

# DRUG & ALCOHOL OFFICE

## DEATHS CAUSED BY ILLICIT DRUGS, WA, 1995-2001

### INTRODUCTION

This publication contains an analysis concerning deaths in Western Australia (WA) between 1995 and 2001 which have involved two types of opioid related deaths:

- accidental heroin related deaths (HRDs); and
- opioid (other than heroin) related deaths, such as methadone, dextromoramide, propoxyphene, morphine and oxycodone.

Detailed information is also presented about illicit drug related deaths between 1997 and 2001 which involve designer drugs such as amphetamine, methylamphetamine and ecstasy.

Data for the study is from the Coronial Database which contains information such as toxicological, forensic and other data about illicit drug related deaths in WA obtained for the purposes of coronial investigations. The Coronial Database was initially developed in 1995 to identify factors and circumstances associated with HRDs and since 1997 expanded to cover other types of illicit drug related deaths.

*(Details of the methodology used to identify specific opioids and other factors which contribute to illicit drug related deaths are outlined in the methods section on page 12.)*

### ACCIDENTAL HEROIN RELATED DEATHS

#### Annual trends

Overall, from 1995 to 1999 the annual number of accidental HRDs in WA increased by 24%, from 66 in 1995 to 81 in 1999. Since 1999 annual HRDs have fallen by 81.7% to 15 deaths in 2001 (Table 1, page 2).

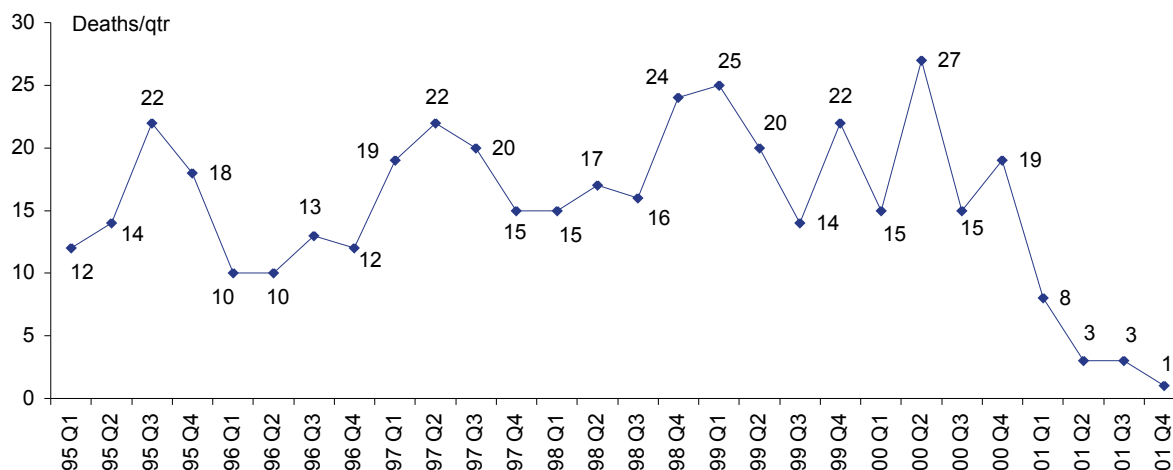
#### Quarterly trends

Over the seven year period there has been a series of fluctuations in the quarterly number of HRDs. There has been four peaks, in the latter part of 1995, in mid 1997, in early 1999 and in mid 2000 (Figure 1).

The number of HRDs increased by 83.3%, from 12 in the March quarter 1995 to 22 in the September quarter 1995 and then fell to 10 in the March quarter 1996. Following a period of relative stability in the first two quarters of 1996 the number of HRDs increased by 83.3%, from 12 in the December quarter 1996 to 22 in the June quarter 1997.

The number of HRDs decreased from the peak of 22 in the June quarter 1997 and then remained relatively constant, with about 16 HRDs per quarter up to the September quarter 1998.

**Figure 1**  
Quarterly accidental heroin related deaths, WA, 1995-2001



The number of HRDs per quarter increased by 53.0%, from 17 in the September quarter 1998 to 25 in the March quarter 1999, fell to 14 in the September quarter 1999 and then nearly doubled to 27 in the June quarter 2000.

Since the June quarter 2000 (27 deaths) the number of HRDs per quarter have steadily declined to 1 death in the December quarter 2001.

**Table 1**  
**Quarterly accidental heroin related deaths, WA 1995-2001**

Year	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total
1995	12	14	22	18	66
1996	10	10	13	12	45
1997	19	22	20	15	76
1998	15	17	16	24	72
1999	25	20	14	22	81
2000	15	27	15	19	76
2001	8	3	3	1	15

**Table 2**  
**Mean age of accidental heroin related deaths WA, 1995-2001**

Year	Males	Females	Persons
1995	31.7	31.9	31.7
1996	31.2	33.5	31.7
1997	30.1	24.8	28.9
1998	31.5	30.2	31.4
1999	29.4	24.9	28.6
2000	29.4	24.9	28.7
2001	31.1	32.2	31.8

## Age

The mean age of HRDs in WA has typically involved persons in their late 20s to early 30s. Overall, for most years from 1995 to 2001 the mean age of all HRDs was nearly 32 years of age except for 1997, 1999 and 2000 (Table 2).

