of ecstasy and related drug-related presentations, by site and month, 2008–2010. Excludes five presentations with missing attendance date data.



ambulance (OR 0.26, 95% CI 0.18 to 0.38), to arrive in an altered conscious state (OR 0.04, 95% CI 0.03 to 0.06) and to be intubated in the ED (OR 0.04, 95% CI 0.01 to 0.18). The context of ecstasy use differed from that of GHB use in that it was significantly more likely to occur in a private residence (OR 2.00, 95% CI 1.20 to 3.35) and to involve concomitant alcohol use (OR 5.55, 95% CI 3.89 to 7.91). Ecstasy presentations were significantly more likely than GHB presentations to result in hospital admission (OR 1.77, 95% CI 1.08 to 2.91).

Patients in amphetamine-related presentations were a distinctly different group from those in GHB-related presentations. They were significantly older (median age 28.4 vs 23.9 years; OR 1.09, 95% CI 1.07 to 1.12) and more likely to have a recorded history of substance use (OR 4.85, 95% CI 3.50 to 6.74) or psychiatric illness (OR 6.64, 95% CI 4.47 to 9.87). These patients presented predominantly in relation to psychiatric/behavioural concerns (39%) or altered conscious state (14%), spent longer in the ED (OR 1.06, 95% CI 1.02 to 1.10), and were more likely to be admitted to hospital (OR 3.11, 95% CI 2.00 to 4.84), most commonly to the ESSU for continued observation (59%) or to a psychiatric ward (17%).

### Repeat presenters

Fifty-seven patients were classified as repeat presenters, presenting between two and six times over the 3-year period (median 2). After adjustment for age, gender, involvement of

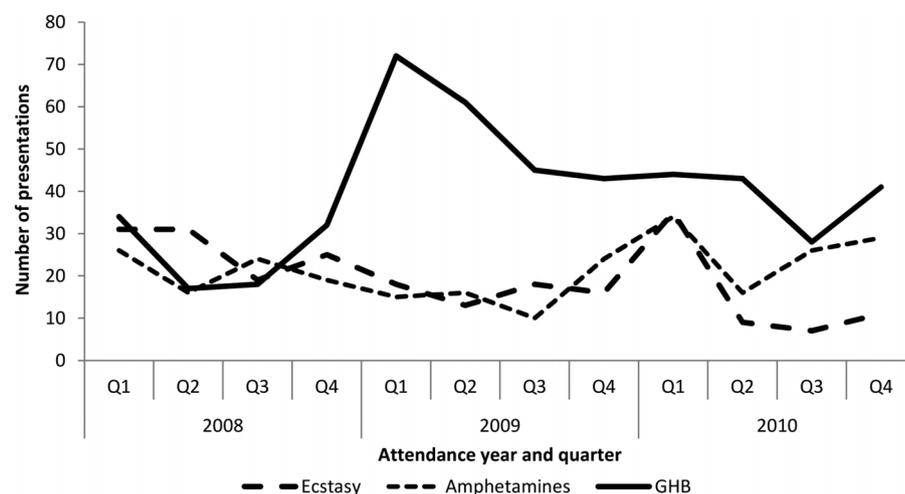
alcohol and presenting symptoms, repeat presentation was independently associated with presenting in relation to GHB use compared with use of other ERDs (AOR 3.54, 95% CI 1.99 to 6.31) and having a recorded history of alcohol or other drug use (AOR 7.23, 95% CI 3.84 to 13.58).

### DISCUSSION

This paper describes the pattern and characteristics of ERD-related presentations at two Australian inner-urban EDs. Patterns of presentation related to each drug class varied over the 3-year study period, with ecstasy-related presentations decreasing between 2008 and 2009, then remaining stable. The decrease in ecstasy-related harm over this period is likely to reflect a reported decrease in population-level ecstasy consumption during this time.<sup>2–4</sup>

The characteristics of presentations varied across drug type: patients in GHB-related presentations were more likely to present in an unconscious state, and almost one-fifth (17%, n=80) were intubated in the ED. While intubated patients were generally managed within the ED and were discharged directly home once GCS increased, length of hospital stay was longer among intubated patients than among those who were not intubated (median 5.4 vs 2.6 h). Further analysis of the implications of intubation on patient outcomes, including length of hospital stay and likelihood of hospital admission, will inform clinical practice guidelines. In contrast, ecstasy-related presentations

**Figure 2** Number of ecstasy-, amphetamine- and  $\gamma$ -hydroxybutyrate (GHB)-related presentations by quarter, 2008–2010. Excludes five presentations with missing attendance date data.



