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VICTORIAN OVERDOSE DEATHS: THE ROLE OF PHARMACEUTICAL DRUGS AND DRUG COMBINATIONS

Final Report

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February 2017

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Foreword

Every year, more than 300 Victorians die from an overdose involving pharmaceutical drugs. Each life lost has an impact on the community, affecting families and friends, colleagues and neighbours, treating doctors, counsellors, alcohol and drug workers, and everybody else who knew the deceased. This impact is a major impetus for Victorian coroners' sustained efforts to reduce pharmaceutical drug related harms, which over the past five years have included several inquests as well as several dozen findings with recommendations on issues including drug prescribing and dispensing practises, drug scheduling and clinical guidelines.

Turning Point shares the Court's concern about the high level of pharmaceutical drug related harm in the community, and a strong relationship has developed over time between the two organisations. Turning Point's experts in drug use and misuse, addiction, health policy and research have assisted the Court with individual investigations as well as exploration of broader systemic issues.

The Victorian Law Enforcement Drug Fund project is the first major research collaboration between Turning Point and the Coroners Court of Victoria. The project's aim was to generate insight into the prevalence of a number of issues that coroners encounter in their individual investigations, including mental illness and drug dependence as comorbidities among those who die following pharmaceutical drug involved overdose, and overdose deaths where the deceased was prescribed contributing drugs by two or more clinicians.

It is my sincere hope that the project's findings will inform clinical and health policy responses to pharmaceutical drug related harms. I commend this important report to you.

Judge Sara Hinchey
State Coroner of Victoria

Preface

This project, involving examination of Victorian overdose deaths that occurred between 2011 and 2013 where one or more pharmaceutical drugs were determined to be contributory, is a collaborative project between Turning Point's Population Health Research Program and the Coroners Court of Victoria (CCOV) and is funded by the Victorian Law Enforcement Fund.

Turning Point is a specialist alcohol and other drug organisation that integrates treatment and support services with research, education and training. This unique service model ensures that research informs clinical practice and vice versa, resulting in a best practice environment.

Turning Point amalgamated with public health provider Eastern Health in October 2009 and is formally affiliated with Monash University. Turning Point is part of the International Network of Drug Treatment and Rehabilitation Resource Centres for The United Nations Office of Drugs and Crime and is a member of the International Harm Reduction Association.

Turning Point strives to promote and maximise the health and wellbeing of individuals and communities living with and affected by alcohol and other drug-related harms. We aspire to be a world-leading service delivery and research and development centre.

To achieve this, we are continually:

- creating thriving service delivery, research and development cultures that produce the best possible knowledge;
- applying, using and translating this knowledge to promote change, build effective and rational policy, and demonstrate and contribute to world's best practice;
- building our own and our communities' capacity through strategic relationships, partnerships and collaborations;
- strengthening organisational capacity to provide the best environment for quality staff to achieve their potential.

Since being established in 1994, Turning Point has led research and its translation into policy and practice at a local, national and international level. To best respond to emerging issues, Turning Point employs staff from a range of professional backgrounds and collaborates with organisations across the research, health, education and community services sectors.

The organisation integrates activities across a diverse range of specialist knowledge and professional practice. This unique combination enables Turning Point to translate evidence into action. Our work is essential to understanding the complexities of alcohol and other drug use in our community and in developing effective approaches to prevent and treat dependence and other related harms.

Programs operate in the areas of research, treatment and support (incorporating statewide and local outpatient and residential services, as well as state and national telephone-based and online services), and state-wide and national education and training.

The Turning Point Population Health Research team is responsible for investigating patterns of alcohol and drug use and related harm using population-based datasets available in Victoria. The staff in the Population Health Research team currently include: Belinda Lloyd, Gennady Baksheev, Emma Barker, Nicola Chen, Cass Connor, Agatha Faulkner, Cathie Garrard, Laura Gorrie, Annie Haines, Cherie Heilbronn, Aidan Jago, Mark Hoffmann, Bridget Jenkins, Jessica Killian, Stephanie La'rive, Liliana Laskaris, Heather Laurie, Elizabeth Le, Sharon Matthews, Michelle McNally, Paul Medew, Lisa Meyenn, Rowan Ogeil, Melissa Reed, Adam Scott, Deborah Scott, Steve Simpson Jr, Rukhsana Tajin, Kaitlyn Taylor, Julie Tennant, Kay van Namen, Merran Waterfall, Renee Webb and James Wilson. The Population Health Research team examines patterns of drug use and harm in Victoria and provides this information to policy makers, alcohol and drug workers, as well as other interested groups and individuals. Current projects include *AODstats*, *Beyond The Emergency, National Surveillance System of AOD, Self-harm and Mental Health,* and *Alcohol and Drug Testing in Wastewater*.

The Coroners Court of Victoria (CCOV) has long been concerned about the high number of overdose deaths involving pharmaceutical drugs. Developments in coronial practice over the past five years, including the implementation of the CCOV's overdose deaths register, have enabled Victoria's coroners to develop a deeper understanding of the issues that underpin pharmaceutical overdose deaths, and identify prevention opportunities across a diverse range of areas including real-time prescription monitoring, good practice in prescribing drugs of dependence, opioid prescribing for migraine, unsupervised methadone dosing for opioid replacement therapy, and the scheduling of benzodiazepines.

This report represents a further development in the CCOV's and Turning Point's efforts to address pharmaceutical drug harms and it can be used to identify new opportunities for death prevention.

Acknowledgements

We would like to thank the following people for their valuable contribution.

- The data coding team, including Bridget Jenkins and Adam Scott

Acronyms

AOD	Alcohol and other drugs
CCOV	Coroners Court of Victoria
OTC	Over the counter
PBS	Pharmaceutical Benefit Scheme
SAMHSA	Substance Abuse and Mental Health Services Administration
VLEDF	Victorian Law Enforcement Fund

Executive Summary

The impact of overdose on individuals, families, the community and government is substantial, and a growing issue of concern, particularly given evidence of the rising use and harms associated with pharmaceutical drugs. A number of key areas regarding the prevalence, characteristics and correlates of overdose deaths have been explored in this study, with findings that have important policy implications.

Demographics and drug involvement

Males represented the majority of overdose deaths. Most female overdose deaths involved pharmaceutical drugs only (63%), while the proportion of overdoses involving pharmaceutical drugs only was lower among males (43%).

Pharmaceutical drugs most frequently contribute to overdose deaths in Victoria. Furthermore, they are particularly prevalent in overdose deaths involving multiple drugs. Multiple drugs are involved in the majority of overdose deaths in Victoria, with over 70% of overdose deaths in 2015 involving multiple drugs.

Benzodiazepines are the most commonly detected drug group, contributing in an average of 51% of overdose deaths annually. The next most frequent pharmaceutical drug groups are opioid analgesics (48% of overdose deaths each year), antidepressants (34% annually) and antipsychotics (19% annually).

The role of drug dependence

For the majority of overdose deaths, there was evidence of drug dependence proximal to death (71%).

Findings suggest that for Victorian overdose deaths involving pharmaceutical drugs, deceased who were drug dependent, and those who were not drug dependent proximal to fatal overdose might represent two different cohorts. In particular:

- The drug dependent deceased were on average younger than deceased who were not drug dependent (mean age 38.4 years for males, 42.1 years for females), more likely to be male, and their fatal overdoses often involved pharmaceutical drugs in combination with alcohol and/or illegal drugs.
- The non-drug dependent deceased were on average older (mean age 49.5 years for males, 54.1 years for females), more likely to be female, and most fatal overdoses involved pharmaceutical drugs only.

Of further note, most of the drug dependent deceased were poly-drug dependent and/or had been drug dependent for more than 10 years, with evidence that their dependence had been clinically documented.

History of diagnosis of mental illness

Overall, 73% of the deceased in the study cohort had a diagnosed mental illness, and for most of these deceased, the duration of mental illness was at least 10 years. However, there was no appreciable difference between those with and without a diagnosed mental illness in terms of age distribution by sex, or in the types of drugs that contributed in fatal overdose.

Intent

More than half of Victorian overdose deaths involving pharmaceutical drugs were unintentional (54%), with 28% classified as international self-harm overdose deaths, and a further 18% where intent was unable to be determined.

There were notable differences in average age and in types of contributing drugs between deceased whose fatal overdoses were unintentional versus suicidal. This indicates that different approaches, prevention strategies and clinical responses may be necessary for different sub-groups identified as at-risk both in terms of overdose risk, and suicide risk.

Sources of pharmaceutical drugs

The likely sources of all contributing drugs were identified in 43% of deaths, with the likely source identified for at least one pharmaceutical drug identified in a further 40% of deaths, while in 16% of deaths no source of any contributing pharmaceutical drug could be identified.

It is important to acknowledge that the capacity to draw strong conclusions from the data presented regarding source of pharmaceutical drugs involved in overdose deaths is somewhat hampered by the inability to confirm all sources of pharmaceutical drugs among the deaths in the study cohort. However, the data supports a tentative conclusion that in most Victorian overdose deaths involving pharmaceutical drugs, the drugs are prescribed to the deceased rather than diverted or accessed OTC.

Importantly, in most cases (74%) the drugs are prescribed by a single prescriber rather than multiple prescribers.

Further to this point, for deaths where the deceased has accessed contributing pharmaceutical drugs from multiple prescribers, in most cases the deceased was not attending multiple prescribers to obtain the same drugs; rather, the deceased would obtain different drugs from different doctors. This suggests that coordination of prescribing between doctors may be an issue, rather than simply patient 'prescription shopping' for excessive quantities of particular drugs from multiple doctors.

Identifying potential targets for intervention

A history of both diagnosed mental illness and clinically documented drug dependence was present for approximately half of all Victorian overdose deaths involving pharmaceutical drugs, with a long history of mental illness and drug dependence most common.

