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Nonfatal Heroin Overdoses in Queensland, Australia: an Analysis of Ambulance Data

Michele J. Clark and Angela C. Bates

ABSTRACT *In the past decade, the utilization of ambulance data to inform the prevalence of nonfatal heroin overdose has increased. These data can assist public health policymakers, law enforcement agencies, and health providers in planning and allocating resources. This study examined the 672 ambulance attendances at nonfatal heroin overdoses in Queensland, Australia, in 2000. Gender distribution showed a typical 70/30 male-to-female ratio. An equal number of persons with nonfatal heroin overdose were between 15 and 24 years of age and 25 and 34 years of age. Police were present in only 1 of 6 cases, and 28.1% of patients reported using drugs alone. Ambulance data are proving to be a valuable population-based resource for describing the incidence and characteristics of nonfatal heroin overdose episodes. Future studies could focus on the differences between nonfatal heroin overdose and fatal heroin overdose samples.*

INTRODUCTION

Heroin overdose is an increasingly serious public health issue,[1] and many countries are witnessing a dramatic rise in the number of fatal overdoses. In the United Kingdom, for example, between 1985 and 1995 there was a six-fold increase in fatalities,[2] with surveys in Scandinavia[3] and Spain[4] reporting similar trends. From 1990 to 1996, heroin-related emergency department visits in the United States doubled in number,[5] from 33,900 to 70,500.

In Australia, the number of opioid overdose deaths among those aged 15–44 years has tripled,[6] from 316 in 1990 to 958 in 1999. In 1997–1998, the population prevalence of dependent heroin users in Australia was 6.9 per 1,000 people aged 15–54 years,[7] virtually the same prevalence as that in the United Kingdom (7 per 1,000). Among the six Australian states and two territories, New South Wales and Victoria share the majority of deaths.[6] In 1999, there were 401 and 347 heroin overdoses, respectively, in these two states, while Queensland recorded 70 opioid overdose deaths for the same period.[6] The average age of fatal overdose in Australia is 30 years.[8] Males account for 90% of these fatalities, yet comprise only 70% of the heroin-using population,[9] suggesting that males may be at greater risk of fatal overdose than females.

Compared with fatal heroin overdoses, the phenomenon of nonfatal overdose has been largely overlooked, apart from early reports based on intravenous drug user (IDU) surveys.[10] Given that such surveys are subject to sampling bias,[10] caution

Dr. Clark is Director, Australian Centre for Prehospital Research, Queensland Ambulance Service and School of Population Health, University of Queensland; Ms. Bates is Research Officer, Australian Centre for Prehospital Research, Queensland Ambulance Service.

Correspondence and reprints: Angela C. Bates, Research Officer, Australian Centre for Prehospital Research, Queensland Ambulance Service, GPO Box 1425, Brisbane, Queensland, 4001, Australia. (E-mail: abates@emergency.qld.gov.au)

is required when attempting to determine the prevalence and characteristics of nonfatal overdoses from these samples. As such, ambulance reports may play an important role in helping determine the prevalence of nonfatal overdose. In addition, many heroin users who survive an overdose do not seek medical assistance.[11] In a study by Darke et al.,[12] intravenous drug users were interviewed about their personal experiences; it was found that 68% of the IDUs surveyed had suffered a nonfatal overdose at least once in their drug-using career. In a second report based on the same sample, the majority (86%) of participants had witnessed a nonfatal overdose, and an ambulance was called in half the incidences.[11] In a recent study of ambulance attendances at nonfatal heroin overdoses in Melbourne, only 16% of cases were transported to the hospital,[13] an indication that ambulance services may hold unique information about the prevalence and characteristics of IDUs who experience a nonfatal heroin overdose.

The use of ambulance data to describe the prevalence and demographics of nonfatal heroin overdose cases has emerged only in the past decade and is limited to studies conducted in Germany,[14] Austria,[15] and Australia.[13,16,17] In Australia, the first study using ambulance data to examine episodes of nonfatal heroin overdose was conducted in the Australian Capital Territory (ACT).[16] This study compiled data from case report sheets completed by paramedics between August 1990 and July 1993 in which the opioid antagonist naloxone had been administered to a patient. There was a dramatic increase in the number of nonfatal cases from the second half of 1992 to the first half of 1993.

In Victoria, a database was established of nonfatal heroin overdoses attended by ambulances in metropolitan Melbourne.[10] Initial results from this database for the period November 1997 to January 1998 showed that those in the majority of cases were male (74%), with an estimated mean age of 27.1 years.[13] Later studies conducted by Degenhardt et al.[17] and Jacobs[18] used ambulance data to report on the prevalence and characteristics of nonfatal heroin overdoses in New South Wales and Western Australia, respectively. Both studies yielded similar results to Melbourne with regard to characteristics such as age and gender.