On average males were older than females in the years between 1997 and 2000, whereas on average females were older than males in the years 1995, 1996 and 2001. The average age of females was just under 25 years of age in the years 1997, 1999 and 2000, whereas in other years the average age of females was more than 30.

A comparison of the age profile of males and females indicates that about half of all male HRDs were between 25 and 34 years of age, whereas about half of all female HRDs were between 20 and 29 years of age (Figure 2; Table 3, page 3).

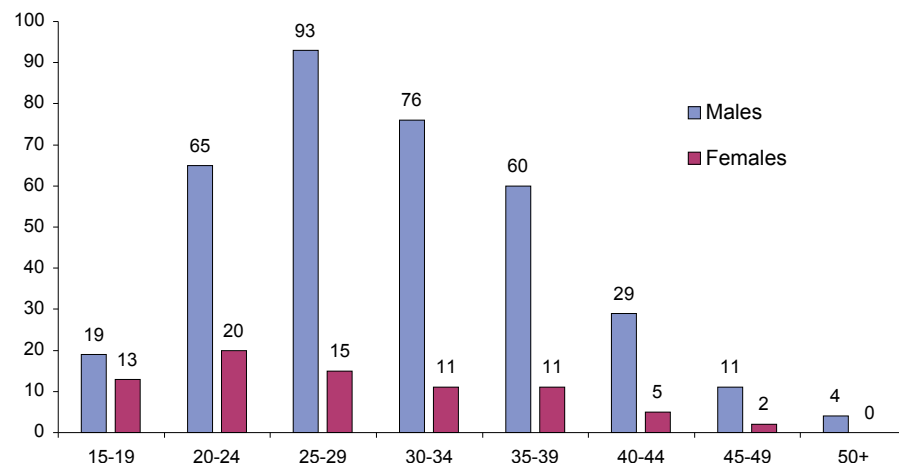
## Time of incident

Data about time of incident has only been available in the Coronial Database since 1997. Over the five year period from 1997 to 2001 there was a total of 320 HRDs, of which 164 (51.3%) occurred between 8.00 am and 6.00 pm (Table 4, page 3).

The greatest number of HRDs occurred between the times of 8.00 am and 2.00 pm when there were 104 deaths, which accounted for one third of all HRDs.

Over the 24 hour period the least number of HRDs occurred between midnight and 8.00 am, with a total of 64 (20.0%) deaths over this time.

**Figure 2**  
**Accidental heroin related deaths by age group & sex, WA, 1995-2001**



**Table 3**  
**Annual accidental heroin related deaths by age group & sex, WA, 1995-2001**

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+	Total
<b>Males</b>									
1995	1	10	11	14	11	7	1	-	55
1996	1	7	9	6	7	4	-	1	35
1997	6	10	14	12	7	8	2	-	59
1998	1	11	16	17	12	4	1	3	65
1999	5	15	18	12	9	5	3	-	67
2000	5	10	18	15	14	1	1	-	64
2001	-	2	6	-	-	-	2	-	10
<b>Females</b>									
1995	1	2	2	3	2	-	-	-	11
1996	-	1	1	4	2	2	-	-	10
1997	3	7	4	-	2	1	-	-	17
1998	1	1	1	-	3	1	-	-	7
1999	4	2	4	2	2	-	-	-	14
2000	3	4	3	1	-	-	1	-	12
2001	-	2	-	1	1	-	1	-	5
<b>Persons</b>									
1995	2	12	13	17	13	7	2	-	66
1996	1	8	10	10	9	6	-	1	45
1997	9	17	18	12	9	9	2	-	76
1998	2	12	17	17	15	5	1	3	72
1999	9	17	22	14	11	5	3	-	81
2000	8	14	21	16	14	1	2	-	76
2001	-	4	6	1	1	-	3	-	15

**Table 4**  
**Annual accidental heroin related deaths by time of incident, WA, 1997-2001**

Time of incident	1997-1998	1999-2000	2001	1997-2001	
	n	n	n	n	%
12-1:59am	9	10	2	21	6.6
2-3:59am	9	3	2	14	4.4
4-5:59am	7	4	2	13	4.1
6-7:59am	9	6	1	16	5.0
8-9:59am	15	13	1	29	9.1
10-11:59am	20	18	0	38	11.9
12-1:59pm	15	21	1	37	11.6
2-3:59pm	14	15	2	31	9.7
4-5:59pm	14	15	0	29	9.1
6-7:59pm	12	14	2	28	8.8
8-9:59pm	17	17	1	35	10.9
10-11:59pm	10	18	1	29	9.1
<b>Total</b>	<b>151</b>	<b>154</b>	<b>15</b>	<b>320</b>	<b>100.0</b>

## Day of incident

Data about day of incident has only been available in the Coronial Database since 1997. This data shows the most frequent number of HRDs occurred on Wednesdays and Saturdays, with a total of 60 (18.8%) and 62 (19.4%) deaths respectively (Table 5).

