Coroners Court of Victoria

Coroners Prevention Unit Data Summary

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Re: Victorian overdose deaths, 2009-2015

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1. Background

This data summary provides an introduction to the drug types, drug groups and individual drugs that contributed to overdose deaths in Victoria 2009-2015. Data was drawn from the Victorian Overdose Deaths Register (the Register) created by the Coroners Prevention Unit (CPU); the composition of the Register is described in Attachment A to the data summary.

2. Annual frequency of overdose deaths, Victoria 2009-2015

Table 1 shows that in the period 2009-2015 the annual frequency of Victorian overdose deaths ranged between 342 deaths (in 2010) and 420 deaths (in 2015) with an average of 376 deaths per year. The annual frequency of deaths increased each year between 2010 and 2015. Approximately 30% of overdose death each year involved a single drug, and 70% involved the combined toxic effects of multiple (two or more) drugs.

Table 1: Annual frequency of overdose deaths, Victoria 2009-2015

Year	2009	2010	2011	2012	2013	2014	2015
All overdose deaths	**379**	**342**	**362**	**367**	**380**	**387**	**420**
Single drug deaths	127	122	133	114	118	101	121
Multiple drug deaths	252	220	229	253	262	286	299

3. Overdose deaths by contributing drug types

Table 2 shows the annual frequency of Victorian overdose deaths involving pharmaceutical drugs, illegal drugs and alcohol. Data is presented across all overdose deaths, then disaggregated into single and multiple drug deaths.

Pharmaceutical drugs were overall the most frequent contributors to overdose deaths in Victoria during 2009-2015; they consistently played a role in around 80% of deaths each year. Their contribution was more prevalent in multiple drug deaths than single drug deaths; on average more than 95% of multiple drug deaths each year involved one or more contributing pharmaceutical drugs.

Illegal drugs consistently played a role in approximately 42% of annual overdose deaths in the period 2009-2014; this increased to just over half of overdose deaths in 2015 (217 of 420, 51.7%). The increase in illegal drug contribution from 164 deaths in 2014 to 217 deaths in 2015, appears to account for the overall increase in the frequency of overdose deaths between 2014 and 2015.

Alcohol consistently played a role in approximately 24% of annual overdose deaths across the period 2009-2015. Alcohol contribution was more prevalent in multiple drug deaths (an average 28% annually) than single drug deaths (an average 16% annually).

Table 2: Annual frequency of overdose deaths by contributing drug types, Victoria 2009-2014

Drug types	2009	2010	2011	2012	2013	2014	2015
All overdose deaths	**379**	**342**	**362**	**367**	**380**	**387**	**420**
Pharmaceutical	295	266	275	306	313	316	330
Illegal	147	149	153	133	166	164	217
Alcohol	94	85	88	80	94	94	97
Single drug deaths	**127**	**122**	**133**	**114**	**118**	**101**	**121**
Pharmaceutical	58	53	58	60	55	49	46
Illegal	45	48	56	35	51	34	56
Alcohol	24	21	19	19	12	18	19
Multiple drug deaths	**252**	**220**	**229**	**253**	**262**	**286**	**299**
Pharmaceutical	237	213	217	246	258	267	284
Illegal	102	101	97	98	115	130	161
Alcohol	70	64	69	61	82	76	78

4. Interactions between contributing drug types

Table 3 shows the combinations of drug types that contributed in Victorian overdose deaths 2009-2015. Overall, 40.2% of overdose deaths involved pharmaceutical drugs only, compared to 13.8% of overdose deaths that involved only illegal drugs (and 5.0% of deaths that were alcohol only). A further 22.0% involved pharmaceutical drugs in combination with illegal drugs, and 11.9% involved pharmaceutical drugs in combination with alcohol.

Table 3: Overall frequency and proportion of overdose deaths by combinations of contributing drug types, Victoria 2009-2015

Combinations of contributing drug types	Single drug		Multiple drug		All overdose	
	n	%	n	%	n	%
Total overdose deaths	**836**	**100.0**	**1801**	**100.0**	**2637**	**100.0**
Pharma only	379	45.3	682	37.9	1061	40.2
Pharma + illegal	0	0.0	581	32.3	581	22.0
Illegal only	325	38.9	38	2.1	363	13.8
Pharma + alcohol	0	0.0	315	17.5	315	11.9
Pharma + illegal + alcohol	0	0.0	144	8.0	144	5.5
Alcohol only	132	15.8	0	0.0	132	5.0
Illegal + alcohol	0	0.0	41	2.3	41	1.6

5. Overdose deaths by contributing pharmaceutical drug groups

Pharmaceutical drugs were disaggregated into drug groups using a modified version of the Drug Abuse Warning Network (DAWN) level 2 drug categories classification system (the main modifications were that the 'analgesics' category was split into opioid and non-opioid analgesics, and the 'anxiolytics' category was split into benzodiazepine and non-benzodiazepine anxiolytics).