The present study analyzed all nonfatal heroin overdose cases to which the Queensland Ambulance Service (QAS) responded in 2000. Queensland is the second largest of Australia's states and territories, covering more than 1.7 million km, a land mass 2.5 times the size of Texas in the United States. Queensland has a population of approximately 3.6 million. The QAS is the sole provider of prehospital emergency care to the population of Queensland and has a network of 255 service locations, including metropolitan, provincial, remote, island, and Aboriginal communities. A uniform ambulance report form (ARF) is completed for every case treated or transported by the QAS, thus providing consistent population-based prehospital data. The QAS employs more than 2,000 operational staff. In 2000–2001, they attended 288,128 emergency cases, 218,718 nonemergency cases, and 2,055 aeromedical cases.[19]

METHOD

Data were extracted from ARFs completed by paramedics for all episodes of suspected heroin overdose attended by QAS from January 1, 2000, to December 31, 2000. The case records were examined by hand, and data were entered into a standalone database. All analyses were conducted using the Statistical Package for Social Sciences (SPSS).[20] Demographic and temporal variables of interest included age,

gender, time of day, day of week, and month of year. Other variables identified in the literature were also recorded, such as transport to hospital,[13] the presence of police at the scene,[21,22] and the potential risk behavior of the patient using heroin without others present.[12,23]

Using clinical information and circumstantial evidence of heroin use, cases were included if they matched one of three criteria:

1. A positive response to naloxone
2. A clinical profile that matched at least three of the following four items: altered level of consciousness (Glasgow Coma Scale score of 12 or less), pinpoint pupils (1–3 mm), depressed respiratory rate (12 or fewer breaths per minute), or low oxygen saturation levels (below 95%)
3. Circumstantial evidence that included any of the following: patient or person on scene verbally reporting patient heroin use, evidence of fresh needle marks, paraphernalia present at scene (e.g., needle, spoon, tourniquet, etc.)

The clinical profile was developed with advice from intensive care paramedics and the medical director of the QAS. Any cases for which another opiate (such as morphine, codeine, pethidine, dextropropoxyphene, or methadone) was implicated were not included in the study.

RESULTS

Demographic Trends

In 2000, the QAS attended 672 nonfatal heroin overdose episodes. Almost half (43.4%) of these cases were included due to a positive response to naloxone. The other half had circumstantial evidence of heroin overdose (47.1%), and only 5.1% of cases were included due to a clinical profile consistent with heroin overdose. The majority of these incidences occurred in the Greater Brisbane region (422) and the Gold Coast region (179). Each episode in this study is a separate, singular report of an incident of a nonfatal heroin overdose. Analysis revealed that 603 individuals accounted for the 672 episodes.

Table 1 shows the distribution of cases by age and gender. There were significantly more males (n = 469) than females (n = 200) in this sample, $t_{671} = 14.3$, $P < .01$. Ages ranged from 15 years to 60 years (M = 27.22, SD = 7.5). Individuals in the majority of cases were 15–34 years old (82.3%). The average age for males (M = 27.7) was significantly higher than the average for females (M = 26.0), $t_{656} = 2.58$, $P < .01$.

Locations where episodes of suspected heroin overdose occurred are shown in Table 2. Almost half of the ambulance attendances were to private residences (45.7%), followed by episodes that occurred in the street (17.9%).

Temporal Trends

The data were assessed for temporal trends including time of day, day of week, and month of year. The time of day when ambulances were called to nonfatal heroin overdoses was grouped into hour blocks (Fig. 1). Calls were most likely between 10 AM and 9 PM and least likely between 12 AM and 9 AM. This trend is similar to

TABLE 1. Distribution of nonfatal suspected heroin overdoses attended by Queensland Ambulance Service in 2000 by age and gender

			Per 10,000 population	
Demographics	Percentage	Number	(males)	(females)
Gender				
Male	69.9	469		
Female	29.8	200		
Transsexual	0.3	2		
Total	100.0	671		
Missing		1		
Age, years				
15–24	42.0	277	6.6	4.1
25–34	41.9	276	7.7	2.6
35–44	13.6	90	2.5	0.8
45–54	2.1	14	0.5	0.1
55+	0.4	3	0.08	0.04
Total	100	660		
Missing		12		