Overall, the least number of deaths occurred on Mondays with a total of 30 (9.4%) HRDs. It is possible there were fewer deaths on Monday than indicated, as some of the 'Monday' deaths which apparently occurred in the early hours of Monday morning would have been the culmination of drug use on the Sunday evening.

## Place of incident

Data about place of incident has only been available in the Coronial Database since 1997. Overall, there was a total of 216 (67.5%) deaths which occurred at a private dwelling (eg house, flat or unit). This accounted for two thirds of all HRDS in the five year period (Table 6).

There was a total of 43 (13.4%) deaths which occurred in a carpark or street, 27 (8.4%) at a hotel, motel or hostel and 15 (4.7%) in a public toilet.

Of the remaining deaths, 3 (1.0%) occurred in a state prison and 16 (5.0%) occurred in other public places, such as vacant land, bush track or parkland.

With respect to the 15 to 29 year age group, there was a pattern for a higher proportion of the HRDs of this age group to have been in a carpark or street (65.1%) or 'other public place' (75.0%), compared to deaths that occurred in other places. This may indicate that younger persons had less means to access accommodation such as a hotel or privately rented dwellings.

A breakdown of place of incident by sex is presented in Table 7 (page 5). This indicates that a higher proportion of all female HRDs compared to male HRDs occurred in a private dwelling (74.5% vs 71.3%).

A slightly higher proportion of male compared to female HRDs occurred in a carpark or street (9.4% vs 7.3%) or public toilet (4.9% vs 3.6%). Nearly one in 10 male deaths occurred at a hotel, motel or hostel whereas about 5% of female deaths occurred at this type of place.

## Locality of incident

Data about locality of incident has only been available in the Coronial Database since 1997. Of the 320 deaths, 274 (85.6%) occurred in the Perth metropolitan area and 46 (14.4%) occurred in non metropolitan localities (Tables 8 and 9, page 6).

**Table 5**  
**Accidental heroin related deaths by day of incident & sex, WA, 1997-2001**

Day of incident	Females		Males		Total	
	n	%	n	%	n	%
Monday	8	14.5	22	8.3	30	9.4
Tuesday	5	9.1	36	13.6	41	12.8
Wednesday	10	18.2	50	18.9	60	18.8
Thursday	5	9.1	34	12.8	39	12.2
Friday	8	14.5	42	15.8	50	15.6
Saturday	11	20.0	51	19.2	62	19.4
Sunday	8	14.5	30	11.3	38	11.9
<b>Total</b>	<b>55</b>	<b>100.0</b>	<b>265</b>	<b>100.0</b>	<b>320</b>	<b>100.0</b>

**Table 6**  
**Accidental heroin related deaths by place of incident & age group, WA, 1997-2001**

Age group	Car park/street	Dwelling	Hotel/motel/hostel	Prison	Public toilet	Other	Total
15-19	1	21	1	1	1	3	28
20-24	13	38	7	-	2	4	64
25-29	14	57	5	-	3	5	84
30-34	4	45	5	1	3	2	60
35-39	4	37	4	-	4	1	50
40-44	3	12	2	1	2	-	20
45-49	3	4	3	-	-	1	11
50+	1	2	-	-	-	-	3
<b>Total</b>	<b>43</b>	<b>216</b>	<b>27</b>	<b>3</b>	<b>15</b>	<b>16</b>	<b>320</b>

**Table 7**  
**Accidental heroin related deaths by place of incident & sex, WA, 1997-2001**

Place of incident	Females		Males		Total	
	n	%	n	%	n	%
Car park/street	4	7.3	25	9.4	29	9.1
Dwelling	41	74.5	189	71.3	230	71.9
Hotel/motel/hostel	3	5.5	24	9.1	27	8.4
Prison	-	-	3	1.1	3	0.9
Public toilet	2	3.6	13	4.9	15	4.7
Other	5	9.1	11	4.2	16	5.0
<b>Total</b>	<b>55</b>	<b>100.0</b>	<b>265</b>	<b>100.0</b>	<b>320</b>	<b>100.0</b>

In the Perth metropolitan area HRDs occurred in a total of 113 different localities. The most frequent localities were in the Perth central business district (CBD) and in Fremantle, with 20 and 11 HRDs respectively (Table 8, page 6).

In addition to the 20 deaths in the CBD there were a further 9 HRDs in the adjacent locality of Northbridge, a major late night entertainment area. Therefore there was a total of 29 (9.0%) HRDs in the inner city area.

Other than the Perth CBD and Fremantle, the next most frequent localities for HRDs were Scarborough (8 deaths), Mount Lawley (7 deaths) and Balga, Bentley and Tuart Hill (6 deaths each).

A total of 5 deaths each occurred in Bassendean, East Perth, East Victoria Park, Girrawheen, Maylands, Riverdale, South Perth and Wembley. There were a further five localities with 4 deaths each.

Out of the total of 21 HRDs in non metropolitan localities, 18 (85.7%) occurred in two regions, Kalgoorlie-Boulder and Mandurah with 10 and 8 respectively (Table 9, page 6).

