Data Collected about Intentional Self-poisoning in New Zealand Emergency Departments and the Implications of Data Limitations for Prevention Planning

A Mixed Methods Study

Eeva-Katri Kumpula

A thesis submitted for the degree of

Doctor of Philosophy

at the University of Otago,

Dunedin/Ōtepoti, New Zealand

2018

“Alle Dinge sind Gift, und nichts ist ohne Gift;
allein die Dosis machts ein Ding kein Gift sei.”

(”All things are poison, and nothing is without poison,
the dosage alone makes it so a thing is not a poison.”)

Paracelsus (Philippus Aureolus Theophrastus Bombastus von Bodenheim):
“Die dritte Defension wegen des Schreibens der neuen Rezepte”,
in *Septem Defensiones,* 1538.

ABSTRACT

Background

Intentional self-poisoning (ISP; taking a purposeful overdose) results in significant morbidity and is a burden on population health. In order to reduce ISP by, for example, restricting inappropriate access to substances, information is required about which specific substances are commonly used.

Aims

I. What information about ISP can be obtained from Ministry of Health (MOH) datasets to plan poisoning prevention initiatives? What are the gaps in these data, and how could these be addressed?
II. How do emergency medicine professionals identify poisonings and investigate intent behind them, and how does that information become national hospital presentation data?
III. Which specific substances do people use in episodes of intentional self-poisoning, and where do they obtain these substances?

Methods

The MOH Mortality data and National Minimum Dataset (NMDS) public hospital presentation cases of intentional and undetermined intent self-poisoning were analysed to investigate demographic characteristics of people who present with ISP, and to investigate limitations of the current data. Poisonings of undetermined intent were included as they may be poorly identified cases of ISP.

Specific poisoning data collected at one Emergency Department (ED; Wellington) were analysed to provide more information about specific substances used in ISP, and to investigate feasibility of clinicians recording these data.

The process of identifying poisoning and intentionality in patients presenting to an ED, which is then recorded in NMDS data, was investigated through interviews with clinicians and clinical coders.

Cross-sectional data were collected prospectively from three EDs. This included data on specific substances and sources to these substances.

Results

Females were at higher risk of hospital presentations for ISP, and males were at higher risk of death. Young people, Māori, New Zealand Europeans and people from deprived areas were most at risk. There are few details about specific substances in existing MOH data. The data recorded by clinicians in Wellington ED provided more detail about substances but coding was less systematic. A range of information along the care pathway is used to determine whether a poisoning has occurred and whether it is intentional. Intent can be complex to determine as it may change over time from the substance exposure to the time of treatment at the ED, particularly in cases of alcohol/recreational drug co-intoxication. We found that clinical coders do send data on specific substances to the MOH although these do not appear in the MOH datasets. The five most frequent substances used by people in the prospective study were paracetamol, ethanol, ibuprofen, quetiapine, and venlafaxine. Most people used their own prescription drugs.

Conclusions

Current national MOH datasets describing ISP are not detailed enough to identify specific substances of concern. The study shows that it is feasible to collect this data, but attention needs to be paid to standardisation. This data could inform measures to prevent ISP.

ACKNOWLEDGEMENTS

My sincerest thanks and immense gratitude go to:

My primary supervisor, **Professor Pauline Norris**, from the School of Pharmacy, University of Otago, and co-supervisor, **Dr Shyamala Nada-Raja**, Senior Research Fellow, from the Department of Preventive and Social Medicine, University of Otago, for their guidance, advice, and patience during the three years of this PhD project. Further, for their faith and support during the two years of preparations before starting this PhD project, as well as co-authorship in the papers published as a result of this PhD project.

The **School of Pharmacy**, University of Otago, for hosting me for the duration of my PhD studies, for the three-year PhD stipend and yearly consumables support, and a Dean's Fund grant to cover data collection costs of the project; the **Department of Preventive and Social Medicine**, University of Otago, for financial support.