Table 4 shows the annual frequency of Victorian overdose deaths 2009-2015 by contributing drug groups, with illegal drugs and alcohol included for context. Overall benzodiazepines were the most frequent contributing drug group, contributing in an annual average of 51.3% of all overdose deaths. The next most frequent pharmaceutical drug groups were opioid analgesics (an annual average of 48.5% of all overdose deaths), antidepressants (annual average 34.0%) and antipsychotics (annual average 19.2%)

Table 4: Most frequent contributing drug groups to overdose deaths, Victoria 2009-2015

Drug groups	2009	2010	2011	2012	2013	2014	2015
All overdose deaths	**379**	**342**	**362**	**367**	**380**	**387**	**420**
Benzodiazepines	160	169	180	199	212	215	220
Opioid analgesics	177	145	183	212	192	186	183
Illegal drugs	147	149	153	133	166	164	217
Antidepressants	122	106	101	142	134	144	151
Alcohol	94	85	88	80	94	94	97
Antipsychotics	63	64	65	78	75	81	82
Non-benzo anxiolytics	35	28	33	38	56	48	56
Non-opioid analgesics	26	25	30	52	41	49	43
Anticonvulsants	18	14	13	10	37	45	44

6. Overdose deaths by individual contributing drugs

Table 5 shows the most frequent individual contributing drugs to Victorian overdose deaths 2009-2015 within each of the most frequent contributing drug groups.

Table 5: Most frequent contributing individual drugs by drug groups in overdose deaths, Victoria 2009-2015

Year	2009	2010	2011	2012	2013	2014	2015
All Benzodiazepines	**160**	**169**	**180**	**199**	**212**	**215**	**220**
Diazepam	104	109	124	133	164	169	176
Alprazolam	62	56	43	57	45	28	21
Temazepam	28	22	48	35	22	20	25
Oxazepam	18	19	44	41	17	19	28
Nitrazepam	17	16	11	24	26	13	17
Clonazepam	7	9	14	18	19	25	31
All opioid analgesics	**177**	**145**	**183**	**212**	**192**	**186**	**183**
Codeine	76	57	66	93	71	54	60
Methadone	50	55	72	75	70	67	64
Oxycodone	41	39	46	46	61	46	53
Tramadol	22	9	15	18	24	23	31
Morphine	22	11	10	13	7	12	7
Fentanyl	1	2	5	17	11	11	20
Buprenorphine	3	4	14	4	3	7	4
Propoxyphene	10	10	7	3	1	2	0

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Year	2009	2010	2011	2012	2013	2014	2015
All illegal drugs	**147**	**149**	**153**	**133**	**166**	**164**	**217**
Heroin	127	139	129	111	132	137	168
Methamphetamine	23	14	29	36	51	53	67
Amphetamine	4	4	19	11	10	8	9
Cocaine	7	1	2	4	5	7	15
MDMA	5	1	1	1	3	4	5
GHB	3	0	3	1	0	1	0
All antidepressants	**122**	**106**	**101**	**142**	**134**	**144**	**151**
Mirtazapine	23	21	23	26	30	29	47
Amitriptyline	24	26	22	32	25	41	26
Citalopram	17	22	21	25	24	25	22
Venlafaxine	25	12	16	15	20	19	10
Fluoxetine	8	9	8	14	10	7	12
Duloxetine	3	5	7	15	11	12	12
Sertraline	6	6	4	12	13	9	11
Desvenlafaxine	0	1	3	6	8	11	13
Doxepin	7	6	6	8	6	4	4
Alcohol	**94**	**85**	**88**	**80**	**94**	**94**	**97**
All antipsychotics	**63**	**64**	**65**	**78**	**75**	**81**	**82**
Quetiapine	28	37	34	41	41	48	45
Olanzapine	19	18	17	22	15	21	28
Risperidone	6	3	11	8	10	7	9
Chlorpromazine	5	2	4	10	6	3	4
Zuclopenthixol	5	4	4	6	3	3	4
Clozapine	5	5	0	4	6	2	2
Amisulpride	1	3	6	3	2	4	1
All non-benzo anxiolytics	**35**	**28**	**33**	**38**	**56**	**48**	**56**
Doxylamine	13	16	11	21	23	13	14
Zopiclone	6	3	6	13	14	11	16
Pentobarbitone	4	5	11	1	8	15	17
Zolpidem	11	3	5	5	4	6	10
Diphenhydramine	5	1	4	2	7	5	4
All non-opioid analgesics	**26**	**25**	**30**	**52**	**41**	**49**	**43**
Paracetamol	23	21	24	50	39	37	39
Ibuprofen	5	5	4	5	2	7	5
Naproxen	1	2	2	2	1	2	1