TABLE 2. Number of call-outs to nonfatal suspected heroin overdoses by location

Location	Percentage	Number
Private residence	45.7	307
Street	17.9	120
Vehicle	6.7	45
Park	4.6	31
Shopping center	4.2	28
Railway station	3.7	25
Hotel/public bar	3.4	23
Public toilet	3.0	20
Medical clinic	2.4	16
Café	2.3	15
Social welfare center	2.1	14
Car park	1.9	13
Other	1.3	9
Police station	0.6	4
Train	0.2	1
Total	100.0	671
Missing		1

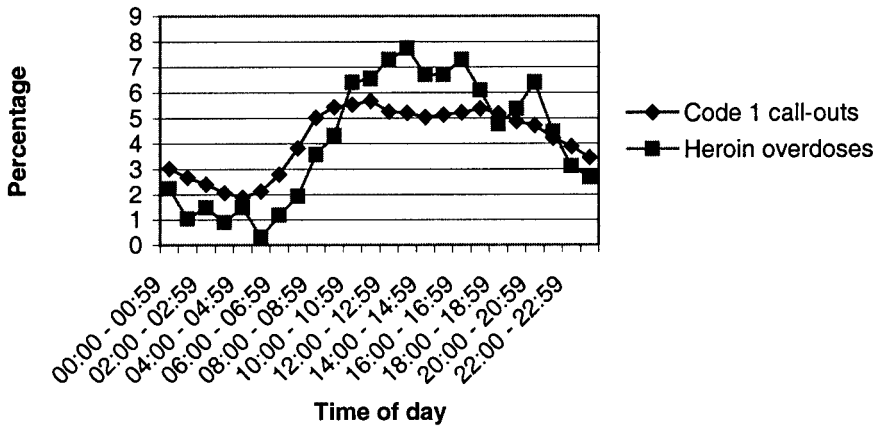

FIGURE 1. Frequency of call-outs to nonfatal suspected heroin overdoses by hour for 2000.

code 1 call-outs,* for which the call-outs followed the general daytime activity pattern.

A gradual increase in the number of calls through the week can be seen in Fig. 2. This rise peaks on Fridays and drops off on Saturdays.

Figure 3 shows the number of cases attended in each month of 2000. The graph shows a gradual increase for each month, with only June and October varying from this trend. A seasonal comparison of months did not reveal a significant difference.

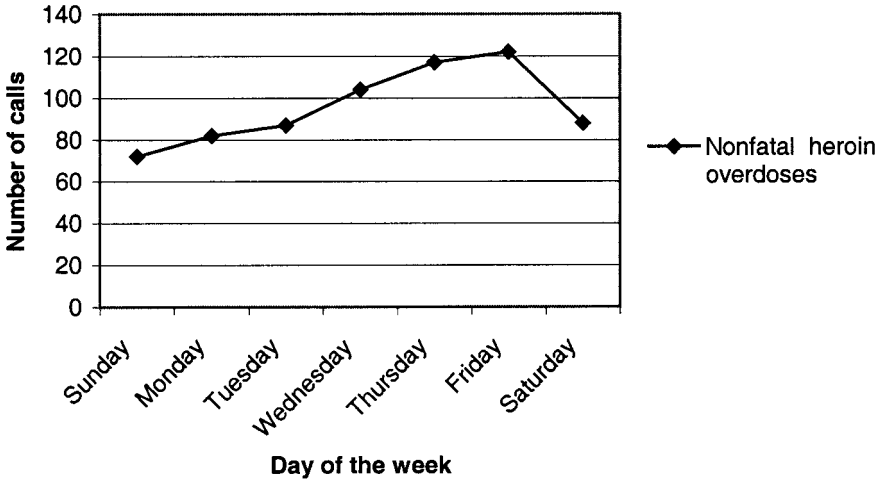

FIGURE 2. Frequency of call-outs to nonfatal suspected heroin overdoses by day of the week.

*Each call-out is given a dispatch code that indicates the level of response required by the incident. A code 1 call-out is the highest level of response and indicates a life-threatening situation that requires immediate response.