Dr Bruce Lambie, MB ChB DipObst FACEM, Emergency Medicine Specialist, from the Dunedin Hospital ED, for his support of the studies, mentoring and invaluable clinician expert comments on results, and his unending patience with organising practical matters for the Studies 2 and 3, and for co-authorship.

Dr Paul Quigley, MB ChB FACEM, Emergency Medicine Specialist, from the Wellington Regional Hospital ED, for his support of the studies, for his clinician expert comments on the findings, for being a mentor in all toxicology items and beyond, and for co-authorship.

Dr Cecilia Smith-Hamel, MB ChB (Otago) FRANZCP, Chief of Psychiatry, Timaru Hospital, for her assistance in arranging locality authorisation for clinician interviews at Timaru ED, and for her invaluable clinician/practitioner/expert comments on results.

Ruth Sharpe, Health Research South, for helpful practical advice on the procedures of obtaining locality authorisations in SDHB. Ruth truly helps researchers navigate the vast jungle of hospital administration!

Dr Caroline Collins, then ED Clinical Leader, Dunedin Hospital, for her support of Studies 2 and 3 being conducted in the ED. And for the kind help of Drs Lambie and Collins, in introducing me to staff and for allowing me to present Study 3 to staff at doctors' handovers between shifts. **Stephen Ryan**, Registered Nurse, and **Shona Willers**, Nurse Educator, for facilitating data collection (Study 2, Study 3) at Dunedin ED, and for fruitful discussions about some of the limitations of the studies.

Ms Lorraine Arnold, CATT nurse, and **Dr Alexander Stewart**, RMO, for being our on-site champions for data collection (Study 3) at Wellington ED and SSU. **Christelle Vorster**, PA for Wellington Regional Hospital ED, for invaluable facilitation of administrative tasks to get the studies going and running in Wellington. **Sandra Allmark**, Quality Systems Performance Analyst, and **Peter Wash**, Team Leader Reporting, from Wellington Regional Hospital/CCDHB, for extracting data for Study 1b and for invaluable explanations of the data collection practicalities and conventions.

Dr Carissa Herbert, RMO, for facilitating the study at Southland ED; **Dr Martin Watts**, SMO, and **Dr Chris Johnstone**, ED Clinical Leader, for their support for Study 3.

Rachel Mills, Charge Nurse Manager, for facilitating Study 2 at Timaru ED.

Pat Bain and **Darryn Grigsby** from St John Ambulance Service, for facilitating Study 2.

All staff at Dunedin, Invercargill, Timaru, and Wellington EDs, who kindly gave of their time for the clinician interviews (Study 2) and/or in data collection (Study 3).

Southern, South Canterbury, and Capital & Coast District Health Boards for their support in allowing these studies to be conducted in their hospitals, and the **Ministry of Health – Manatū Hauora** for the data used in Study 1.

Dr Adam Pomerleau, Director of the National Poisons Centre, Medical Toxicologist, for his invaluable comments and discussions on all things relating to toxicology during the last six months of this thesis work.

Andrew Gray, Senior Research Fellow (Biostatistician), Department of Preventive and Social Medicine, for multiple discussions about statistical methods and how to best present results, in his weekly 'drop-in' statistical help desk sessions.

Mark Brunton, Kaiwhakahaere Rakahau Māori – Research Manager Māori, Office of Māori Development, University of Otago, for helpful discussions about how to make study results available to those that could benefit from them.

Dr Annette Beautrais, Suicide Prevention Coordinator for Canterbury and South Canterbury DHBs, researcher and long-time suicide prevention expert and advocate, for her invaluable comments and faith in me during the two-year preparation period prior to starting this PhD project, the initial introductions in CDHB and SCDHB, and the initial scoping of the PhD project.

Professor Tim Stokes, Head of Department of General Practice and Rural Medicine, University of Otago, for stimulating discussions in the initial planning phase of the project.

Dr Sue Nightingale, Chief of Psychiatry, Canterbury DHB, for her support and discussions in the initial planning phase of the project.