**Table 2** Sociodemographic and clinical characteristics of ERD-related presentations, by main drug type implicated, 2008–2010

Variable†	Main drug type implicated						
	GHB (N=480), n (%) or median (IQR)	Ecstasy (N=236) n (%) or median (IQR)	OR§ (95% CI)	Amphetamines (N=255) n (%) or median (IQR)	OR§ (95% CI)	Other (N=376)‡ n (%) or median (IQR)	OR§ (95% CI)
Gender							
Male	305 (64)	142 (60)	1	163 (64)	1	246 (65)	1
Female	175 (36)	94 (40)	1.15 (0.84 to 1.59)	92 (36)	0.98 (0.72 to 1.35)	130 (35)	0.92 (0.69 to 1.22)
Age	23.9 (21.0–27.8)	24.9 (21.7–28.7)	1.01 (0.99 to 1.04)	28.4 (24.1–34.8)	1.09 (1.07 to 1.12)*	25.6 (21.9–30.6)	1.04 (1.02 to 1.07)*
History of substance use	119 (25)	61 (27)	1.08 (0.75 to 1.54)	158 (62)	4.85 (3.50 to 6.74)*	140 (38)	1.77 (1.32 to 2.38)*
History of psychiatric illness	45 (10)	32 (14)	1.54 (0.95 to 2.50)	105 (41)	6.64 (4.47 to 9.87)*	90 (24)	3.00 (2.03 to 4.42)*
Last recorded location							
Licensed premises/event	104 (25)	42 (25)	1	16 (10)	1	45 (18)	1
Dance party/music festival	44 (11)	9 (5)	0.51 (0.23 to 1.13)	4 (3)	0.59 (0.19 to 1.87)	10 (4)	0.53 (0.24 to 1.14)
Public location	192 (47)	58 (35)	0.75 (0.47 to 1.19)	63 (40)	2.13 (1.17 to 3.88)*	101 (40)	1.22 (0.80 to 1.86)
Private residence	63 (15)	51 (31)	2.00 (1.20 to 3.35)*	57 (36)	5.88 (3.11 to 11.12)*	86 (34)	3.15 (1.96 to 5.09)*
Other¶	7 (2)	6 (4)	–	18 (11)	–	13 (5)	–
Arrived by ambulance	408 (86)	141 (62)	0.26 (0.18 to 0.38)*	140 (56)	0.21 (0.15 to 0.30)*	218 (61)	0.25 (0.18 to 0.35)*
Presenting complaints**							
Altered conscious state	429 (89)	61 (26)	0.04 (0.03 to 0.06)*	35 (14)	0.02 (0.01 to 0.03)*	97 (26)	0.04 (0.03 to 0.06)*
Heart palpitations	1 (<1)	20 (9)	–	17 (7)	–	27 (7)	–
Injury	6 (1)	37 (16)	–	21 (8)	–	42 (11)	–
Psychological/behavioural††	43 (9)	61 (26)	3.56 (2.32 to 5.47)*	99 (39)	6.53 (4.37 to 9.77)*	115 (31)	4.48 (3.05 to 6.56)*
Vomiting/nausea	40 (8)	45 (19)	2.61 (1.65 to 4.12)*	25 (10)	1.21 (0.71 to 2.04)	53 (14)	1.80 (1.17 to 2.79)*
Triage category 1‡‡	206 (46)	8 (3)	0.04 (0.02 to 0.09)*	9 (4)	0.05 (0.02 to 0.09)*	26 (7)	0.09 (0.06 to 0.14)*
Hospital arrival GCS ≤8	245 (55)	11 (6)	0.05 (0.03 to 0.10)*	11 (6)	0.05 (0.03 to 0.10)*	24 (8)	0.07 (0.05 to 0.11)*
Intubated in ED	80 (17)	2 (<1)	0.04 (0.01 to 0.18)*	3 (1)	0.06 (0.02 to 0.19)*	5 (1)	0.07 (0.03 to 0.17)*
Admitted to hospital	39 (8)	32 (14)	1.77 (1.08 to 2.91)*	55 (22)	3.11 (2.00 to 4.84)*	63 (17)	2.28 (1.49 to 3.48)*
Length of stay (h)	2.9 (1.9–4.3)	3.0 (1.7–4.9)	1.02 (0.98 to 1.05)	3.3 (1.9–5.9)	1.06 (1.02 to 1.10)*	2.9 (1.7–5.0)	1.01 (0.98 to 1.04)
Alcohol implicated	158 (35)	173 (75)	5.55 (3.89 to 7.91)*	101 (40)	1.26 (0.92 to 1.73)	215 (58)	2.55 (1.92 to 3.38)*