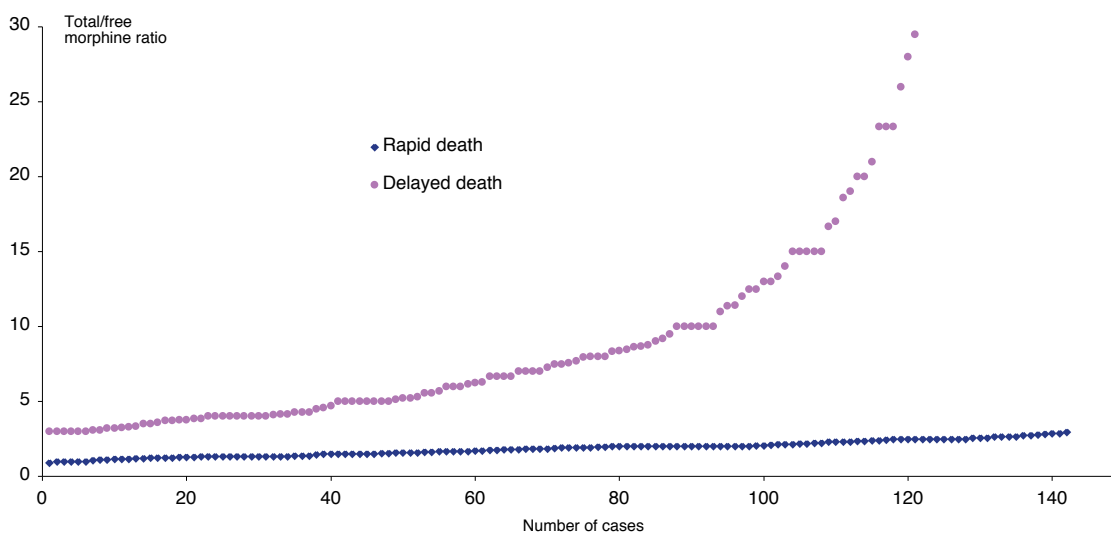
### Rate of death

A study undertaken by the Chemistry Centre, which examined correlation between blood morphine concentrations and estimated time of death from data from July 1992 to May 1997, published in *Statistical Bulletin No. 8* confirmed earlier research<sup>1</sup> that a total/free morphine rate ratio of less than 3, is a 'rapid death' which has occurred within 20 minutes of injection of heroin. If the rate ratio is 3 or greater, this is a 'delayed death' which has occurred more than 20 minutes after injection, in most cases considerably hours later.

An updated analysis of samples of mortuary admission blood computed the ratio of total morphine to free morphine in 263 HRDs between 1997 and 2001 (Figure 3). In relation to the 263 cases, it was found that 142 (54.0%) involved deaths with a total morphine to free morphine ratio of less than 3.

This result suggests that heroin purity may be a less important factor in recent HRDs in WA, compared to the earlier study from July 1992 to May 1997 which found that 72.5% of deaths had a rate ratio of less than 3.

**Figure 3**  
**Rate of death - mortuary admission blood, morphine ratio vs rate of death WA, 1997-2001**



**Table 8**  
**Accidental heroin related deaths by locality of incident, metropolitan area, WA, 1997-2001**

Applecross	2	East Victoria Park	5	Leederville	3	Red Hill	1
Armadale	4	Edgewater	1	Lockridge	2	Rivervale	5
Ashfield	1	Ellenbrook	1	Lynwood	1	Rockingham	2
Attadale	1	Forrestdale	1	Maddington	2	Safety Bay	1
Atwell	1	Forrestfield	3	Manning	1	Samson	1
Balcatta	2	Fremantle	11	Marangaroo	2	Scarborough	8
Balga	6	Girrawheen	5	Maylands	5	South Perth	5
Bassendean	5	Glendalough	2	Midland	2	Stirling	1
Bayswater	2	Gosnells	2	Midvale	3	Subiaco	1
Beckenham	1	Greenwood	1	Mirrabooka	1	Thornlie	1
Beechboro	1	Guildford	1	Mosman Park	3	Tuart Hill	6
Belmont	3	Hamersley	3	Mt Claremont	1	Victoria Park	4
Bentley	6	Hamilton Hill	2	Mt Hawthorn	2	Wanneroo	1
Bicton	1	Helena Valley	1	Mt Helena	1	Waterford	1
Bullcreek	1	Highgate	1	Mt Lawley	7	Wattleup	2
Cannington	4	Hilton	1	Mundaring	2	Wembley	5
Carlisle	1	Iluka	1	Nedlands	1	Wembley Downs	1
City Beach	1	Inglewood	1	Nollamara	3	Westfield	1
Claremont	2	Innaloo	3	Noranda	1	West Leederville	1
Cloverdale	2	Jolimont	1	Northbridge	9	West Perth	2
Coogee	1	Joondanna	2	North Perth	4	Willetton	1
Coolbellup	4	Kalamunda	2	Ocean Reef	2	Woodlands	2
Cooloongup	1	Kallaroo	1	O'Connor	1	Yokine	1
Craigie	1	Kardinya	1	Orelia	1		
Currabine	1	Karrinyup	3	Osborne Park	4		
Dianella	3	Kenwick	1	Padbury	2		
Doubleview	3	Kingsley	2	Parmelia	2		
Duncraig	1	Koondoola	1	Perth CBD	20		
East Perth	5	Lathlain	1	Prison	3		
East Fremantle	3	Ledge Point	1	Queens Park	2		