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Drugs	2009	2010	2011	2012	2013	2014	2015
All anticonvulsants	**18**	**14**	**13**	**10**	**37**	**45**	**44**
Pregabalin	0	0	0	0	17	27	31
Valproic Acid	9	9	5	6	13	9	7
Carbamazepine	7	3	6	1	3	3	1
Lamotrigine	1	2	1	2	2	2	1
Levetiracetam	0	0	1	0	2	1	6
Topiramate	0	0	0	0	4	4	2

To summarise Table 5, the 10 overall most frequent contributing individual drugs to Victorian overdose deaths 2009-2015 were:

- Diazepam, a benzodiazepine (which contributed in 979 overdose deaths across the period).
- Heroin, an illegal drug (943 deaths)
- Alcohol (632 deaths)
- Codeine, an opioid analgesic (477 deaths)
- Methadone, an opioid analgesic (453 deaths)
- Oxycodone, an opioid analgesic (332 deaths)
- Alprazolam, a benzodiazepine (312 deaths)
- Quetiapine, an antipsychotic (274 deaths)
- Methamphetamine, an illegal drug (273 deaths)
- Paracetamol, a non-opioid analgesic (233 deaths)

6. Overdose deaths by location of fatal incident

The Register includes detailed coded information on locations (street address, suburb and local government area) where fatal overdose incidents occur, and where deceased usually reside. For the purpose of this report, the CPU extracted basic overdose death frequencies (overall overdoses and subsets involving pharmaceutical drugs, illegal drugs and alcohol) by local government area (LGA) for the period 2009-2015.

The CPU established the population of each LGA as at 2011 according to the Australian Bureau of Statistics (ABS), and then calculated average annual overdose death rate per 100,000 population for each LGA using these steps:

(a) Overall frequency of overdose deaths in LGA for 2009-2015, -

(b) divided by 2011 population of LGA, -

(c) multiplied by 100,000 (to yield seven-year overdose rate per 100,000), -

(d) divided by seven (to yield average annual overdose rate per 100,000 for the period 2009-2015).

Table 6(a) shows the overall frequency of overdose deaths and average annual overdose rate per 100,000 population across the period 2009-2015, for all metropolitan Victorian LGAs. Across all metropolitan LGAs the average annual rate of overdose death per 100,000 population was 6.9 deaths.

Table 6a: Overall frequency and average annual rate per 100,000 population of overdose deaths in metropolitan local government areas, Victoria 2009-2015

LGA	Total overdose deaths	Involving pharma drugs	Involving illegal drugs	Involving Alcohol	Population (ABS 2011)	Average Annual Rate
All metropolitan deaths	**1985**	**1533**	**945**	**473**	**4,108,837**	**6.9**
Banyule	48	39	20	9	122,983	5.6
Bayside	31	26	8	6	96,119	4.6
Boroondara	61	50	23	14	167,062	5.2
Brimbank	103	74	62	17	191,496	7.7
Cardinia	27	19	9	7	75,831	5.1
Casey	69	55	22	12	261,282	3.8
Darebin	85	67	38	17	142,942	8.5
Frankston	101	87	42	26	130,350	11.1
Glen Eira	44	28	19	13	137,152	4.6
Greater Dandenong	92	70	46	25	142,167	9.2
Hobsons Bay	35	27	19	6	87,395	5.7
Hume	56	44	29	8	174,290	4.6
Kingston	46	38	19	8	148,304	4.4
Knox	64	54	25	14	154,625	5.9
Manningham	27	21	11	4	116,750	3.3
Maribyrnong	73	52	47	18	75,154	13.9
Maroondah	60	46	15	19	107,323	8.0
Melbourne	129	96	89	31	100,240	18.4
Melton	29	24	10	3	112,643	3.7
Monash	59	44	25	12	177,345	4.8
Moonee Valley	40	25	27	12	112,180	5.1
Moreland	57	43	25	19	154,247	5.3
Mornington Peninsula	78	70	15	20	149,271	7.5
Nillumbik	11	8	4	1	62,716	2.5
Port Phillip	132	94	79	38	97,276	19.4
Stonnington	54	43	29	16	98,853	7.8
Whitehorse	82	69	33	24	157,538	7.4
Whittlesea	47	39	23	6	160,800	4.2
Wyndham	58	45	25	6	166,699	5.0
Yarra	131	88	96	41	78,903	23.7
Yarra Ranges	56	48	11	21	148,901	5.4

The highest frequency of overdose deaths among metropolitan LGAs occurred in Port Phillip (132 deaths between 2009-2012) followed by Yarra (131 deaths) and Melbourne (129 deaths). These three LGAs also had the highest average annual rates per 100,000 population: Yarra (23.7 deaths per 100,000 population per year on average) then Port Phillip (19.4) then Melbourne (18.4).