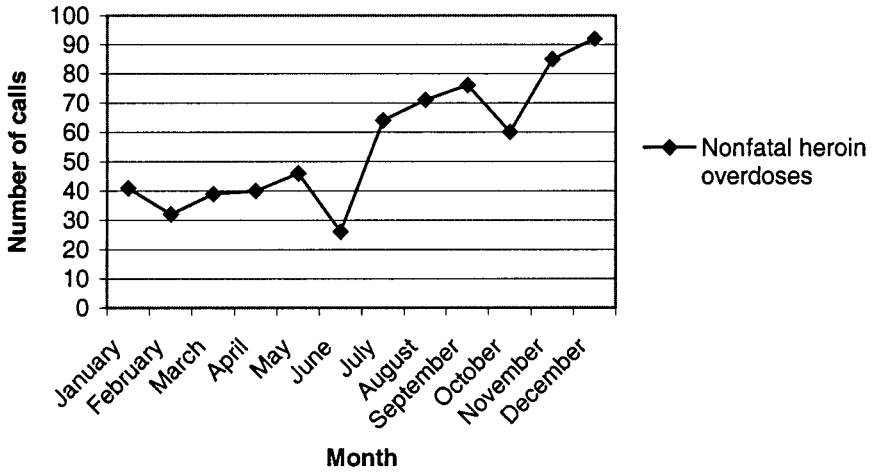

FIGURE 3. Number of QAS attendances to nonfatal suspected heroin overdoses by month for 2000.

Patient Disposition After Ambulance Attendance

Of the 672 nonfatal suspected heroin overdose episodes attended by the QAS, 60.7% were transported to hospital by the QAS; in 1.5% of episodes, patients were transported to a medical center or hospital by others. In 29.6% of episodes, the patient refused transport and remained in the care of friends, relatives, or an unspecified person; they remained with police in 3.6% of episodes. Patients were left alone in only 1.2% of episodes and absconded from the scene in 23 cases (3.4%).

Circumstances Surrounding Patient Drug Use

In 39.1% of episodes, the patient was recorded as having used heroin in the company of others, while in 28.1% of episodes, the patient used the drug alone. This information was not stated in the remaining 32.7% of episodes. Although males used heroin alone more frequently than females, the results were not significant ($\chi^2 = 3.42$; $df = 1$, nonsignificant). However, a chi-square analysis on age group and using alone demonstrated a significant difference ($\chi^2 = 30.35$; $df = 1$, $P < .001$), suggesting that users aged 25 years and older were more likely to use alone than those aged 24 years or younger.

Police Attendance

Police were present at the scene in 108 cases (16.1%) throughout Queensland. Data indicated that, of all cases attended by police, the ambulance service called for the police service in 19 of these cases (17.6%), other people called the police service in 8 cases (7.4%); in 17.6% of cases, police were on routine patrol. In over half the cases (57.4%) attended by the police, the reason for their presence was not recorded.

DISCUSSION

The present study reports on population data regarding nonfatal heroin overdose episodes attended by the ambulance service in Queensland for the year 2000. We

documented a relatively low number of heroin overdoses during the period of investigation. Dietze et al.[24] previously showed a prevalence of nonfatal heroin overdoses attended by the ambulance service in Queensland (approximately 1.5 per 100,000) in 2000, compared to New South Wales (approximately 5.25 per 100,000), Melbourne (approximately 8.5 per 100,000), and Western Australia (approximately 4.5 per 100,000). In terms of the geographical distribution, we showed the typical pattern of high concentrations in high-density urban environments.[13,17] Of the overdoses attended by the QAS during the period of study, 89.4% occurred in the urban Greater Brisbane and Gold Coast regions.

While there are substantial differences in terms of prevalence of heroin overdose between Australian states, there are similarities in relation to key variables such as age and gender and their role in overdose. Typically, the mean age of heroin users is approximately 30 years,[9] with the majority of the heroin-using population in the 25–35-year age range.[25] More recently, there has been some indication that the average age of users[9] and the average age of initiation is decreasing.[26] As Warner-Smith et al.[1] noted, the decline in the average age of initiation does not necessarily indicate a corresponding decline in the mean age of heroin users. The data in the current study demonstrated that a comparable proportion of heroin overdose patients in this study were aged between 25 and 34 years (41.9%) and between 15 and 24 years (42%). However, cases were not limited to the young adult population, as the oldest person in the present sample was 60 years of age. Western Australian ambulance data from the period of January 1998 to June 1999 showed this same trend, with 52.5% of patients aged between 15 and 24 years and 30% of patients aged between 25 and 34 years.[18]

Not surprisingly, the mean age of the population in this study was younger than the average age of 30 years as reported in studies by Darke et al.[9] and Loxley et al.,[27] with the average age for males 27.7 years and females 26 years. Again, ambulance data from Western Australia are similar to our Queensland data, with a 2-year age difference between males (27.5 years) and females (25.6 years).[18] Previous studies have also found this approximate 2-year difference between the sexes.[28,29] Loxley et al. suggest this could reflect an earlier initiation into heroin use by older male sexual partners as female heroin users are more likely than males to have an IDU sexual partner.

This decrease in the average age of users who experience nonfatal overdose is in contrast to the reported increase in the average age of overdose fatalities in Australia. Warner-Smith et al.[1] reported that victims of fatal overdose have been found to be consistently in their late 20s and early 30s, and Hall and Darke[30] found the average age of Australian individuals who were overdose fatalities increased steadily from 24.5 years in 1979 to 30.6 years in 1995.