A conclusion to be drawn from these findings is that in a substantial proportion of the Victorian overdose deaths involving pharmaceutical drugs that occurred between 2011 and 2013, the deceased had a long-established clinical history of mental illness and drug dependence. Put another way, these deceased were known to the health system, and had in most cases been known to the health system for extended periods of time - greater than 10 years.

Chapter 1: Background

Prescription medications have made a significant and positive contribution to the health and wellbeing of Australians (1, 2). However, some medications have the potential to cause harm when misused (1). Pharmacological classes identified as particularly susceptible to misuse, dependence or subsequent harm are the benzodiazepines and opioid analgesics. While legitimate use of these drugs confers evidence-based short-term treatment for anxiety (3), insomnia (4) and the management of chronic pain (5), recent data highlights increasing rates of harm associated with their use. Given the substantial increases in the prescription of opioids and benzodiazepines in Australia (6, 7), there is a growing challenge for governments to increase awareness regarding the potential misuse of prescription medications, and to implement mechanisms that promote quality use of medicine and minimise harm. This challenge is multifaceted and requires both system level (e.g. policies related to prescribing and dispensing and monitoring systems) and individual level (screening for appropriate behavioural markers, referral and treatments) actions to succeed.

Benzodiazepines and opioid analgesics: risks and benefits

Benzodiazepines are widely prescribed and are efficacious in the treatment of anxiety disorders and insomnia in the short-term (8, 9). Benzodiazepines also have significant side-effect profiles if they are misused, most notably the development of tolerance and dependence with longer term use (10, 11). Chronic use of benzodiazepines is associated with cognitive impairment, falls and a diminished quality of life (12, 13), especially in the elderly (6, 7). In addition, short-acting benzodiazepines such as alprazolam, typically prescribed for the management of anxiety, are more likely to be diverted, and are associated with both drug-related offending and increased utilisation of emergency resources (14).

Opioids are efficacious analgesics and have legitimate and important treatment indications for the management of pain (2, 5). Misuse of opioids including fentanyl, morphine and oxycodone is associated with significant side-effects including respiratory depression which can result in death (5). Long-term therapy using opioids for chronic pain is increasing in community settings (15), and has been associated with higher rates of fatal overdose (15). This has led to increasing debate about their efficacy and safety in the management of chronic non-malignant pain (16).

Pharmaceutical drug use and associated harms in Australia

In 2013, 4.7% of Australians aged 14 years and older engaged in non-medical use of analgesics, sedatives and/or steroids, compared to 3.9% in 2001 (17). This upward trend mirrors international patterns (8), and is occurring in parallel to rising supplies of commonly misused medications. In Australia, from 1992 to 2012, dispensed government-subsidised pharmaceutical opioid prescriptions grew 15-fold (from 500,568 to 7,495,648 scripts), with dramatic increases in morphine prescription during the 1990s, oxycodone prescription from 2000, and fentanyl from the mid-2000s (18). The concordant proliferation in the number of available opioid formulations from 11 preparations in 1992 (7) to 146 preparations in 2013 was predominantly driven by slow-release preparations (18). Changing Pharmaceutical Benefit Scheme (PBS) regulations over the past 20 years has precipitated

alterations in benzodiazepines prescribing patterns. For example, while diazepam comprised the leading number of scripts in most years from 1992 to 2011, there were notable transferrals from the prescribing of oxazepam, nitrazepam, temazepam toward alprazolam (19). The subsequent popularity of alprazolam and its well-documented harms resulted in its rescheduling to a restricted S8 medicine in 2014.

Greater population-level prescription is not necessarily detrimental. Continued, high benzodiazepines and opioid demand is expected as Australia's ageing population results in a greater prevalence of painful conditions and psychological disorders that peak during the middle and older years. If rising prescriptions reflect quality use of medicines, then Australians will profit from the advantageous potential of these drugs. Yet, as more Australians have engaged in non-medical use of these medicines concomitant to greater supply, associated harms have also been on the rise.

From the late 1990s, inappropriate benzodiazepines use has been involved in more ambulance attendances in Melbourne than any other drug except alcohol (20, 21). Over this period, pharmaceutical opioid-related ambulance attendances have increased more than four-fold, while heroin-related events have halved (20, 21). In parallel, Australian hospitalisations for pharmaceutical opioid (excluding methadone) poisoning substantially increased from 1998 to 2009, superseding heroin as the leading cause of opioid-poisoning hospitalisations in 2001 (18). While hospital separations related to benzodiazepines remained stable, rates were consistently high and were the second leading drug cause of Victorian hospitalisations (after alcohol) from 2000-01 to 2010-11 (22). Perhaps most troubling is the growing rate of Australian deaths involving oxycodone (2, 23) and fentanyl (24), as well as increased benzodiazepines involvement in heroin-related deaths (25) over the past two decades.

Victorian Overdose Deaths

This Chapter provides a description of overdose deaths in Victoria from 2009 to 2015, highlighting the prevalence of pharmaceutical drug contribution and drug combinations in the deaths. Data is drawn from the Coroners Court of Victoria (CCOV) Victorian Overdose Deaths Register (the Register), which is described in detail in Chapter 2 of this report.

1.1 Overdose deaths by number of contributing drugs

Table 1 shows the annual frequency of overdose deaths in Victoria for the period 2009 to 2015, as well as the number of these deaths each year that were due to the toxic effects of a single or multiple drugs.

The annual frequency of Victorian overdose deaths declined between 2009 and 2010, but then climbed steadily over following years to reach 453 deaths in 2015. While this pattern was also present in overdose deaths involving multiple drugs, the number of deaths involving multiple drugs fluctuated over time. The proportion of Victorian overdose deaths involving multiple drugs increased slightly across this period, from 66% of deaths (252 of 379) in 2009 to 71% of deaths (323 of 453) in 2015.

Table 1: Annual frequency of overdose deaths by number of contributing drugs, Victoria 2009-2015

	2009	2010	2011	2012	2013	2014	2015
Single drug	127	122	133	114	118	101	130
Multiple drug	252	220	229	253	262	286	323
Total	379	342	362	367	380	387	453

1.2 Overdose deaths by contributing drug types

Table 2 shows that pharmaceutical drugs were overall the most frequent contributors to overdose deaths in Victoria during 2009 to 2015; they played a role in about 300 deaths each year. By comparison, illegal drugs contributed in around 160 overdose deaths, and alcohol contributed to about 90 deaths, annually. Among single drug deaths specifically, pharmaceutical and illegal drugs contributed in similar numbers of deaths: an annual average of approximately 55 deaths (46%) and 47 (38%) deaths respectively. But among multiple drug overdose deaths, pharmaceutical drugs were overwhelmingly the biggest contributors: they played a role in around 250 (96%) of 261 deaths each year. Alcohol also contributed to nearly one-third of all overdose deaths.

Table 2: Annual frequency of overdose deaths by contributing drug types, Victoria 2009-2015

	2009	2010	2011	2012	2013	2014	2015
All overdose deaths							
Pharmaceutical	295	266	275	306	313	316	358
Illegal	147	149	153	133	166	164	227
Alcohol	94	85	88	80	94	94	106
Total	379	342	362	367	380	387	453
Single drug deaths							
Pharmaceutical	58	53	58	60	55	49	50
Illegal	45	48	56	35	51	34	58
Alcohol	24	21	19	19	12	18	22
Total	127	122	133	114	118	101	130
Multiple drugs deaths							
Pharmaceutical	237	213	217	246	258	267	308
Illegal	102	101	97	98	115	130	169
Alcohol	70	64	69	61	82	76	84
Total	252	220	229	253	262	286	323

1.3 Combinations of contributing drug types

Table 3 shows the contribution of single and multiple drugs by combinations of contributing drug types. The results indicate that 40.3% of all overdose deaths involved pharmaceutical drugs only (either single pharmaceutical drugs or combinations of pharmaceuticals). A further 22% involved pharmaceutical drugs in combination with illegal drugs. 13.4% involved illegal drugs only; the majority of these were single drug deaths rather than overdoses from combinations of illegal drugs.

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

	Single Drug		Multiple Drug		Total	
Drug types	**n**	**%**	**n**	**%**	**n**	**%**
Pharmaceuticals only	383	45.3	693	38.0	1076	40.3
Pharmaceuticals and illegals	-	--	588	32.2	588	22.0
Illegals only	327	38.7	38	2.1	365	13.7
Pharmaceuticals and alcohol	-	-	320	17.5	320	12.0
Pharmaceuticals, illegals and alcohol	-	-	145	7.9	145	5.4
Alcohol only	135	16.0	-	-	135	5.1
llegals and alcohol	-	-	41	2.2	41	1.5
Total	845	100.0	1825	100.0	2670	100.0

1.4 Overdose deaths by contributing pharmaceutical drug groups

Table 4 shows the annual frequency of Victorian overdose deaths from 2009 to 2015 for the most frequent contributing pharmaceutical drug groups, with illegal drugs and alcohol included for context. Benzodiazepines were the most frequent contributing pharmaceutical drug group, contributing in an average of 196 deaths (51%) annually across the period. The next most frequent pharmaceutical drug groups were opioid analgesics (an average of 185 deaths or 48% of overdose deaths each year), antidepressants (annual average of 130, 34%) and antipsychotics (annual average of 74, 19%)

Pharmaceutical drug contribution was overwhelmingly concentrated in multiple drug deaths rather than single drug deaths. The most extreme example of this was benzodiazepines: 98.2% of all Victorian overdose deaths involving benzodiazepines between 2009 and 2015 were deaths from combined drug toxicity. Opioids were the only pharmaceutical drug group that contributed in an annual average of more than 10 single drug deaths per year.