Dr Shakila Rizwan, School of Pharmacy, University of Otago, for acting as my PhD Facilitator during these three years of study.

Lea Doughty, PhD candidate and researcher, for patiently listening to interview recordings, trying to decipher the difficult bits, and for her immense help in proof-reading this thesis.

My **'office mates'** over the years - for the fruitful discussions as well as all the distractions. Kia kaha, kia māia!

Staff at the School of Pharmacy, University of Otago for fruitful discussions, peer reviews for ethical approvals, all the invaluable help, and fun times over the three years of this PhD. I would especially like to thank **Dr Alesha Smith** for help with data enquiries, and **Tim Campbell** and **Brian Young**, the SoP IT wizards – you have made PhD life so much easier.

Aroha nui to the denizens of Orokonui Ecosanctuary, the Otago Peninsula, Zealandia Ecosanctuary, Tiritiri Matangi Island Sanctuary, and DoC Burwood Takahē Recovery Centre (human and otherwise) for offering opportunities to escape study life through volunteering for your projects. These have kept me sane. Mostly.

My dear family in Finland, especially my ever supportive mother **Eeva-Liisa Kumpula**, and my whānau in New Zealand and Australia, for their support and for providing distractions from PhD work as needed.

Finally, I dedicate this thesis to my late father **Risto Erkki Kumpula**, 'emeritus pharmacist' as he liked to call himself, who passed away on 18 August 2016 at the age of 71 after a 10-year battle with prostate cancer. He was not overly happy about me leaving Finland again for New Zealand, but nevertheless gave me his blessing, and to the very end supported my work in spirit. His first advice on getting this thesis finished, same as for the other two theses I have done in the past, was to start with the Table of Contents, and go from there. I think that worked again. Kiitos, Isu.

Dunedin/Ōtepoti, 29/03/2018

Eeva-Katri Kumpula

PUBLICATIONS THAT AROSE FROM WORK ASSOCIATED WITH THIS THESIS

International peer-reviewed journal articles

Published:

- Kumpula, E.-K., Nada-Raja, S., Norris, P. & Quigley, P. 2017. A descriptive study of intentional self-poisoning from New Zealand national registry data: exploring the challenges. *Australian and New Zealand Journal of Public Health*, 41, 535-540.
    - The first author (PhD candidate) designed the study with feedback and input from the other authors, performed the data analysis and interpretation, and wrote the manuscript. The co-authors contributed to the interpretation and presentation of results, and to the discussion segment of the article.

Oral presentations

- "*Intentional self-poisoning – impossible to catch in current format New Zealand national registry data?*" 34th Annual Scientific Meeting, Australasian College for Emergency Medicine, 19 – 23 November 2017, Sydney, Australia
- "*Taking action on intentional self-poisoning in the population: do we have the tools?*" 13th Australasian Injury Prevention and Safety Promotion Conference, 13 – 15 November 2017, Ballarat, Australia

TABLE OF CONTENTS

LIST OF FIGURES

Main text

LIST OF TABLES

Main text

Appendices

APPENDICES

Appendix 1: Additional material to Chapter 2 (Study 1)

Table A1.1: Some examples of substances in the ICD-10 groups involving intentional and undetermined intent poisonings (World Health Organization, 2015).

Table A1.2: ICD-10 groups describing poisonings without indication of intent, T36-T65 (World Health Organization, 2015).

Appendix 2: Additional material to Chapter 3 (Study 2)

Appendix 2.1: Study 2 participant information sheet

Appendix 2.2: Study 2 participant consent form

Appendix 2.3: Interview schedule for ED clinician participants

Appendix 2.4 Interview schedule for clinical coder participants

Appendix 3: Additional material to Chapter 4 (Study 3)

Appendix 3.1: Study 3 participant information sheet (Southland Hospital ED)