In analysing regional Victorian LGAs, the CPU notes there are recognised issues with calculating rates where there are low frequencies of deaths among small populations. These issues were clearly present when average annual rates were calculated for some regional LGAs. Therefore, the CPU determined to tabulate only the results for regional LGAs where at least seven overdose deaths occurred across the seven-year period 2009-2015. This led to the exclusion of 23 regional LGAs from Table 6b. However, the bolded row "All regional deaths" in Table 6b shows the

frequencies and average annual rates aggregated across all regional LGAs, not just the LGAs included in the table.

Table 6(b) shows the overall frequency of overdose deaths and average annual overdose rate per 100,000 population across the period 2009-2015, for regional Victorian LGAs where at least seven overdose deaths occurred. Across all regional LGAs the average annual rate of overdose death per 100,000 population was 6.5 deaths, which was very close to the overall metropolitan rate (6.9).

Table 6b: Overall frequency and average annual rate per 100,000 population of overdose deaths in regional local government areas where at least seven overdose deaths occurred, Victoria 2009-2015.

LGA	Total overdose deaths	Involving pharma drugs	Involving illegal drugs	Involving Alcohol	Population (ABS 2011)	Average Annual Rate
All regional deaths	643	562	177	156	1,422,355	6.5
Ballarat	34	29	14	10	95,185	5.1
Bass Coast	17	12	5	4	30,233	8.0
Baw Baw	21	19	2	3	43,389	6.9
Campaspe	12	12	1	1	36,855	4.7
Colac Otway	9	8	3	2	20,799	6.2
East Gippsland	22	20	8	8	42,826	7.3
Glenelg	18	14	4	5	19,848	13.0
Greater Bendigo	58	49	12	10	101,995	8.1
Greater Geelong	111	94	40	32	215,837	7.3
Greater Shepparton	38	34	11	8	61,744	8.8
Hepburn	8	6	3	1	14,629	7.8
Horsham	8	8	1	1	19,523	5.9
Latrobe	50	49	13	8	73,788	9.7
Macedon Ranges	12	9	3	2	42,883	4.0
Mildura	25	22	4	8	51,822	6.9
Mitchell	17	15	7	2	35,105	6.9
Moira	8	7	2	2	28,406	4.0
Moorabool	8	6	2	1	28,670	4.0
Northern Grampians	8	8	1	2	12,054	9.5
South Gippsland	9	9		1	27,512	4.7
Wangaratta	12	12	3	5	27,212	6.3
Warrnambool	12	9	2	1	32,667	5.2
Wellington	17	15	7	6	42,068	5.8
Wodonga	21	20	3	3	36,025	8.3

The highest frequency of regional overdose deaths occurred in Greater Geelong (111 deaths), but the highest average annual rate was in Glenelg (13.0 deaths per 100,000 population per year).

Attachment A

The Coroners Prevention Unit (CPU) created the Victorian Overdose Deaths Register (the Register) to support coronial investigations; this attachment describes the case identification and coding process used to populate the register.

A.1 Definitions

The CPU definition of the term 'drug' is largely consistent with the Australian Bureau of Statistics (ABS) definition, encompassing substances that "may be used for medicinal or therapeutic purposes, or to produce a psychoactive effect".[1] Like the ABS, the CPU excludes tobacco and volatile solvents such as petrol and toluene from its definition of a drug. However, the CPU considers alcohol to be a drug, whereas it is excluded under the ABS definition.

An overdose death is any death in which the acute toxic effects of one or more drugs played a causal or contributory role.

A.2 Inclusion and exclusion criteria

The CPU includes as relevant any death where the expert death investigators (coroner, forensic pathologist and forensic toxicologist) advise the acute toxic effects of one or more drugs played a causal or contributory role.