Table 4: Annual frequency of contribution to overdose deaths among most frequent contributing pharmaceutical drug groups, alcohol and illegal drugs, Victoria 2009-2015

	2009	2010	2011	2012	2013	2014	2015
All overdose deaths							
Benzodiazepines	160	169	180	199	212	215	238
Opioids	177	145	183	212	192	186	199
Illegals	147	149	153	133	166	164	227
Antidepressants	122	106	101	142	134	144	161
Alcohol	94	85	88	80	94	94	106
Antipsychotics	63	64	65	78	75	81	91
Non-benzodiazepine anxiolytics	35	28	33	38	56	48	60
Non-opioid analgesics	26	25	30	52	41	49	46
Anticonvulsants	18	14	13	10	37	45	51
Total	379	342	362	367	380	387	453
Single drug deaths							
Benzodiazepines	2	5	3	5	4	3	3
Opioids	15	22	23	28	16	15	12
Illegals	45	48	56	35	51	34	58
Antidepressants	15	9	9	10	5	4	5
Alcohol	24	21	19	19	12	18	22
Antipsychotics	5	1	2	4	3	1	2
Non-benzodiazepine anxiolytics	3	3	9	1	9	12	11
Non-opioid analgesics	4	2	6	4	6	6	9
Anticonvulsants	5	1	1	2	0	1	0
Total	127	122	133	114	118	101	130
Multiple drugs deaths							
Benzodiazepines	158	164	177	194	208	212	235
Opioids	162	123	160	184	176	171	187
Illegals	102	101	97	98	115	130	169
Antidepressants	107	97	92	132	129	140	156
Alcohol	70	64	69	61	82	76	84
Antipsychotics	58	63	63	74	72	80	89
Non-benzodiazepine anxiolytics	32	25	24	37	47	36	49
Non-opioid analgesics	22	23	24	48	35	43	37
Anticonvulsants	13	13	12	8	37	44	51
Total	252	220	229	253	262	286	323

1.5 Combinations of contributing drug groups

Table 5 presents the 20 most common combinations of two contributing drug groups in overdose deaths. Five of the seven most frequently occurring combinations of drug types (including the three most frequent combinations) involved benzodiazepines, reflecting their status as ubiquitous co-contributors to overdose deaths.

Table 5: Most frequent combinations of two contributing drug groups among overdose deaths, Victoria 2009-2015

Drug groups	n	%
Benzodiazepines and opioids	899	33.7
Benzodiazepines and antidepressants	675	25.3
Benzodiazepines and illegals	581	21.8
Opioids and antidepressants	551	20.6
Opioids and illegals	448	16.8
Benzodiazepines and antipsychotics	397	14.9
Benzodiazepines and alcohol	334	12.5
Opioids and antipsychotics	307	11.5
Antidepressants and antipsychotics	295	11.0
Antidepressants and illegals	265	9.9
Opioids and alcohol	241	9.0
Antidepressants and alcohol	218	8.2
Opioids and non-opioid analgesics	190	7.1
Alcohol and illegals	186	7.0
Antipsychotics and illegals	181	6.8
Opioids and non-benzodiazepine anxiolytics	173	6.5
Benzodiazepines and non-opioid analgesics	171	6.4
Antidepressants and non-opioid analgesics	158	5.9
Antidepressants and non-benzodiazepine anxiolytics	145	5.4
Benzodiazepines and anticonvulsants	141	5.3
Total	2670	100.0

1.6 Overdose deaths by individual contributing drugs

Table 6 shows the most frequent contributing individual drugs within each of the drug groups listed in Table 4. The most frequent individual contributing drug to Victorian overdose deaths from 2009 to 2015 was the benzodiazepine diazepam (995 deaths), following by the illegal drug heroin (948 deaths), alcohol (641 deaths), then the opioids codeine (481), methadone (456) and oxycodone (337). The 10 most frequent contributing drugs also included the benzodiazepine alprazolam (314), the illegal drug methamphetamine (278), the antipsychotic quetiapine (278), and the antidepressant mirtazapine (202).

Table 6: Annual frequency of 30 most frequent contributing individual drugs to overdose deaths, Victoria 2009-2015

	2009	2010	2011	2012	2013	2014	2015
Benzodiazepines							
Diazepam	104	109	124	133	164	169	192
Alprazolam	62	56	43	57	45	28	23
Temazepam	28	22	48	35	22	20	25
Oxazepam	18	19	44	41	17	19	34
Nitrazepam	17	16	11	24	26	13	17
Clonazepam	7	9	14	18	19	25	33
Total	160	169	180	199	212	215	238
Opioids							
Codeine	76	57	66	93	71	54	64
Methadone	50	55	72	75	70	67	67
Oxycodone	41	39	46	46	61	46	58
Tramadol	22	9	15	18	24	23	32
Morphine	22	11	10	13	7	12	8
Fentanyl	1	2	5	17	11	11	23
Total	177	145	183	212	192	186	199
Illegal drugs							
Heroin	127	139	129	111	132	137	173
Methamphetamine	23	14	29	36	51	53	72
Amphetamine	4	4	19	11	10	8	9
Cocaine	7	1	2	4	5	7	15
MDMA	5	1	1	1	3	4	5
Total	147	149	153	133	166	164	227
Antidepressants							
Mirtazapine	23	21	23	26	30	29	50
Amitriptyline	24	26	22	32	25	41	28
Citalopram	17	22	21	25	24	25	26
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	12
Total	122	106	101	142	134	144	161
Alcohol							
Alcohol	94	85	88	80	94	94	106

	2009	2010	2011	2012	2013	2014	2015
Antipsychotics							
Quetiapine	28	37	34	41	41	48	49
Olanzapine	19	18	17	22	15	21	30
Risperidone	6	3	11	8	10	7	9
Chlorpromazine	5	2	4	10	6	3	5
Zuclopenthixol	5	4	4	6	3	3	5
Clozapine	5	5	-	4	6	2	4
Total	63	64	65	78	75	81	91
Non-benzodiazepine anxiolytics							
Doxylamine	13	16	11	21	23	13	14
Pentobarbitone [1]	4	5	11	1	8	15	18
Zopiclone	6	3	6	13	14	11	17
Zolpidem	11	3	5	5	4	6	11
Total	35	28	33	38	56	48	60
Non-opioid analgesics							
Paracetamol	23	21	24	50	39	37	42
Ibuprofen	5	5	4	5	2	7	5
Total	26	25	30	52	41	49	46
Anticonvulsants							
Pregabalin [2]	-	-	-	-	17	27	34
Sodium valproate	9	9	5	6	13	9	9
Carbamazepine	7	3	6	1	3	3	2
Total	18	14	13	10	37	45	51

Table 7 illustrates the variability among the 20 most frequent contributing drugs in overdose deaths with respect to single and multiple drug overdose. The drug associated with the highest proportion of single drug overdoses was heroin (28.9%), following by alcohol (21.1%). Paracetamol was the only pharmaceutical drug for which more than 10% of deaths were single drug overdoses. In contrast, with the exception of paracetamol, more than 90% of deaths for each pharmaceutical drug presented had multiple drugs involved.

[1] Pentobarbitone prescribing to humans is not permitted in Australia, and the drug could be alternatively classified as illegal.

[2] Routine post-mortem testing for pregabalin did not commence in Victoria until 2013.

Table 7: The 20 most frequent contributing drugs in overdose deaths, and the proportion of single and multiple drug overdoses to which each drug contributed, Victoria 2009-2015

Individual drug	Drug group	n	% Single drug	% Multiple drug
Diazepam	Benzodiazepine	995	0.1	99.9
Heroin	Illegal	948	28.9	71.1
Alcohol	Alcohol	641	21.1	78.9
Codeine	Opioid	481	1.7	98.3
Methadone	Opioid	456	9.9	90.1
Oxycodone	Opioid	337	9.8	90.2
Alprazolam	Benzodiazepine	314	0.6	99.4
Methamphetamine	Illegal	278	14.4	85.6
Quetiapine	Antipsychotic	278	2.9	97.1
Paracetamol	Non-opioid analgesic	236	15.7	84.3
Mirtazapine	Antidepressant	202	1.0	99.0
Temazepam	Benzodiazepine	200	5.0	95.0
Amitriptyline	Antidepressant	198	9.6	90.4
Oxazepam	Benzodiazepine	192	1.0	99.0
Citalopram	Antidepressant	160	2.5	97.5
Tramadol	Opioid	143	2.1	97.9
Olanzapine	Antipsychotic	142	1.4	98.6
Clonazepam	Benzodiazepine	125	1.6	98.4
Nitrazepam	Benzodiazepine	124	4.8	95.2
Venlafaxine	Antidepressant	117	6.8	93.2

1.7 Combinations of individual drugs

Table 8 shows the 20 most frequently occurring combinations of two individual drugs. The combinations mainly reflect the top contributing individual drugs to be diazepam, heroin, alcohol, codeine, methadone, alprazolam, oxycodone and quetiapine.

Table 8: Most frequent combinations of two contributing individual drugs among overdose deaths, Victoria 2009-2014

Combinations of individual drugs	n	%
Diazepam and heroin	378	14.2%
Diazepam and methadone	268	10.0%
Diazepam and codeine	263	9.9%
Diazepam and alcohol	258	9.7%
Heroin and codeine	196	7.3%
Diazepam and oxycodone	173	6.5%
Diazepam and quetiapine	165	6.2%
Heroin and alcohol	164	6.1%
Diazepam and alprazolam	155	5.8%
Heroin and methamphetamine	142	5.3%
Heroin and alprazolam	134	5.0%
Diazepam and mirtazapine	131	4.9%
Heroin and methadone	129	4.8%
Diazepam and methamphetamine	125	4.7%
Diazepam and temazepam	124	4.6%
Codeine and paracetamol	122	4.6%
Diazepam and oxazepam	119	4.5%
Codeine and alprazolam	110	4.1%
Alcohol and codeine	108	4.0%
Diazepam and paracetamol	108	4.0%
Total	2670	100.0

As the data presented in this Chapter shows, pharmaceutical drugs are the most frequent contributors to overdose deaths in Victoria. They are particularly prevalent in overdose deaths involving multiple drugs.