–, OR not calculated because of small numbers.

\*p&lt;0.05.

†Missing data excluded.

‡Includes other ERDs (eg, cocaine, ketamine, LSD) (n=89), cases where no main drug type was specified because of the involvement of multiple ERDs (N=224), and cases where the main drug type could not be ascertained (n=63).

§ORs calculated relative to GHB presentations.

¶Predominantly custodial settings.

\*\*Multiple presenting complaints could be recorded.

††For example, displaying erratic or unusual behaviour, experiencing psychological distress.

‡‡Based on the Australasian Triage Scale, where Category 1 indicates the need for immediate resuscitation.

ED, emergency department; ERD, ecstasy and related drugs; GCS, Glasgow Coma Score; GHB,  $\gamma$ -hydroxybutyrate.

were generally related to behavioural concerns or vomiting/nausea. Although these patients did not require active intervention, they were significantly more likely to be admitted to hospital than patients in GHB presentations. Patients presenting to EDs after amphetamine use had a different profile from those presenting after GHB use; they were older and commonly had a history of alcohol or drug use and psychiatric illness. In terms of the context of presentation, they were less likely to attend the ED after attendance at licensed premises, a music festival or event. This fits with other Australian studies of amphetamine-related ED presentations, which suggest that a significant proportion of these patients inject drugs, and experience high rates of psychiatric comorbidity.<sup>24 25</sup> Given that hospital admission was three times as common in amphetamine as GHB users, and that a significant proportion of these patients were admitted for psychiatric care, hospitals may need to consider developing separate management strategies for presentations involving amphetamines that take into consideration these complex needs.

The median length of stay for all ERD-related presentations was 3 h, indicating that the majority of patients were effectively treated and discharged within the 4 h limit recommended by the Australian National Emergency Access Target guidelines.<sup>28</sup> Nevertheless, given that the majority of presentations occurred during peak times in the ED (late nights, weekends, Christmas/summer holidays),<sup>29</sup> these patients place an avoidable burden on the ED. Given the relatively minor nature of a large proportion of presentations, particularly those related to drugs other than GHB, solutions need to be put in place to enable effective prevention and management of these harms, in order to minimise the need for ED attendance.

Despite common perceptions that ERD-related harms usually occur at dance parties and music festivals, our data indicate that a significant proportion of adverse events are occurring at licensed venues, such as pubs and clubs, or in private residences, highlighting the need for expansion of prevention and harm reduction messages within these settings. One potential approach may be to focus on the development of strategies aimed at enhancing the capacity of venues and their patrons to self-manage minor adverse events. A recent systematic review highlighted the variety of harm reduction interventions that have been conducted in recreational settings such as pubs and clubs, but few such interventions have been evaluated.<sup>30</sup> Another potential strategy for harm minimisation may be to increase the availability of pill testing kits, which allow users to identify the contents of ecstasy pills, as regular ecstasy users have reported that they would make use of these kits if they were readily available.<sup>31</sup> In the private setting, strategies for party hosts and guests, such as planning ahead and maintaining hydration, should be emphasised in order to minimise the risk of harm; resources have been developed to assist people in this manner.<sup>32</sup> Education around the risks of harms associated with concurrent alcohol and ecstasy use is also important, given the high rate of alcohol consumption associated with ecstasy-related presentations.