The following types of deaths are included:

- Deaths caused by drug overdose in combination with an underlying natural disease process; for example "methamphetamine toxicity in a setting of cardiomegaly",or "acute alcohol toxicity in an obese person".
- Deaths caused by drug overdose in combination with another (non-overdose) mechanism; for example "effects of hypothermia and combined drug toxicity", or "inhalation of motor vehicle exhaust in a person with fatally toxic levels of oxycodone and diazepam".

The following types of deaths are excluded:

- Deaths that resulted from allergic reactions to drugs (allergic reaction and overdose are very different mechanisms of death, requiring different preventative countermeasures).
- Deaths associated with the behavioural effects of drugs, for example a motor vehicle collision or falling off a pier and drowning while intoxicated.
- Deaths linked to chronic drug abuse in the absence of an acute toxic effect, for example a death from liver disease brought about by chronic alcohol use.
- Deaths linked to a means of drug-taking rather than the toxic effects of the drug, for example foreign body granulomatosis caused by crushing and injecting tablets that contain insoluble binding agents. Note however that a death from foreign body granulomatosis in combination with acute drug toxicity would be included as relevant.
- Suspected overdose deaths where specific contributing could not be identified (for example because appropriate specimens could not be obtained for forensic toxicological examination).

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1 Australian Bureau of Statistics, "Drug-induced deaths: a guide to ABS causes of death data", 8 August 2002, p.2.

- Suspected overdose deaths where the cause of death was unascertained following coronial investigation.

A.3 Case identification

The CPU identifies potentially relevant deaths for inclusion in the Register through searches of the CCOV's case management system and death surveillance database, as well as the National Coronial Information System. The autopsy report, toxicology report and (for closed cases) finding in each potentially relevant death are reviewed to determine whether the death meets the inclusion criteria.

A.4 Coding

For each death that meets the inclusion criteria, the CPU uploads the following information into the Register (a custom Access database): the local case number, deceased age and sex, cause of death, intent, and the date the death was reported. For each death the CPU then uses the register interface to record each individual drug that the expert death investigators determined had played a causal or contributory role in the overdose. The coding rules are:

- Where the expert death investigators explicitly nominate the individual contributing drugs (for example, "an overdose of morphine in combination with diazepam"), these are coded as contributory in the death.
- Where the expert death investigators nominate drug types or groups rather than individual drugs (for example, "an overdose of opioids and benzodiazepines"), the toxicology report is reviewed and all specific drugs detected that belong to that drug type or group are coded as contributory.
- Where the expert death investigators do not nominate contributing drugs at all, the toxicology report is reviewed and every specific drug detected is coded as contributory.

In most cases, the expert death investigators concur as to contributing drugs. The main exception is with respect to metabolites, where on occasion the forensic pathologist and coroner nominate a contributing drug that the toxicologist advises was actually a metabolite of another drug (recurring examples are risperidone and hydroxyrisperidone, which are both are drugs in their own right but the latter is also a metabolite of the former; and diazepam, temazepam and oxazepam, where the latter two drugs can also be present as metabolites of the diazepam). In such cases, the CPU follows the toxicologist's advice and codes only the contributing drugs, not the metabolites.

The CPU also uses special coding rules for determining the drug source where morphine is a contributing drug, because morphine can be present as a metabolite of heroin, as a metabolite of codeine, or as a drug in its own right. The following hierarchy of coding rules is applied:

- If 6-monoacetyl morphine (a distinctive metabolite of heroin) is detected in post-mortem blood or urine, morphine is assumed to be present as a metabolite of heroin.
- If there is evidence of a high level of codeine in comparison to morphine in blood (as a rule of thumb, if the codeine level is more than six times higher than the morphine level), or if there is codeine in blood but morphine is only detected in urine, the morphine is assumed to be present as a metabolite of codeine.
- If there is evidence the deceased was prescribed morphine, or if morphine-containing medications were found at the scene of death, the morphine is assumed to be present as a drug in its own right.

- If none of the above three conditions are met, the morphine is coded as being of unknown source. Morphine of unknown source is aggr

In the overwhelming majority (more than 90%) of deaths involving morphine of unknown origin, the circumstantial evidence including statements of witnesses and deceased drug use history indicates that the likely morphine source was heroin. For this reason, deaths involving morphine of unknown source are classified as heroin deaths for analysis.

A.5 Limitations

Coding in the Register is continually reviewed as coroners' investigations progress and findings are made. Therefore, any data reported from the Register is subject to review and may subsequently change.

Combining heroin with morphine of unknown source for analysis may lead to an over-estimate of heroin involvement in Victorian overdose deaths. However, the magnitude of over-estimate is likely to be very small and is preferable to the large distortion in estimation of heroin overdose that would occur if morphine of unknown source was treated separately to heroin.