Chapter 2: The VLEDF pharmaceutical overdose deaths project

2.1 Background: the Victorian Overdose Deaths Register

The data source for the project was the Victorian Overdose Deaths Register ('the Register') owned and maintained by the Coroners Court of Victoria (CCOV). The following is an overview of the Register design.

2.1.1 Register definitions and inclusion criteria

The Register is implemented consistently with the Substance Abuse and Mental Health Services Administration (SAMHSA) Consensus Panel recommendations for determining and documenting drug poisoning deaths (26). The Register definition of a drug largely reflects the SAMHSA definition (though the Register includes alcohol as a drug whereas it is excluded under the SAMHSA definition):

> *Any chemical compound that may be used by or administered to humans or animals as an aid in the diagnosis, treatment, or prevention of disease or injury; for the relief of pain or suffering; to control or improve any physiologic or pathologic condition; or for the feeling it causes.*

The Register definition of an 'overdose death' is identical to the SAMHSA definition of 'drug poisoning death': a death where the expert death investigators (the coroner, forensic pathologist and forensic toxicologist) determined that the acute toxic effects of a drug or drugs played a contributory role. Deaths associated with the behavioural effects of drug taking (for example, a fatal motor vehicle collision while affected by drugs and alcohol) or its chronic effects (for example, alcoholic liver disease) are excluded from the Register. Likewise, deaths resulting from allergic reactions to drugs are excluded.

2.1.2 Case identification

In Victoria, all deaths from suspected non-natural causes (including suspected overdose deaths) must be reported to the CCOV for investigation. Regular searches are conducted across coronial databases to identify Victorian deaths where the expert death investigators determined that the acute toxic effects of a drug or drugs played a causal role. Any such death is added to the Register.

2.1.3 Core dataset

For each overdose death the individual drugs that the expert death investigators determined were contributory are recorded in the Register; information regarding drugs that were detected but not determined to be contributory is not recorded. The core dataset for each overdose death recorded in the Register includes the following information in addition to the contributory drugs:

- Age of deceased.
- Sex of deceased.
- Date on which the death was reported to the CCOV.

- The location (street address, suburb, postcode and local government area) where the deceased usually resided when the death occurred.
- The location (street address, suburb, postcode and local government area) where the fatal drug-taking incident occurred.
- The cause of death (the medical cause of death from the forensic pathologist's autopsy report if the death is still under coronial investigation; the coronial cause of death from the finding if the investigation has been completed).
- Whether the death was drug induced (an overdose death in the absence of any non-drug contributing factors) or drug related (an overdose death where factors unrelated to drug toxicity also played a contributory role, such as cardiomegaly or respiratory disease).

The other major core variable in the Register is deceased intent, which is coded consistently with the Victorian Suicide Register – another database owned and maintained by the CCOV. Deceased intent is coded as one of the following three mutually exclusive categories:

- "Unintentional", if the deceased did not intend to fatally overdose (the overdose was an 'accident' in colloquial speech).
- "Intentional self-harm", if the deceased intentionally overdosed and understood that this would likely lead to his or her death (a 'suicide').
- "Unable to form intent", if the deceased intentionally overdosed but was unable to understand that his or her actions would likely lead to death.
- "Unable to be determined", if there was insufficient evidence on the balance of probabilities to establish the deceased's intent in fatally overdosing, and/or the deceased's ability to understand that the drug taking would likely lead to his or her death.

Coding of intent in the Register follows the coroner's explicit determination. However, if there is no explicit coronial determination of intent (either because the death is still under investigation or the coroner does not determine the deceased's intent), intent is coded into the Register based on review all available evidence, and is default coded to "Unable to be determined" if the evidence does not permit a clear conclusion to be reached.

2.1.4 Enhanced data on drug dependence

The Register includes several non-core variables that are optional to be coded. One group of variables in this enhanced dataset pertains to whether the deceased had a history of drug dependence. Evidence regarding this history is recorded as one of five mutually exclusive options:

- "Current dependence - clinically documented", if there is positive evidence that (a) the deceased was drug dependent proximal to death, and (b) a clinician documented his or her knowledge of the drug dependence.
- "Current dependence - not clinically documented", if there is positive evidence that the deceased was drug dependent proximal to death, but no evidence that any clinician was aware of the drug dependence. The most common source of information in this scenario is the statements of family and friends.

- “Past dependence but not current”, if there is evidence that the deceased was formerly drug dependent but had not used drugs in at least a year leading up to the death.
- “No evidence of dependence”, where there was no evidence of drug dependence in the available coronial material. This category includes scenarios where the deceased engaged in drug misuse, but there was evidence of associated drug dependence (for example, episodic binge drinking or weekend-only injecting drug use).

Where the deceased had a history of drug dependence, the duration of the history is recorded with six mutually exclusive options:

- Less than a year.
- One to two years.
- Two to five years.
- Six to 10 years.
- More than 10 years.
- Not known.

Additionally, evidence regarding the drugs of dependence for the deceased is also recorded. Tick boxes offer the following non-exclusive options:

- Alcohol
- Heroin
- Cannabis
- Amphetamines
- Other illegal drugs
- Pharmaceutical opioids
- Benzodiazepines
- Antidepressants
- Antipsychotics
- Other pharmaceutical drugs
- Other known substances (which encompasses for example butane inhalation and use of hallucinogenic mushrooms)
- Unknown drugs (where there is positive evidence of drug dependence but the drugs used are not identified in the available material)

Where a box is ticked for a particular drug, the coder must also select whether the dependent drug use was current (proximal to the time of death) or historical with no evidence of use in the year leading up to death.

Finally, there are tick-boxes to indicate whether the deceased was engaged in injecting drug use, and whether there was evidence of engagement in prescription shopping (attending multiple medical practitioners to obtain prescriptions for pharmaceutical drugs in excess of therapeutic need and without making each medical practitioner aware of the others). There is a large free text field where

coders can record information about the deceased's drug dependence and about their coding decisions.

2.1.5 Enhanced data on mental illness

The enhanced dataset includes variables regarding the deceased's history of mental illness. Evidence regarding any history of mental illness other than drug dependence is recorded as one of three mutually exclusive options:

- "Diagnosed mental illness", if there is positive evidence that an appropriately qualified clinician has made a formal diagnosis of a mental illness that is not drug dependence.
- "Suspected mental illness", if there is evidence the deceased may have suffered mental illness but no formal clinical diagnosis can be confirmed. The most common scenario here is where a general practitioner states the deceased may have been (for example) depressed and anxious. Another scenario is where family members state they had concerns about the deceased's mental state but the deceased refused to attend a doctor.
- "No evidence of mental illness", where the available material does not indicate the deceased may have suffered mental ill health.

Where the deceased had a history of diagnosed or suspected mental illness, the duration of the history is recorded with six mutually exclusive options:

- Less than a year.
- One to two years.
- Two to five years.
- Six to 10 years.
- More than 10 years.
- Not known.

A large free text field is provided for coders to record information about the deceased's mental health and about their coding decisions.

2.1.6 Enhanced data on socio-demographics

The enhanced dataset enables current employment status of the deceased proximal to death to be recorded using one of the following seven options:

- Employed
- Unemployed
- Student
- Retired/pensioner
- Unable to work
- Other
- Not known

Evidence can also be recorded as to whether the deceased belonged to a culturally and linguistically diverse (CALD) community, using the following three options:

- Yes
- No
- Not known

The deceased's relationship status proximal to death can be recorded using the following six options:

- In a relationship – dating
- In a relationship - de facto or domestic
- In a relationship – married
- In a relationship – other
- Not in a relationship
- Not known

A large free text field is provided for coders to record information about the socio-demographic variables and about their coding decisions.

2.1.7 Other contextual information

The enhanced dataset includes a tick box to indicate if there was evidence the deceased had ever been in prison; and a tick box to indicate if anybody observed the deceased was sleeping heavily, snoring, or otherwise unconscious with impaired breathing in the lead-up to death. Again, free text fields are available to record details of this contextual information.

2.1.8 Revision of Register contents

Register coding is revised dynamically as coroners' investigations progress, and therefore the data reported from the Register changes over time.

2.2 VLEDF Project coding

For the VLEDF Project, the Register was used to identify every Victorian overdose death that occurred between 2011 and 2013 where one or more pharmaceutical drugs were determined to be contributory. Then, the full coronial case file for as many of these deaths as possible were obtained and reviewed. The case file for a death invariably contains the forensic medical documents, the coronial brief of evidence, witness statements, statements from treating practitioners, and the coroner's findings; depending on the course of the investigation, the file might also include documents such as Pharmaceutical Benefits Scheme dispensing data for the deceased, medical records, and similar. The purpose of the review was to code two sets of data into the Register for each death.

2.2.1 Completing the enhanced dataset for all deaths

The variables that comprise the enhanced dataset, including the deceased's history (if any) of drug dependence and mental ill health, socio-demographic features and other contextual information, were coded. At least some of this information had been coded before the VLEDF Project commenced; the full case review process undertaken for the VLEDF Project was an opportunity to check existing coding, complete missing information, and ensure the enhanced dataset for each death reflected as accurately as possible the coroner's investigation.

2.2.2 Coding for pharmaceutical drug sources

Information regarding the sources of the pharmaceutical drugs that contributed in each death was coded. An interface was built in the Register so that for each contributing pharmaceutical drug in each death, the following sources could be recorded as applicable:

- Prescribed to deceased
- Obtained over the counter (OTC)
- Diverted to deceased
- Unknown

If the drug was prescribed to the deceased, the interface enabled information to be recorded regarding the number of clinicians who prescribed the drug to the deceased, and the clinics at which they worked.