Our study is limited by the fact that no biological marker of drug use was used to identify cases, and as such some cases may have been missed. Presentations relating to seizures may also have been missed if no ERD-related terms were recorded, as these patients were not searched for specifically. In addition, as some variables were based on medical staff notes, the extent to which these were assessed and recorded may vary. Further, the EDs involved in the study may not be a representative sample of all EDs in Melbourne.

## CONCLUSION

Although the majority of ERD-related presentations are not serious and few require hospital admission, the number occurring at peak times places a burden on EDs. Education around prevention of minor ERD-related harms and strategies for improved management of these at licensed venues and private locations could reduce this burden.

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## REFERENCES

- 1 Australian Institute of Health & Welfare. 2010 National Drug Strategy Household Survey Report, Drug Statistics Series No. 25. Canberra: Australian Institute of Health & Welfare, 2011.
- 2 Sindich N, Burns L. *Australian Trends in Ecstasy and Related Drug Markets 2011: Findings from the Ecstasy and Related Drugs Reporting System (EDRS)*. Sydney: National Drug and Alcohol Research Centre, University of New South Wales, 2012, Australian Drug Trend Series No. 82.
- 3 Chen C, Kostakis C, Harpas P, et al. Marked decline in 3,4-methylenedioxymethamphetamine (MDMA) based on wastewater analysis. *J Stud Alcohol Drugs* 2011;72:737–40.
- 4 Sweeney J, Macgregor S. *Decrease in use of ecstasy/MDMA, Drug Use Monitoring in Australia (DUMA) Report No. 26*. Canberra: Australian Institute of Criminology, 2012.
- 5 Sindich N, Burns L. *Australian Trends in Ecstasy and Related Drug Markets 2010: Findings from the Ecstasy and Related Drugs Reporting System (EDRS)*. Sydney: National Drug and Alcohol Research Centre, University of New South Wales, 2011, Australian Drug Trend Series No. 83.
- 6 Degenhardt L, Mathers B, Guarinieri M, et al. Meth/amphetamine use and associated HIV: implications for global policy and public health. *Int J Drug Policy* 2010;21:347–58.
- 7 Degenhardt L, Bucello C, Calabria B, et al. What data are available on the extent of illicit drug use and dependence globally? Results of four systematic reviews. *Drug Alcohol Depend* 2011;117:85–101.
- 8 Lea T, Reynolds R, de Wit J. Alcohol and club drug use among same-sex attracted young people: associations with frequenting the lesbian and gay scene and other bars and nightclubs. *Subst Use Misuse* Posted online on November 5, 2012. (doi:10.3109/10826084.2012.733904)
- 9 Duff C. Party drugs and party people: examining the 'normalization' of recreational drug use in Melbourne, Australia. *Int J Drug Policy* 2005;16:161–70.
- 10 Liechti ME, Kunz I, Kupferschmidt H. Acute medical problems due to Ecstasy use. Case-series of emergency department visits. *Swiss Med Wkly* 2005; 135:652–7.
- 11 Rogers G, Elston J, Garside R, et al. The harmful health effects of recreational ecstasy: a systematic review of observational evidence. *Health Technol Assess* 2009;13:iii–iv, ix–xii, 1–315.