**Table 9**  
**Accidental heroin related deaths by locality of incident, non-metropolitan area, WA, 1997-2001**

Albany	2	Dunsborough	1	Laverton	2	South Hedland	3
Boulder	2	Esperance	2	Mandurah	8	Wundowie	1
Bridgetown	1	Geraldton	4	Marvel Loch	1	Yerecoin	1
Broome	1	Harvey	1	Newman	1		
Busselton	2	Kalgoorlie	8	Pannawonnica	1		
Carnarvon	1	Kununurra	1	Port Hedland	2		

# OPIOID RELATED DEATHS

## Licit and illicit opioids

Over the seven year period from 1995 to 2001 there was a total of 617 opioid related deaths in WA, of which:

- 431 (69.9%) were accidental HRDs;
- 96 (15.5%) were illicit opioid related (other than accidental HRDs), caused either accidentally or intentionally; and
- 90 (14.6%) were licit opioid related, caused either accidentally or intentionally (Table 10, page 8).

The number of quarterly opioid deaths more than doubled, from 17 in the March quarter 1995 to 38 in the December quarter 1998, then dropped by half to 19 in the March quarter 2000.

From the March quarter 2000 to the June quarter 2000 quarterly deaths increased sharply, from 19 to 34 deaths (Figure 4). Since the June quarter 2000 quarterly opioid deaths have steadily declined, with 10 deaths in the December quarter 2001, a fall of 70.6%.

However, whilst quarterly accidental HRDs have steadily declined since the peak of 27 deaths in the June quarter 2000, this has been partly offset by an increase in quarterly deaths associated with opioids other than heroin (Figure 4).

It can be seen that over the seven year period, since the year 2000, there has been more deaths each quarter related to the use of opioids *other than* heroin.

## Type of opioid and cause

A breakdown from 1995 to 2001 of the annual number of opioid related deaths by type of opioid and type of cause is presented in Table 11 (page 9).

Overall, 449 (72.8%), nearly three quarters of the total of 617 opioid deaths, were heroin related, with 50 (8.1%) morphine related deaths and 49 (7.9%) methadone related deaths.

In relation to the remaining deaths, 22 (3.6%) were propoxyphene related, 15 (2.4%) were oxycodone related, 12 (1.9%) involved a combination of opioids, 10 (1.6%) were codeine related and 8 (1.3%) were dextromoramide related.

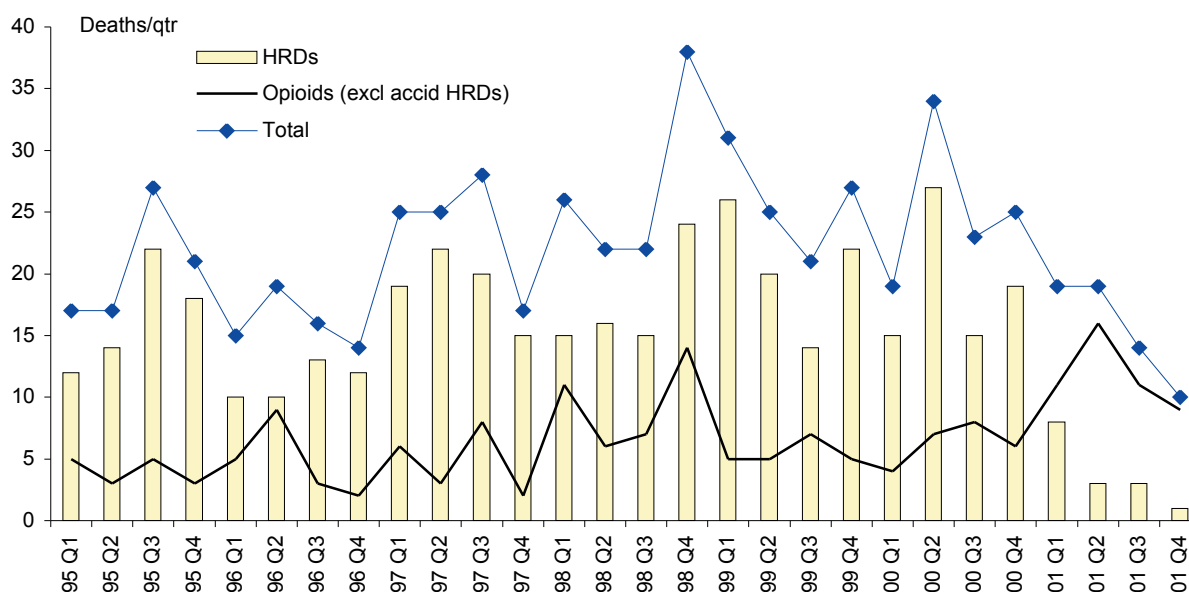
There was also 1 pethidine related death and 1 buprenorphine related death.