If the drug was diverted to the deceased, the interface enabled information to be recorded regarding the relationship between the deceased and the person who diverted the drug, and the reason why the drug was diverted, whether it was:

- Given to the deceased
- Sold to the deceased
- Taken without permission by the deceased
- Other known reason
- Not known

2.3 Data analysis and report structure

In Chapter 3, the study cohort by sex, age group and contributing drug groups was described. Subsequent sections of the report examine separately the major variables coded in the VLEDF project, using basic descriptive analyses (frequencies and proportions by age group, sex, contributing drugs, drug dependence, mental illness, intent and pharmaceutical drug source):

- History of deceased drug dependence (Chapter 4)
- History of deceased mental illness (Chapter 5)
- Deceased intent (Chapter 6)
- Pharmaceutical drug sources (Chapter 7)
- Intersection of drug dependence, mental illness, intent and drug source (Chapter 8)

Chapter 3: The study cohort

Among the 894 Victorian overdose deaths that occurred between 2011 and 2013 where one or more pharmaceutical drugs contributed, the coronial files for 838 deaths were able to accessed and coded. These comprised the study cohort for the VLEDF Project, and encompassed:

- 263 (95.6%) of the 275 relevant deaths that occurred in 2011.
- 293 (95.7%) of the 306 relevant deaths that occurred in 2012.
- 282 (90.0%) of the 313 relevant deaths that occurred in 2013.

The 56 remaining deaths were largely still under coronial investigation at the time when the Project coding took place and could not be accessed. We believe no underlying systematic bias skewed the composition of the study cohort with respect to any variable examined in the Project; the study cohort is representative of the overall 894 relevant deaths from which it was drawn.

3.1 Sex and age group

Table 9 shows the frequency of deaths in the study cohort by sex and age group. Males comprised the majority of the cohort (526 of 838, 62.8%). The female deceased were on average slightly older (mean 47.1 years) than the male deceased (mean 40.8 years).

Table 9 : Frequency of overdose deaths in study cohort by sex and age group

Age group (years)	Male	Female	All
10-17	6	-	6
18-24	30	12	42
25-34	153	49	202
35-44	161	82	243
45-54	107	83	190
55-64	44	57	101
65-74	10	17	27
75-84	8	7	15
85+	7	5	12
All ages	526	312	838
Mean age (years)	40.8	47.1	43.2

3.2 Contributing drug combinations

Among the 838 overdose deaths in the study cohort:

- 422 (50.3%) involved pharmaceutical drugs only.
- 140 (16.7%) involved pharmaceutical drugs in combination with alcohol.
- 222 (26.6%) involved pharmaceutical drugs in combination with illegal drugs.
- 54 (6.4%) involved pharmaceutical drugs in combination with alcohol and illegal drugs.

Table 10 shows the frequency of overdose deaths by contributing drug combinations, sex and age group. There was a clear difference between the sexes, in that most female overdose deaths (195 of 312, 62.5%) were pharmaceutical drug only, whereas the proportion of pharmaceutical drug only fatal overdoses in males were much lower (227 of 526, 43.1%) and males had a far higher frequency and proportion of overdose deaths involving combinations of pharmaceutical and illegal drugs. Across both males and females, the average age of deceased whose fatal overdoses involved illegal drugs was lower.

Table 10: Frequency of overdose deaths in study cohort by sex and age group and contributing drug combination

Age group (years)	Pharmaceuticals only	Pharmaceuticals and alcohol	Pharmaceuticals and illegals	Pharmaceutical, illegal and alcohol
		Males		
10-17	5	1	-	-
18-24	16	4	10	-
25-34	53	17	69	14
35-44	56	24	67	14
45-54	51	26	21	9
55-64	25	10	7	2
65-74	7	2	-	1
75-84	8	-	-	-
85+	6	1	-	-
All ages	227	85	174	40
Mean (years)	43.6	42.7	36.5	39.6
		Females		
10-17	-	-	-	-
18-24	8	-	4	-
25-34	21	6	17	5
35-44	49	15	13	5
45-54	52	18	9	4
55-64	41	12	4	-
65-74	12	4	1	-
75-84	7	-	-	-
85+	5	-	-	-
All ages	195	55	48	14
Mean (years)	49.3	49.2	38.3	39.3

Chapter 4: Drug dependence

Among the 838 overdose deaths in the study cohort:

- For 595 deceased (71.0%) there was evidence of drug dependence proximal to death ('current drug dependence').
- For 243 deceased (29.0%) there was no evidence of drug dependence proximal to death ('no current drug dependence').

4.1 Drug dependence by sex and age group

Table 11 shows the frequency of overdose deaths in the cohort by sex and history of drug dependence. While there was evidence of current drug dependence among the majority of both males and females, a higher proportion of male (79%) than female (58%) deceased were currently drug dependent.

Table 11: Frequency of overdose deaths in study cohort by sex and history of drug dependence

Drug dependence	Male	Female	Total
Current drug dependence			
Clinically documented	369	161	530
Not clinically documented	44	21	65
Total	413	182	595
No current drug dependence			
Past but not current dependence	21	9	30
No evidence of dependence	86	116	202
Not known	6	5	11
Total	113	130	243
All			
Total	526	312	838

Table 12 shows deceased history of drug dependence by sex and age group. For both men and women, the average age at death among those who were currently drug dependent was at least 10 years lower than among those who were not.

Table 12: Frequency of overdose deaths in study cohort by deceased drug dependence history, sex and age group

	Current drug dependence		No current drug dependence	
Age group (years)	**Male**	**Female**	**Male**	**Female**
10-17	3	-	3	-
18-24	27	9	3	3
25-34	137	42	16	7
35-44	136	57	25	25
45-54	80	49	27	34
55-64	24	21	20	36
65-74	4	3	6	14
75-84	2	1	6	6
85+	-	-	7	5
All ages	413	182	113	130
Mean (years)	38.4	42.1	49.5	54.1

4.2 Single drug and poly-drug dependence

Table 13 shows the frequency of overdose deaths among the 565 deceased in the study cohort who were currently drug dependent, by sex and the drugs they used. For both male and female deceased, poly-drug dependence was far more prevalent (413 of 565 deaths, 73.1%) than single drug dependence. Among single drug dependent deceased, the most frequently used drugs were alcohol followed by heroin then pharmaceutical opioids. For poly-drug dependent deceased, the most frequently used drug was heroin, following by alcohol then cannabis and benzodiazepines. There were no particularly notable differences in drug use between the male and female deceased.

Table 13: Frequency of overdose deaths among drug dependent study cohort by deceased sex and drugs used

Drugs used	Male	Female	Total
Single drug dependence			
Alcohol	48	37	85
Heroin	32	9	41
Cannabis	6	1	7
Amphetamines	2	1	3
Other and unknown illegal	1	-	1
Opioids	15	10	25
Benzodiazepines	4	-	4
Antidepressants	-	1	1
Antipsychotics	-	1	1
Other and unknown pharmaceuticals	-	2	2
Total	116	66	182
Poly-drug dependence			
Alcohol	161	60	221
Heroin	170	56	226
Cannabis	145	52	197
Amphetamines	97	39	136
Other and unknown illegals	16	6	22
Opioids	72	30	102
Benzodiazepines	116	58	174
Antidepressants	9	9	18
Antipsychotics	5	3	8
Other and unknown pharmaceuticals	9	3	12
Other and unknown drugs	31	13	44
Total	297	116	413

4.3 Duration of drug dependence

Table 14 shows the duration of drug dependence history among the 182 single drug dependent deceased and 413 poly-drug dependent deceased in the study cohort. For single and poly-drug dependent deceased, both male and female, where duration of drug dependence was known it was in most cases more than 10 years.

Table 14: Duration of single or poly-drug dependence in the study cohort by sex

Duration (years)	Male	Female	Total
Single drug dependence			
< 1	5	-	5
1-2	4	2	6
2-5	10	6	16
6-10	4	4	8
10+	46	18	64
Not known	47	36	83
Total	116	66	182
Poly-drug dependence			
< 1	-	-	-
1-2	-	-	-
2-5	19	8	27
6-10	19	10	29
10+	191	83	274
Not known	68	15	83
Total	297	116	413

4.4 Drug dependence and contributing drugs

Table 15 shows the frequency of overdose deaths by contributing drugs among deceased in the study cohort who were drug dependent and not drug dependent. Nearly 80% of the overdose deaths among those who were not drug dependent, involved only pharmaceutical drugs; whereas among those with current drug dependence the majority of deaths involving pharmaceutical drugs in combination with alcohol and/or illegal drugs.

Table 15: Frequency of overdose deaths in the study cohort by contributing drugs and drug dependence status

	Current drug dependence		No current drug dependence	
Contributing drugs	**n**	**%**	**n**	**%**
Pharmaceuticals only	228	38.3	194	79.8
Pharmaceuticals and alcohol	110	18.5	30	12.3
Pharmaceuticals and illegals	204	34.3	18	7.4
Pharmaceuticals, illegals and alcohol	53	8.9	1	0.4
Total	595	100.0	243	100.0

Chapter 5: Diagnosed mental illness

For the purposes of this project, diagnosed mental illness excludes drug dependence.

Among the 838 overdose deaths in the study cohort:

- 612 deceased (73.0%) had a diagnosed mental illness (other than drug dependence).
- 226 deceased (27.0%) did not have any evidence of a diagnosed mental illness.

5.1 Mental illness by sex and age group

Table 16 shows the frequency of overdose deaths in the study cohort by sex and history of diagnosed mental illness. The majority of both men and women had a diagnosed mental illness; the proportion of women with a diagnosed mental illness (245 of 312, 78.5%) was slightly higher than the proportion of men (367 of 526, 69.8%).