In line with findings from New South Wales,[17] Victoria,[25] Western Australia,[18] and the Australian Capital Territory,[16] a breakdown for gender of the Queensland data showed a 70/30 distribution, with patients twice as likely to be males. This is consistent with other reports that showed that the heroin-using population is predominantly male.[10]

In a heroin user survey conducted by Darke et al.,[12] only 15% of participants were alone at the time of their last overdose, in comparison to our study, for which the patient used alone in 28.1% of episodes. Hall[23] suggests that older users may be more likely to use alone than younger users and then particularly need to be discouraged from injecting alone. The current study revealed a similar trend toward older users (25 years and older) using alone more frequently than younger users.

Not surprisingly, examination of the time of day of ambulance call-outs to heroin overdose episodes showed a pattern of ordinary waking day activity, with the majority of incidences occurring between 10 AM and 9 PM. Again, similar patterns were found in Melbourne,[13] Australian Capital Territory,[16] and Western Australia.[18] More interesting was the finding for the distribution across weekdays, which showed a gradual increase that culminated on Friday and then declined during the weekend. An almost identical pattern has been reported in Melbourne[13] and Western Australia,[18] supporting the claim of Darke et al.[9] that the majority of the heroin-using population in Australia are, in fact, daily or regular users. This trend, evident in Victoria, Western Australia, and Queensland, clearly shows that use does not peak on the weekend, as would be expected if this drug was used in a purely recreational manner.

The most curious temporal pattern, however, was the steady increase in the number of call-outs over the year 2000, with the exception of June and October. More longitudinal data are required to assess whether this is a periodic change or is particular to changes in drug availability. The currently available data can only describe, but not explain, the underlying reasons for the observed pattern.

To further explore the circumstances surrounding heroin overdose, data were broken down in terms of types of locations where incidences occurred. In almost half the incidences (45.7%), the ambulance service was called to a private residence, demonstrating a very similar pattern to that reported[13] for Melbourne (44%). In Queensland, incidences occurring in the street and in vehicles accounted for 17.9% (almost one fifth) and 6% of the episodes, respectively.

Although there are strong demographic and temporal similarities between the Australian states regarding ambulance attendances to nonfatal heroin overdoses, there appears to be a difference in outcomes of these attendances. In Melbourne, for example, only 16.5% of patients were transported to the hospital, with 59% choosing to remain in the care of friends, relatives, partners, or others.[13] In contrast, the Western Australian ambulance service transported the majority (89%) of those with opiate overdoses to the hospital.[18] In the present study, patients were transported to the hospital in 60.7% of the cases, while in 31.1% of the cases, patients chose to remain in the care of friends, relatives, partners, staff at hotel or café premises, or other unidentified people. It should be noted that, in both Melbourne and Queensland, all patients suspected of suffering from a heroin overdose are strongly encouraged to accept ambulance transport to the hospital. This advice, however, is not enforceable.[13,31] In Queensland, only 8 patients refused transport and remained without company, and in 23 (3.4%) of cases, the patient absconded. This figure is relatively low when compared to the 17% of cases reported by Dietze et al.[13] for which patients were left alone.

The large percentage (39.3%) of patients refusing transport to hospital is of concern, as there is a risk of the patient becoming renarcotized.[32] This reluctance may be due to a number of reasons, including previous negative experiences with hospitals,[24] an unwillingness or inability to pay the cost of the ambulance transport or ambulance insurance,[33] or fear of police involvement and hence prosecution.[11,34] However, a change in protocol, adopted by police services throughout Australia, guarantees that police activity at heroin overdoses is to ensure the provision of appropriate medical care and to protect the welfare of the attending paramedics.[35] The goal of this policy change is to decrease the reluctance of heroin users and their peers to access emergency medical help. Perhaps as a consequence, the Queensland Police Service (QPS) was in attendance in only 1 of 6 cases. For over half these

cases, the reason for their presence was not specified. In these situations, they were called first to an incident or the patient was found by police in a public place, which resulted in a police call for medical assistance. The QAS called the Queensland Police Service in about 20% of cases, requesting assistance with transport or security.

CONCLUSION

The present study provides data about the incidence and distribution of nonfatal heroin overdoses in Queensland. The strength of the data lies in the availability of the more informative variables, such as sex, age, time, location, and circumstances around heroin use. This information can address certain remaining questions regarding the use of heroin in Queensland, which may aid law enforcement and health care agencies to better distribute and allocate their resources.

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