Out of these 617 deaths over the seven year period, 568 (92.1%) were accidental and 49 (7.9%) were intentional, ie due to suicide. The study also found that of the total of 449 HRDs over the seven year period, 18 (4.0%) were due to suicide.

Research in other jurisdictions has highlighted the need for careful controls to ensure that adequate assessment protocols, appropriate prescribing and dispensing practices are maintained to minimise the risks of abuse of prescribed opioids.<sup>2-3</sup>

There are two further cases which have not been included in this analysis, where the opioid related death was due to homicide. These deaths involved heroin and morphine and occurred in 1998 and 1999 respectively. In both cases the parties responsible for the death were convicted and sentenced to terms of imprisonment.

**Figure 4**  
Quarterly opioid related deaths, WA, 1995-2001



**Table 10**  
**Quarterly opioid related deaths, type of opioid,**  
**WA, 1995-2001**

Year & quarter	Illicit opioids		Licit opioids	All opioids
	Accidental HRDs	Excluding accid. HRDs		
<b>1995</b>				
Qtr 1	12	2	3	17
Qtr 2	14	1	2	17
Qtr 3	22	2	3	27
Qtr 4	18	1	2	21
<b>1996</b>				
Qtr 1	10	3	2	15
Qtr 2	10	3	6	19
Qtr 3	13	1	2	16
Qtr 4	12	-	2	14
<b>1997</b>				
Qtr 1	19	2	2	23
Qtr 2	22	4	2	28
Qtr 3	20	4	4	28
Qtr 4	15	1	-	16
<b>1998</b>				
Qtr 1	15	9	2	26
Qtr 2	17	4	2	23
Qtr 3	16	4	3	23
Qtr 4	24	10	4	38
<b>1999</b>				
Qtr 1	25	6	-	31
Qtr 2	20	3	2	25
Qtr 3	14	6	1	21
Qtr 4	22	3	2	27
<b>2000</b>				
Qtr 1	15	2	2	19
Qtr 2	27	2	5	34
Qtr 3	15	5	2	22
Qtr 4	19	5	1	25
<b>2001</b>				
Qtr 1	8	4	7	19
Qtr 2	3	5	11	19
Qtr 3	3	1	10	14
Qtr 4	1	3	6	10
<b>1995-2001</b>	<b>431</b>	<b>96</b>	<b>90</b>	<b>617</b>



**Table 11**  
**Annual opioid related deaths, type of opioid and type of cause, WA, 1995-2001**

Drug & cause	1995	1996	1997	1998	1999	2000	2001	Total
<b>Heroin/morphine</b>								
Accidental	66	45	76	72	81	76	15	431
Suicide	-	-	3	8	2	5	-	18
<b>Morphine</b>								
Accidental	2	2	4	6	4	7	15	40
Suicide	1	-	-	5	1	1	2	10
<b>Methadone</b>								
Accidental	2	3	5	7	11	3	14	45
Suicide	-	-	-	1	-	-	3	4
<b>Oxycodone</b>								
Accidental	1	3	1	-	1	2	3	11
Suicide	-	-	-	3	-	-	1	4
<b>Dextromoramide</b>								
Accidental	3	2	2	-	1	-	-	8
Suicide	-	-	-	-	-	-	-	-
<b>Opiates combination</b>								
Accidental	1	-	4	1	2	1	-	9
Suicide	-	1	-	1	-	1	-	3
<b>Codeine</b>								
Accidental	2	-	-	1	1	-	1	5
Suicide	2	-	-	-	-	-	3	5
<b>Propoxyphene</b>								
Accidental	2	5	-	4	-	3	3	17
Suicide	-	2	-	1	-	1	1	5
<b>Pethidine</b>								
Accidental	-	1	-	-	-	-	-	1
Suicide	-	-	-	-	-	-	-	-
<b>Buprenorphine</b>								
Accidental	-	-	-	-	-	-	1	1
Suicide	-	-	-	-	-	-	-	-
<b>All drugs</b>								
Accidental	79	61	92	91	101	92	52	568
Suicide	3	3	3	19	3	8	10	49
<b>Total</b>	<b>82</b>	<b>64</b>	<b>95</b>	<b>110</b>	<b>104</b>	<b>100</b>	<b>62</b>	<b>617</b>

## DESIGNER DRUG RELATED DEATHS

An analysis of toxicological data in the Coronial Database was used to select deaths that occurred between 1997 and 2001 which involved designer drugs, such as amphetamine, methylamphetamine, PMA (paramethoxyamphetamine), ecstasy or MDMA (methylenedioxymetamphetamine), MDA (3,4-methylenedioxymethylamphetamine) and ketamine.

The files for each of these deaths were examined to identify the circumstances surrounding the incident and the role identified by the Coroner that designer drugs played in being the primary or related cause of death.