Table 16: Frequency of overdose deaths in the study cohort by sex and history of diagnosed mental illness

Mental illness	Male	Female	Total
Diagnosed mental illness			
Total	367	245	612
No diagnosed mental illness			
Suspected mental illness	42	19	61
No evidence of mental illness	101	38	139
Not known	16	10	26
Total	159	67	226
All			
Total	526	312	838

Table 17 shows the frequency of deaths by sex, age group and mental illness. The age group distribution did not differ notably by sex between the two groups.

Table 17: Frequency of overdose deaths in the study cohort by history of mental illness, sex and age group

Age group (years)	Diagnosed mental illness		No diagnosed mental illness	
	Male N (%)	Female N (%)	Male N (%)	Female N (%)
10-17	4 (1.1%)	0 (0%)	2 (1.3%)	0 (0%)
18-24	22 (6%)	9 (3.7%)	8 (5%)	3 (4.5%)
25-34	111 (30.2%)	37 (15.1%)	42 (26.4%)	12 (17.9%)
35-44	117 (31.9%)	67 (27.3%)	44 (27.7%)	15 (22.4%)
45-54	73 (19.9%)	67 (27.3%)	34 (21.4%)	16 (23.9%)
55-64	28 (7.6%)	49 (20%)	16 (10.1%)	8 (11.9%)
65-74	5 (1.4%)	10 (4.1%)	5 (3.1%)	7 (10.4%)
75-84	3 (0.8%)	4 (1.6%)	5 (3.1%)	3 (4.5%)
85+	4 (1.1%)	2 (0.8%)	3 (1.9%)	3 (4.5%)
All ages	367	245	159	67
Mean (years)	40.0	46.6	42.7	49.2

5.2 Duration of mental illness

Table 18 shows the duration of mental illness among the 612 deceased in the study cohort who had diagnosed mental illnesses. For both male and female deceased, where the duration of their mental illness was known it was in most cases more than 10 years.

Table 18: Duration of mental illness in the study cohort by sex

Duration (years)	Male	Female	Total
< 1	20	4	24
1-2	18	9	27
2-5	28	15	43
6-10	50	19	69
10+	122	123	245
Not known	129	75	204
Total	367	245	612

5.3 Mental illness and contributing drugs

Table 19 shows the frequency of overdose deaths by contributing drug groups among deceased in the study cohort who did or did not have diagnosed mental illness. The proportions of deceased in each group who fatally overdosed on pharmaceutical drugs only and pharmaceutical drugs in combination with alcohol and/or illegal drugs was quite similar, regardless of mental illness history.

Table 19: Frequency of overdose deaths in study cohort by contributing drug groups and history of mental illness

Contributing drugs	Diagnosed mental illness		No diagnosed mental illness	
	n	%	n	%
Pharmaceuticals only	310	50.7	112	49.6
Pharmaceuticals and alcohol	106	17.3	34	15.0
Pharmaceuticals and illegals	153	25.0	69	30.5
Pharmaceuticals, illegals and alcohol	43	7.0	11	4.9
Total	612	100.0	226	100.0

Chapter 6: Intent

Among the 838 overdose deaths in the study cohort, the deceased intent was:

- Unintentional in 449 fatal overdoses (53.6%).
- Intentional self-harm in 238 fatal overdoses (28.4%).
- Unable to be determined in 151 fatal overdoses (18.0%).

6.1 Intent by sex and age group

Table 20 shows the frequency of overdose deaths in the study cohort by intent, sex and age group. Two main patterns were apparent. First, for both males and females, suicide (intentional self-harm) deceased were on average 10 years older than those whose fatal overdoses were unintentional. Second, there were almost three times more unintentional than suicidal overdoses among males, but for females the frequencies of the two groups were approximately equal.

Table 20: Frequency of overdose deaths by deceased intent, sex and age group

Age group (years)	Unintentional self-harm	Intentional self-harm	Unable to be determined
	Males		
10-17	4	2	-
18-24	23	4	3
25-34	111	22	20
35-44	104	28	29
45-54	61	23	23
55-64	15	23	6
65-74	2	5	3
75-84	3	5	-
85+	1	6	-
All ages	324	118	84
Mean (years)	38.0	48.0	41.8
	Females		
10-17	-	-	-
18-24	6	4	2
25-34	34	9	6
35-44	36	26	20
45-54	26	41	16
55-64	16	23	18
65-74	4	9	4
75-84	1	5	1
85+	2	3	-
All ages	125	120	67
Mean (years)	42.5	51.1	48.7

6.2 Contributing drugs by intent and sex

Table 21 shows the frequency of overdose deaths by intent, sex and contributing drugs. In suicidal overdose, the majority of deaths were pharmaceutical drug only for both males (75 of 118, 63.6%) and females (93 of 120, 77.5%); whereas in unintentional overdose the majority of deaths for both males and females involve pharmaceutical drugs in combination with alcohol and/or illegal drugs.

Table 21: Frequency of overdose deaths by deceased intent, sex and contributing drugs.

Contributing drugs	Unintentional self-harm	Intentional self-harm	Unable to be determined
	Males		
Pharmaceuticals only	106	75	46
Pharmaceuticals and alcohol	41	30	14
Pharmaceuticals and illegals	142	11	21
Pharmaceuticals, illegals and alcohol	35	2	3
Total	324	118	84
	Females		
Pharmaceuticals only	58	93	44
Pharmaceuticals and alcohol	24	18	13
Pharmaceuticals and illegals	32	7	9
Pharmaceuticals, illegals and alcohol	11	2	1
Total	125	120	67

Chapter 7: Pharmaceutical drug sources

Of the 838 overdose deaths in the study cohort, and the 2775 contributing pharmaceutical drugs, the following information regarding likely source was identified:

- In 364 deaths (43.4%), the likely sources of all contributing pharmaceutical drugs were identified.
- For a further 337 deaths (40.2%), the likely source of at least one contributing pharmaceutical drug was identified
- In 137 deaths (16.4%) no sources of any contributing pharmaceutical drugs were identified
- The likely sources for 1749 (63.0%) of the 2775 contributing pharmaceutical drugs were identified

7.1 Pharmaceutical drug sources in deaths

Table 22 shows the frequency and proportion of overdose deaths in the study cohort involving pharmaceutical drugs that were prescribed, diverted and obtained OTC, for the 364 deaths where all pharmaceutical drug sources were known and the 337 deaths where the source of at least one pharmaceutical drug was known. The overwhelming majority of these deaths (607 of 701, 86.6%) involved pharmaceutical drugs prescribed to the deceased. Pharmaceutical and OTC drugs were less prevalent.

Table 22: Frequency of overdose deaths in the study cohort where the sources of some or all pharmaceutical drug sources are known, by pharmaceutical drug sources

	All sources known		Some sources known		Total	
Source	n	%	n	%	n	%
Prescribed	306	84.1	301	89.3	607	86.6
Diverted	71	19.5	70	20.8	141	20.1
OTC	41	11.3	65	19.3	106	15.1
Total	364	100.0	337	100.0	701	100.0

Table 23 shows the frequencies and proportions from Table 22, further broken down into mutually exclusive combinations of contributing prescribed, diverted and OTC pharmaceutical drugs. Two-thirds of the deaths involved only pharmaceutical drugs prescribed to the deceased.

Table 23: Frequency of overdose deaths in the study cohort where the sources of some or all pharmaceutical drug sources are known, by combinations of pharmaceutical drug sources

	All sources known		Some sources known		Total	
Source	n	%	n	%	n	%
Prescribed only	257	70.6	211	62.6	468	66.8
Prescribed and diverted	27	7.4	39	11.6	66	9.4
Prescribed and OTC	18	4.9	44	13.1	62	8.8
Diverted only	39	10.7	22	6.5	61	8.7
OTC only	18	4.9	12	3.6	30	4.3
Prescribed, OTC and diverted	4	1.1	7	2.1	11	1.6
OTC and diverted	1	0.3	2	0.6	3	0.4
Total	364	100.0	337	100.0	701	100.0

7.1.1 Prescribers and prescribed drugs

Table 24 shows the frequency of overdose deaths where at least one contributing pharmaceutical drug was known to be prescribed, by the number of prescribers and clinics involved in prescribing contributing drugs to the deceased. The majority of deaths (417 of 607, 68.7%) involved drugs prescribed by a single prescriber at a single clinic. In 43 deaths there was positive evidence that drugs were prescribed to the deceased, but the number of involved prescribers was unable to be confirmed.

Table 24: Frequency of overdose deaths in the study cohort where the sources of some or all pharmaceutical drug sources are known to be prescription, by number of prescribers and number of clinics

	Number of clinics						
Number of prescribers	One	Two	Three	Four	Five+	Unknown	Total
One	417	-	-	-	-	-	417
Two	23	80	-	-	-	-	103
Three	5	11	14	-	-	-	30
Four	-	2	4	1	-	-	7
Five+	-	2	-	1	4	-	7
Unknown	-	-	-	-	-	43	43
Total	445	95	18	2	4	43	607

In Table 25 and Table 26, the deceased in Table 24 were aggregated into two groups: those deceased who fatally overdosed using a pharmaceutical drug or drugs sourced from a single prescriber; and those who fatally overdosed using pharmaceutical drugs sourced from multiple prescribers (the 'unknown' group were excluded). Table 25 shows that the two groups did not differ in age distribution within sex; moreover differences between sexes reflected the sex distribution in

the overall study cohort. Moreover, Table 26 shows that there were no differences between these two groups in the distribution of contributing drugs to overdose death.