- 12 Munir VL, Hutton JE, Harney JP, *et al.* Gamma-hydroxybutyrate: a 30 month emergency department review. *Emerg Med Australas* 2008;20:521–30.
- 13 Sporer KA, Chin RL, Dyer JE, *et al.* Gamma-hydroxybutyrate serum levels and clinical syndrome after severe overdose. *Ann Emerg Med* 2003;42:3–8.
- 14 Liechti ME, Kunz I, Greminger P, *et al.* Clinical features of gamma-hydroxybutyrate and gamma-butyrolactone toxicity and concomitant drug and alcohol use. *Drug Alcohol Depend* 2006;81:323–6.
- 15 Galicia M, Nogue S, Miro O. Liquid ecstasy intoxication: clinical features of 505 consecutive emergency department patients. *Emerg Med J* 2011;28:462–6.
- 16 Caldicott DG, Chow FY, Burns BJ, *et al.* Fatalities associated with the use of gamma-hydroxybutyrate and its analogues in Australasia. *Med J Aust* 2004;181:310–13.
- 17 Degenhardt L, Darke S, Dillon P. GHB use among Australians: characteristics, use patterns and associated harm. *Drug Alcohol Depend* 2002;67:89–94.
- 18 Nicholson KL, Balster RL. GHB: a new and novel drug of abuse. *Drug Alcohol Depend* 2001;63:1–22.
- 19 Degenhardt L, Roxburgh A, Black E, *et al.* The epidemiology of methamphetamine use and harm in Australia. *Drug Alcohol Rev* 2008;27:243–52.
- 20 Lloyd B. Trends in alcohol and drug related ambulance attendances in Melbourne: 2009/10. *Fitzroy: Turning Point Alcohol and Drug Centre* 2011.
- 21 Lowthian JA, Curtis AJ, Jolley DJ, *et al.* Demand at the emergency department front door: 10-year trends in presentations. *Med J Aust* 2012;196:128–32.
- 22 Couper FJ, Thatcher JE, Logan BK. Suspected GHB overdoses in the emergency department. *J Anal Toxicol* 2004;28:481–4.
- 23 de Millas W, Haasen C, Reimer J, *et al.* Emergencies related to cocaine use: a European multicentre study of expert interviews. *Eur J Emerg Med* 2010; 17:33–6.
- 24 Bunting PJ, Fulde GW, Forster SL. Comparison of crystalline methamphetamine ('ice') users and other patients with toxicology-related problems presenting to a hospital emergency department. *Med J Aust* 2007;187:564–6.
- 25 Gray SD, Fatovich DM, McCoubrie DL, *et al.* Amphetamine-related presentations to an inner-city tertiary emergency department: a prospective evaluation. *Med J Aust* 2007;186:336–9.
- 26 Indig D, Copeland J, Conigrave KM, *et al.* Characteristics and comorbidity of drug and alcohol-related emergency department presentations detected by nursing triage text. *Addiction* 2010;105:897–906.
- 27 Victorian Government Department of Health. Victorian Health Services Performance: Performance Data by Hospital (17/10/2012). <http://performance.health.vic.gov.au/Home/Performance-Data-by-Hospital.aspx> (accessed 17 Oct 2012).
- 28 Richardson DB. Emergency department targets: a watershed for outcomes research? *Med J Aust* 2012;196:126–7.
- 29 Zheng W, Muscatello DJ, Chan AC. Deck the halls with rows of trolleys...emergency departments are busiest over the Christmas holiday period. *Med J Aust* 2007;187:630–3.
- 30 Akbar T, Baldacchino A, Cecil J, *et al.* Poly-substance use and related harms: a systematic review of harm reduction strategies implemented in recreational settings. *Neurosci Biobehav Rev* 2012;35:1186–202.
- 31 Johnston J, Barratt M, Fry C, *et al.* A survey of regular ecstasy users' knowledge and practices around determining pill content and purity: implications for policy and practice. *Int J Drug Policy* 2006;17:464–72.
- 32 ACON. Drugs at parties: For Guests (19/10/2012). <http://www.partyingathome.acon.org.au/index/downloads/PartyingatHomeDrugsforguests.pdf> (accessed 19 Oct 2012).



## Pattern and characteristics of ecstasy and related drug (ERD) presentations at two hospital emergency departments, Melbourne, Australia, 2008 –2010

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