**Table 12**  
Quarterly designer drug related deaths, WA 1997-2001

Year	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total
1997	-	-	2	-	2
1998	-	-	-	1	1
1999	1	-	-	4	5
2000	4	4	4	5	17
2001	6	7	3	2	18

**Table 13**  
Mean age of designer drug related deaths WA, 1997-2001

Year	Males	Females	Persons
1997	36.0	24.0	30.0
1998	25.0	-	25.0
1999	26.0	34.5	29.4
2000	30.9	23.3	29.1
2001	32.0	27.0	29.8

**Table 14**  
Annual designer drug related deaths by cause, WA, 1997-2001

Year	1997	1998	1999	2000	2001	Total
<i>External causes</i>						
Drug overdoses	1	-	4	7	9	21
Other causes	-	-	-	2	2	4
<i>Medical conditions</i>						
Cardiovascular	1	-	1	4	3	9
Other conditions	-	-	-	1	3	4
<b>Total</b>	<b>2</b>	<b>-</b>	<b>5</b>	<b>14</b>	<b>17</b>	<b>38</b>

## Results

Overall, from 1997 to 2001 there was a total of 43 designer drug related deaths in Western Australia (Table 12). There were 38 cases with complete data, of which 25 (65.8%) deaths were due to external causes and 13 (34.2%) were due to medical conditions (Table 14). In relation to the 25 deaths due to external causes, 21 (84.0%) were overdoses, ie where death arose from the toxic effects of the drug itself and 4 (16.0%) involved other external causes such as immersion.

In relation to the 13 deaths due to medical conditions, 9 (69.2%) were due to a number of cardiovascular events such as cardiac arrest, cardiac arrhythmia, cardiac dysrhythmia, myocardial infarction or coronary arteriosclerosis. There were also 4 (30.8%) cases where death arose from medical conditions such as asthma, cerebral haemorrhage and epileptiform seizure. All of these medical conditions were found by the Coroner to have occurred as a consequence of the use of designer drugs.

From 1997 to mid 1999 there were very few designer drug related deaths in WA, with only 2 deaths in the September quarter 1997 and 1 death in both the September 1998 and March 1999 quarters (Table 12).

However, since late 1999 the number of quarterly designer drug related deaths increased from 4 deaths in the December quarter 1999 to 7 deaths in the June quarter 2001. Since mid 2001 the number of deaths has decreased to 2 deaths in the December quarter 2001.

Typically most of the designer drug related deaths have involved people in their late 20s to early 30s, with an average age of about 30 years, except for 1998 (Table 13).

A breakdown of date of incident of the 43 deaths, found that 26 (60.5%) deaths occurred on Friday, Saturday and Sunday (Table 15, page 11). This may suggest that just under two thirds of all designer drug related deaths were the result of recreational drug use that occurred at the end of the week and over the weekend.

## Coroner's verdict

As has been indicated earlier, just over one third of all designer drug deaths in WA over the five year period since 1997 were found by a Coroner to be due to one or more medical conditions that occurred as a consequence of the use of these drugs. There is a body of overseas research which has highlighted the risks of the use of designer drugs resulting in medical complications.<sup>4-6</sup>

Extracts from a sample of the Coroner's findings and a narrative of the circumstances provide an understanding of typical circumstances of these deaths as follows.

*"Coronary arteriosclerosis associated with recent use of methylamphetamine"* (male 36 years). Witness statements noted that about 24 hours after injecting amphetamines this man complained of hot flushes, sweating and shivering. These were symptoms he had experienced a number of times in the preceding six months following amphetamine use and each time he had refused medical assistance.

*"Coronary arteriosclerosis with thrombosis and methylamphetamine effect (open finding)"* (male 37 years). This death occurred as a result of a heart attack due to coronary arteriosclerosis and the use of methylamphetamines was considered to have contributed to the heart attack.

*"Intracerebral haemorrhage (massive) in association with arteriovenous malformation (natural causes)"* (female 20 years). This death occurred on the day following recreational use of amphetamine tablets at a party. This woman collapsed in the shower, became unconscious and died four days later in an intensive care unit. It was found that she had vascular abnormalities which may have burst due to very high blood pressure (systemic hypertension) that occurred following amphetamine use.

*"Consistent with acute cardiac dysrhythmia in a woman with focal coronary artery atherosclerotic and methylamphetamine/amphetamine effect (accident)."* (female 24 years). This woman had a pattern of injecting amphetamines with her partner on weekends. Toxicology tests confirmed the presence of methylamphetamine/

amphetamine. However, while the levels were not directly fatal, they had potential to create vulnerability to acute cardiac dysrhythmia in a person already cardiologically vulnerable on account of having focal coronary artery disease.

The following Coroner's findings are concerned with those cases where the toxic effects of the drugs were the cause of death: *"Amphetamine effect (accident)"* (female 42 years); *"Acute amphetamine toxicity (accident)"* (male 24 years); *"Combined drug toxicity (accident)"* (male 22 years); *"Acute combined drug effect (amphetamines, methadone, cannabis, benzodiazepines) (accident)"* (female 32 years).

In these and similar cases there was evidence of amphetamine use in the period immediately prior to death. In a number of these cases the person had also used other substances such as cannabis, alcohol and prescription drugs.

In a number of other cases the Coroner's verdict referred to the effect of amphetamines in association with other substances: *"Aspiration of vomitus in association with alcohol and amphetamine effect (accident)"*, *"Combined drug toxicity (accident)"* or *"Combined drug effect (accident)"*.