Table 25: Frequency of overdose deaths in the study cohort by number of prescribing doctors, sex and age group

	Single prescriber		Multiple prescribers	
Age group (years)	**Male**	**Female**	**Male**	**Female**
10-17	3	-	-	-
18-24	11	6	9	2
25-34	72	23	27	9
35-44	89	40	30	18
45-54	47	45	16	15
55-64	30	27	3	9
65-74	4	7	3	3
75-84	3	3	2	1
85+	5	2	-	-
All ages	264	153	90	57
Mean (years)	41.8	46.9	39.4	45.1

Table 26: Frequency of overdose deaths in the study cohort by number of prescribing doctors, sex and contributing drugs groups

Contributing drugs	Single prescriber	Multiple prescribers
	Males	
Pharmaceuticals only	103	46
Pharmaceuticals and alcohol	50	7
Pharmaceuticals and illegals	87	32
Pharmaceuticals, illegals and alcohol	24	5
Total	264	90
	Females	
Pharmaceuticals only	92	37
Pharmaceuticals and alcohol	29	12
Pharmaceuticals and illegal	24	7
Pharmaceuticals, illegals and alcohol	8	1
Total	153	57

7.2 Pharmaceutical drug sources by drug

As noted above, the confirmed or probable source for 1749 of the 2775 pharmaceutical drugs that contributed to the overdose deaths in the study cohort were identified. Table 27 summarises this information for the 30 most frequent contributing drugs in the study cohort:

There was evidence that a small number of drugs had been obtained from multiple sources (mainly prescribed and diverted, and to a lesser extent prescribed and OTC). To simplify the analysis, any drug with multiple sources was re-designated to have come from a single source. The order of priority for the re-designation was prescribed then OTC then diverted.

Regarding knowledge of drug source, Table 27 shows:

- For most drugs, the source in the majority of deaths was known. The drugs with the highest level of source ascertainment included paracetamol (101 sources identified in 110 deaths, 91.8%), fluoxetine (24 sources identified in 29 deaths, 82.8%) and venlafaxine (39 sources identified in 49 deaths, 79.6%). Clearly the drug with the lowest source ascertainment was codeine (64 sources identified from 225 deaths, 28.4%).
- Source ascertainment for codeine requires further commentary. The central challenge was that codeine was identified as a contributing drug in 104 deaths where heroin was another contributing drug. Codeine (particularly in OTC preparations) can be present as an adulterant of heroin, or can be used as an adjunct to heroin; therefore in heroin overdose where there is no direct evidence of pharmaceutical codeine use (for example medication packaging found at the scene of death) the source cannot be determined with any confidence.

Regarding known sources, Table 27 shows:

- Where sources were known, most drugs were directly prescribed to the deceased. For several drugs, the only known source was prescription to the deceased (citalopram, olanzapine, venlafaxine, clonazepam, zopiclone, duloxetine, fluoxetine, valproic acid and doxepin). For several further drugs, in the overwhelming majority of deaths the source was prescription to the deceased, including quetiapine (source known in 83 deaths, was prescribed in 80 of these, 96.4%) and diazepam (source known in 260 deaths, was prescribed in 250 of these, 96.1%).
- Drugs associated with the highest proportions of diversion in the deaths were opioids: fentanyl (diverted in 10 deaths among 21 known, 47.6%), methadone (diverted in 62 deaths among 161 known, 38.5%), morphine (diverted in nine deaths among 22 known, 36.3%) and oxycodone (diverted in 23 deaths among 106 known, 21.7%).
- The drugs associated with the highest proportions of OTC access were paracetamol (accessed OTC in 77 deaths among 101 known, 76.2%) and doxylamine (accessed OTC in 11 deaths among 20 known, 76.2%)

Table 27: Sources of pharmaceutical drugs that contributed to overdose deaths in the study cohort

Source	Knowledge of drug source			Source known		
	Total deaths	Source known	Source unknown	Prescribed	Diverted	OTC
Diazepam	405	260	145	250	10	-
Codeine	225	64	161	48	6	10
Methadone	217	161	56	99	62	-
Oxycodone	143	106	37	83	23	-
Alprazolam	140	91	49	78	13	-
Quetiapine	111	83	28	80	3	-
Paracetamol	110	101	9	24	-	77
Temazepam	100	48	52	46	2	-
Oxazepam	98	50	48	47	3	-
Amitriptyline	76	48	28	43	5	-
Mirtazapine	76	48	28	46	2	-
Citalopram	66	43	23	43	-	-
Nitrazepam	55	28	27	26	2	-
Tramadol	54	34	20	31	3	-
Doxylamine	51	20	31	9	-	11
Olanzapine	51	34	17	34	-	-
Venlafaxine	49	39	10	39	-	-
Clonazepam	47	23	24	23	-	-
Zopiclone	31	20	11	20	-	-
Duloxetine	30	22	8	22	-	-
Fentanyl	30	21	9	11	10	-
Metoclopramide	30	16	14	15	-	1
Fluoxetine	29	24	5	24	-	-
Morphine	29	22	7	14	8	-
Sertraline	29	23	6	21	2	-
Risperidone	27	16	11	15	1	-
Valproic Acid	23	18	5	18	-	-
Promethazine	21	9	12	5	-	4
Buprenorphine	20	8	12	6	2	-
Doxepin	20	13	7	13	-	-

7.3 Deaths involving multiple prescribers

Of the 607 overdose deaths where at least one contributing pharmaceutical drug was known to be prescribed, 147 deaths involved multiple known prescribers for the contributing drugs (see Table 25). There are two different ways in which multiple prescribers can be involved in prescribing contributing drugs to a person in the study cohort:

- Multiple prescribers can prescribe the same drug to a person (for example, three different prescribers providing scripts for oxycodone).
- Multiple prescribers can prescribe different drugs to the person (for example, the first prescriber provides oxycodone, the second prescriber provides diazepam).

Of 147 deaths where the deceased accessed pharmaceutical drugs from multiple prescribers, the extent to which the prescribers provided the same versus different drugs to the deceased was examined:

- In 41 deaths (27.9% of the 147) the deceased accessed at least one contributing pharmaceutical drug from multiple prescribers.
- In the remaining 106 deaths (72.1%) the deceased did not access the same single contributing drug from multiple prescribers.

From these 147 deaths where multiple prescribers were identified, Table 28 presents each of the prescribed contributing drugs by single or multiple prescribers. Most drugs contributing to deaths (where the combination of contributing drugs were prescribed by multiple prescribers) were prescribed by a single prescriber. Only diazepam had any notable amount of multiple prescriber involvement.

Table 28: Prescribed pharmaceutical drugs that most frequently contributed to overdose deaths involving multiple prescribers, by number of prescribers

Drug	Single prescriber	Multiple prescribers	Total
Diazepam	73	17	90
Methadone	31	3	34
Quetiapine	28	3	31
Alprazolam	25	3	28
Oxycodone	23	3	26
Codeine	19	5	24
Oxazepam	11	5	16
Mirtazapine	12	4	16
Tramadol	11	3	14
Temazepam	11	3	14
Venlafaxine	12	2	14
Olanzapine	12	1	13
Nitrazepam	13	-	13
Amitriptyline	11	1	12
Citalopram	11	1	12
Duloxetine	11	1	12
Clonazepam	12	-	12
Paracetamol	8	3	11
Fluoxetine	9	1	10
Valproic Acid	7	1	8

Chapter 8: Identifying potential targets for intervention

In Chapters 4 through 7, a range of factors relating to the study cohort were examined separately:

- Drug dependence.
- Diagnosed mental illness.
- Deceased intent.
- Sources of contributing pharmaceutical drugs.

In this chapter, these factors are presented in concert to seek opportunities for targeted interventions and policies to reduce overdose deaths in Victoria.

8.1 Drug dependence and mental illness

Table 29 shows the intersection between drug dependence and diagnosed mental illness among the deceased in the study cohort. In total 416 of the 838 deceased, just under 50% of the study cohort, had both a diagnosed mental illness and clinically documented drug dependence.

Table 29: Intersection of drug dependence and mental illness in the study cohort

	Mental illness		
Current drug dependence	Diagnosed	Not diagnosed	Total
Yes - clinically documented	416	114	530
Yes - not clinically documented	35	30	65
No evidence of current dependence	161	82	243
Total	612	226	838

Table 30 shows the duration of mental illness referenced against the duration of drug dependence for these 416 deaths. Even including the large number of deaths for which the duration of either measure (or both) was unknown, the data clearly indicates that most of the deceased had a long history of diagnosed mental illness and clinically documented drug dependence.

Table 30: Duration of drug dependence and mental illness in the study cohort

	Duration of mental illness (years)						
Duration of drug dependence	<1	1-2	2-5	6-10	10+	Unknown	Total
<1	-	-	-	1	-	-	1
1-2	1	2	1	-	-	1	5
2-5	3	1	8	8	5	4	29
6-10	3	1	4	4	8	6	26
10+	7	7	13	21	135	81	264
Unknown	3	3	5	7	16	57	91
Total	17	14	31	41	164	149	416

For the remainder of this Chapter, all drug dependent deceased, regardless of whether clinically documented, were combined to produce four groups within the study cohort:

- 451 deceased who had diagnosed mental illnesses and were drug dependent proximal to death.
- 161 deceased who had diagnosed mental illnesses and were not drug dependent proximal to death.
- 144 deceased who had no diagnosed mental illness and were drug dependent proximal to death
- 82 deceased who had no diagnosed mental illness and were not drug dependent proximal to death.[3]

8.2 Deceased intent and contributing drugs

Table 31 shows the frequency of deaths by contributing drug types and deceased intent, between the four groups. Two main features were evident:

- Among drug dependent deceased, overdoses using pharmaceutical drugs in combination with illegal drugs and/or alcohol were more prevalent than pharmaceutical drug only overdoses. This was the case regardless of whether or not the deceased had co-morbid diagnosed mental illness, and regardless of deceased intent.
- Among deceased who were not drug dependent proximal to death, most overdoses were pharmaceutical drug only; this was the case regardless of any co-morbid diagnosed mental illness, and regardless of deceased intent.

[3] As is explained in Chapter 2.1.5, for the purposes of this study 'mental illness' was defined to include all mental illnesses except drug dependence.