The role of PMA (paramethoxyamphetamine) as a contributing cause of death was specifically noted in the verdicts of three cases. All these deaths involved combinations of amphetamine type drugs and ecstasy which also contained PMA.

It was found that 4 (9.3%) of all designer drug related deaths involved Aboriginal persons. There appear to have been relatively few cases where any of these individuals had sought treatment with a specialist drug and alcohol agency.

There were four cases where an individual had attended a naltrexone program, including one with a naltrexone implant. There were also four cases where psychiatric treatment had been undertaken, usually due to self harm incidents. There was one case of dexamphetamines being prescribed over a period of time.

**Table 15**  
**Designer drug related deaths by day of incident & sex, WA, 1997-2001**

Day of incident	Females		Males		Total	
	n	%	n	%	n	%
Monday	1	6.7	2	7.1	3	7.0
Tuesday	1	6.7	4	14.3	5	11.6
Wednesday	2	13.3	2	7.1	4	9.3
Thursday	1	6.7	4	14.3	5	11.6
Friday	4	26.7	4	14.3	8	18.6
Saturday	2	13.3	7	25.0	9	20.9
Sunday	4	26.7	5	17.9	9	20.9
<b>Total</b>	<b>15</b>	<b>100.0</b>	<b>28</b>	<b>100.0</b>	<b>43</b>	<b>100.0</b>

## METHODS

This publication is an update of data in *Statistical Bulletin No. 2* (August 1996), *Statistical Bulletin No. 4* (July 1997) and *Statistical Bulletin No. 8* (May 2000).

Coroners in this State by law are required to investigate all sudden and unexpected deaths. In relation to drug related deaths Coroners obtain and consider a large range of toxicological and forensic data.

The Australian Bureau of Statistics (ABS) has responsibility for compiling comprehensive statistical summaries for all causes of death for each Australian jurisdiction. This process uses an internationally standardised system of cause of death codes developed under the auspices of the World Health Organisation.

The Tenth Revision of the International Classification of Diseases, referred to as ICD-10, has been used to classify the underlying cause of death from 1999.

The ICD-10 system uses different codes to identify deaths caused by specific pharmacological groups of drugs, including opioid type (F11.-), stimulant type (F15.-), cocaine type (F14.-) and hallucinogens (F16.-) etc. A fourth character sub division is used to determine the level of drug use, harmfulness, dependence and other related disorders.

The ICD-10 system also distinguishes between deaths that are externally caused due to accidental poisoning (code for opioids X42), deaths due to intentional self harm (opioids included in code X62) and assault by poisoning (code X85 refers to all drugs).

The Coronial Database was established in 1995 in collaboration with the Chemistry Centre of WA and the Coroner's Court and is presently managed by Drug and Alcohol Office (DAO). Its purpose is to overcome the limitations of the ICD system, such as not being able to identify a HRD by a specific ICD code.

As the Coronial Database includes information extracted from forensic, demographic and toxicological data it provides comprehensive data about HRDs and other drug deaths to support preventive measures.

This data also enables monitoring of the extent to which licit opioid drugs, such as morphine, oxycodone, dextromoramide and methadone, may be available in the black market. Diverted licit opioids may become substitutes for

heroin and thus be a cause of death as they have similar actions as heroin.

Differences can occur for a count based on ICD cause of deaths codes and a count based on HRDs identified by examination of toxicology and data in coronial records.

The level of detail available from the Coronial Database means it is possible to distinguish three types of opioid related deaths, as follows:

- *accidental HRDs*, ie where monoacetylmorphine or other metabolites of heroin were identified and the death was accidentally caused;
- *other illicit opioid related deaths* caused accidentally or intentionally, where there was evidence of self administration (eg samples from injection sites or injection paraphernalia) and other information, such as a history of dependence; and
- *licit opioid related deaths* caused accidentally or intentionally, where a person was under medical care for health problems (eg was prescribed an opioid for pain relief arising from a medical condition).

## References

1. Goldberger BA, Cone EJ, Grant TM. "Disposition of heroin and its metabolites in heroin related deaths". (1994) 18 *Journal of Analytical Toxicology*, 22-28.
2. Seymour A, Black M, Jay J et al. "The role of methadone in drug related deaths in the west of Scotland." (2003) 98 *Addiction*, 995-1002.
3. Wagner-Servais D, Erkens M. "Methadone related deaths associated with faulty induction procedures." (2003) 2 *Journal of Maintenance in the Adictions*, 57-67.
4. Logan BK, Fligner CL, Haddix T. "Cause and manner of death in fatalities involving methamphetamine". (1998) 43 *Journal of Forensic Science*, 28-34.
5. Waxman J, Taylor RN, Bodor GS et al. "Acute myocardial infarction associated with amphetamine use." (2001) 76 *Mayo Clinical Procedures*, 323-326.
6. Perez JA, Arsura EL, Strategos S. Methamphetamine-related stroke: four cases. (1999) 17 *Journal of Emergency Medicine*, 469-471.

This publication is available online at  
<http://www.dao.health.wa.gov.au>