Table 31: Frequency of deaths by contributing drug types, deceased intent, drug dependence and mental health status

Contributing drug types	Unintentional self-harm	Intentional self-harm	Unable to be determined	Total
Drug dependence and mental illness				
Pharmaceuticals only	89	54	34	177
Pharmaceuticals and alcohol	46	25	17	88
Pharmaceuticals and illegals	116	10	18	144
Pharmaceuticals, illegals and alcohol	37	3	2	42
Total	288	92	71	451
No drug dependence and mental illness				
Pharmaceuticals only	19	84	30	133
Pharmaceuticals and alcohol	6	8	4	18
Pharmaceuticals and illegals	3	3	3	9
Pharmaceuticals, illegals and alcohol	-	1	-	1
Total	28	96	37	161
Drug dependence and no mental illness				
Pharmaceuticals only	35	2	14	51
Pharmaceuticals and alcohol	12	6	4	22
Pharmaceuticals and illegals	51	4	5	60
Pharmaceuticals, illegals and alcohol	9	-	2	11
Total	107	12	25	144
No drug dependence and no mental illness				
Pharmaceuticals only	21	28	12	61
Pharmaceuticals and alcohol	1	9	2	12
Pharmaceuticals and illegals	4	1	4	9
Pharmaceuticals, illegals and alcohol	-	-	-	-
Total	26	38	18	82

8.3 Deceased intent, age and sex

Table 32 shows the average age in years of deceased in the study cohort by sex, intent, drug dependence history and history of diagnosed mental illness.

The data appears to include two notable features:

- For currently drug dependent deceased, average age did not vary by presence or absence of comorbid diagnosed mental illness, but both male and female deceased who suicided were on average around five to eight years older than those who died from unintentional overdose.

- Deceased who were not currently drug dependent, were on average between five and 15 years older than the drug dependent deceased. The effect of diagnosed mental illness and deceased intent on average age in this this cohort differed by deceased sex.

Table 32: Average age by sex, intent, drug dependence and mental health status

	Unintentional self-harm	Intentional self-harm	Unable to be determined
Males (years)			
Drug dependence and mental illness	36.8	43.3	39.4
Drug dependence and no mental illness	37.9	43.4	42.2
No drug dependence and mental illness	43.0	50.6	46.6
No drug dependence and no mental illness	48.9	56.5	43.8
Total	37.9	48.0	41.8
Females			
Drug dependence and mental illness	39.3	45.9	43.9
Drug dependence and no mental illness	40.2	44.5	47.3
No drug dependence and mental illness	49.1	54.3	53.6
No drug dependence and no mental illness	64.1	54.4	55.1
Total	42.5	51.1	48.7

8.4 Pharmaceutical drug sources

Table 33 presents the frequency of deaths in the study cohort by drug dependence history, history of diagnosed mental illness and knowledge of contributing pharmaceutical drug sources.

Regardless of whether the deceased was drug-dependent and/or had a diagnosed mental illness, the majority of deceased sourced contributing pharmaceutical drugs from a single prescriber.

Table 33: Frequency of deaths in the study cohort where the sources of some or all pharmaceutical drug sources are known, by history of drug dependence, mental illness and pharmaceutical drug sources

	Drug dependence and mental illness	Drug dependence and no mental illness	No drug dependence and mental illness	No drug dependence and no mental illness
Knowledge of source				
All sources known	187	41	96	40
Some sources known	216	56	47	18
No sources known	48	47	18	24
Total	**451**	**144**	**161**	**82**
Sourced by prescription				
Single prescriber	247	51	85	34
Multiple prescribers	100	19	28	0
Unknown prescribers	18	7	12	6
Total	365	77	125	40
Sourced by diversion				
Total	59	11	25	11
Sourced OTC				
Total	90	26	13	12

Chapter 9: Conclusion

Key findings

The impact of overdose on individuals, families, the community and government is substantial, and a growing issue of concern, particularly given evidence of the rising use and harms associated with pharmaceutical drugs. A number of key areas regarding the prevalence, characteristics and correlates of overdose deaths have been explored in this study, with findings that have important policy implications.

Demographics and drug involvement

Males represented the majority of overdose deaths. Most female overdose deaths involved pharmaceutical drugs only (63%), while the proportion of overdoses involving pharmaceutical drugs only was lower among males (43%).

Pharmaceutical drugs most frequently contribute to overdose deaths in Victoria. Furthermore, they are particularly prevalent in overdose deaths involving multiple drugs. Multiple drugs are involved in the majority of overdose deaths in Victoria, with over 70% of overdose deaths in 2015 involving multiple drugs.

Benzodiazepines are the most commonly detected drug group, contributing in an average of 51% of overdose deaths annually. The next most frequent pharmaceutical drug groups are opioid analgesics (48% of overdose deaths each year), antidepressants (34% annually) and antipsychotics (19% annually).

The role of drug dependence

For the majority of overdose deaths, there was evidence of drug dependence proximal to death (71%).

Findings suggest that for Victorian overdose deaths involving pharmaceutical drugs, deceased who were drug dependent, and those who were not drug dependent proximal to fatal overdose might represent two different cohorts. In particular:

- The drug dependent deceased were on average younger than deceased who were not drug dependent (mean age 38.4 years for males, 42.1 years for females), more likely to be male, and their fatal overdoses often involved pharmaceutical drugs in combination with alcohol and/or illegal drugs.
- The non-drug dependent deceased were on average older (mean age 49.5 years for males, 54.1 years for females), more likely to be female, and most fatal overdoses involved pharmaceutical drugs only.

Of further note, most of the drug dependent deceased were poly-drug dependent and/or had been drug dependent for more than 10 years, with evidence that their dependence had been clinically documented.

History of diagnosis of mental illness

Overall, 73% of the deceased in the study cohort had a diagnosed mental illness, and for most of these deceased, the duration of mental illness was at least 10 years. However, there was no appreciable difference between those with and without a diagnosed mental illness in terms of age distribution by sex, or in the types of drugs that contributed in fatal overdose.

Intent

More than half of Victorian overdose deaths involving pharmaceutical drugs were unintentional (54%), with 28% classified as international self-harm overdose deaths, and a further 18% where intent was unable to be determined.

There were notable differences in average age and in types of contributing drugs between deceased whose fatal overdoses were unintentional versus suicidal. This indicates that different approaches, prevention strategies and clinical responses may be necessary for different sub-groups identified as at-risk both in terms of overdose risk, and suicide risk.

Sources of pharmaceutical drugs

The likely sources of all contributing drugs were identified in 43% of deaths, with the likely source identified for at least one pharmaceutical drug identified in a further 40% of deaths, while in 16% of deaths no source of any contributing pharmaceutical drug could be identified.

It is important to acknowledge that the capacity to draw strong conclusions from the data presented regarding source of pharmaceutical drugs involved in overdose deaths is somewhat hampered by the inability to confirm all sources of pharmaceutical drugs among the deaths in the study cohort. However, the data supports a tentative conclusion that in most Victorian overdose deaths involving pharmaceutical drugs, the drugs are prescribed to the deceased rather than diverted or accessed OTC.

Importantly, in most cases (74%) the drugs are prescribed by a single prescriber rather than multiple prescribers.

Further to this point, for deaths where the deceased has accessed contributing pharmaceutical drugs from multiple prescribers, in most cases the deceased was not attending multiple prescribers to obtain the same drugs; rather, the deceased would obtain different drugs from different doctors. This suggests that coordination of prescribing between doctors may be an issue, rather than simply patient 'prescription shopping' for excessive quantities of particular drugs from multiple doctors.

Identifying potential targets for intervention

A history of both diagnosed mental illness and clinically documented drug dependence was present for approximately half of all Victorian overdose deaths involving pharmaceutical drugs, with a long history of mental illness and drug dependence most common.

A conclusion to be drawn from these findings is that in a substantial proportion of the Victorian overdose deaths involving pharmaceutical drugs that occurred between 2011 and 2013, the deceased had a long-established clinical history of mental illness and drug dependence. Put another way, these deceased were known to the health system, and had in most cases been known to the health system for extended periods of time - greater than 10 years.

Future directions

The findings presented here demonstrate the need for targeted approaches to prevent harm and reduce overdose deaths involving pharmaceutical drugs in Victoria. In order to effectively address this issue, a number of responses and approaches may be effective in reducing harm.

One of the most striking findings of this study relates to the source of drugs involved in overdose deaths. While there is a perception that pharmaceutical drug harm is fuelled by drug diversion and doctor shopping, the evidence indicates that in the majority of cases, the drugs involved in overdose deaths are prescribed by a single prescriber. This raises issues regarding training of clinicians, and also monitoring of prescribing in order to reduce harm. Responses to reduce harm from pharmaceutical drug misuse, such as real time prescription monitoring, have the potential to reduce harm, but only when combined with monitoring of prescribing practice, support for clinicians, and ongoing training and professional development. Implementation of mechanisms such as clinical placement, clinical supervision, networks for ongoing prescriber support and engagement, clinical advice and review, and ongoing surveillance and feedback to identify and respond to high-risk prescribing are approaches that are warranted given the magnitude of harm.

The identification of key indicators of risk, including documented drug dependence, diagnosed mental illness, intent, and duration of mental illness and drug dependence, provide points of opportunity for the development and trialling of targeted intervention strategies to support those most at risk of fatal overdose.

Given that a substantial number of the overdose deaths were unintentional, involved combined drug toxicity, and were of people who have a long history of mental illness and/or drug dependence, there is a rationale to examine how doctors and pharmacists deliver initial and ongoing education to patients about drug interactions and drug combinations and the dangers of mixing pharmaceutical drugs with illegal drugs and alcohol.

There are also opportunities to better understand trajectories of risk, harm, service engagement and potential points of intervention through further research that explores both fatal and non-fatal pharmaceutical overdose. Through understanding key points of risk, and also intersection with services, there is scope to target prevention activities to substantially reduce both fatal and non-fatal harm.

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