Appendix 3.2: Study 3 participant consent form

Appendix 3.3: Data collection form

GLOSSARY: ABBREVIATIONS

ACC	Accident Compensation Corporation
ACEM	Australasian College of Emergency Medicine
ASIST	Applied Suicide Intervention Skills Training
ASR	age-standardised rate
ATS	Australasian Triage Scale
BAC	blood alcohol concentration
CATT	Crisis Assessment and Treatment Team
CCDHB	Capital & Coast District Health Board
CI	confidence interval
CNM	Charge Nurse Manager
CO	carbon monoxide
DDD	Defined Daily Dose
DHB	District Health Board
ECG	electrocardiogram
ED	Emergency Department
EDIS	Emergency Department Information System
EPA	Environmental Protection Authority
EPS	Emergency Psychiatric Service
GHB	gamma hydroxybutyrate

GBL	gamma butyrolactone
GCS	Glasgow Coma Scale
GP	general practitioner
GST	Goods and Services Tax
HREC	Human Research Ethics Committee (University of Otago)
HRS	Health Research South
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems 10th Revision, Australian Modification
ICU	intensive care unit
ISH	intentional self-harm
ISP	intentional self-poisoning
MAOI	monoamine oxidase inhibitor
MBIE	Ministry of Business, Innovation and Employment – Hīkina Whakatutuki
MDMA	3,4-Methylenedioxy methamphetamine (ecstasy)
MOH	Ministry of Health – Manatū Hauora
MVA	motor vehicle accident
NEC	'not elsewhere classified'
NFD	'not further defined'
NHI	National Health Index [number]
NMDS	National Minimum Dataset

NSAID	nonsteroidal anti-inflammatory drug
NSSI	non-suicidal self-injury
NTRCC	Ngāi Tahu Research Consultation Committee
NZ	New Zealand
NZ$	New Zealand dollar
NZHIS	New Zealand Health Information Service
OTC	“over-the-counter” medication
PhD	Doctor of Philosophy
PI	Principal Investigator
PIC	Poisoning Information Centre
PM	post mortem [examination]
RANZCP	the Royal Australian and New Zealand College of Psychiatrists
RTD	“ready-to-drink” [pre-mixed alcohol-containing drink]
SCDHB	South Canterbury District Health Board
SDHB	Southern District Health Board
SI	International System of Units (Système international (d'unités))
SMO	senior medical officer
SNOMED-CT	Systematized Nomenclature of Medicine – Clinical Terms
SNRI	serotonin-noradrenaline re-uptake inhibitor
SSRI	selective serotonin re-uptake inhibitor
SSU	short-stay unit
TCA	tricyclic antidepressant

UDP	poisoning of undetermined intent
UK	United Kingdom
US	United States
UOHEC	University of Otago Human Ethics Committee
WHO	World Health Organization

THESIS OUTLINE

This Doctor of Philosophy (PhD) thesis investigates intentional self-poisoning from a data quality and subsequent policy implication perspective. It has six main chapters, which are outlined here, and in Figure I.

Chapter 1: Introduction reviews the literature, giving context in order to set the aims of the project and to the analysis and discussion of results in later chapters. It provides a snapshot of the recent extent and properties of intentional self-poisoning behaviour in New Zealand, and some of the challenges that this thesis attempts to address. These lead to the development of the aims of the PhD project.

Chapter 2: Epidemiology of intentional self-poisoning from Ministry of Health data presents Study 1, which describes ISP in New Zealand through an analysis of Ministry of Health (MOH) registry data on intentional self-poisoning deaths and public hospital presentations (National Minimum Dataset; NMDS). These are investigated by population groups such as ethnicity, age groups, and sex, to understand who may be most at risk of intentional self-poisoning, and therefore may benefit most from interventions designed to prevent such poisonings. This chapter further describes some of the limitations of these official data. These limitations are discussed in the context of improving dataset usefulness for intentional self-poisoning prevention policy planning. This chapter is based on a journal publication (see page ix).

Chapter 3: Comparison of two poisoning datasets presents Study 1b, where two datasets collected at Wellington Regional Hospital Emergency Department (ED) are compared. One dataset collects more detailed substance information ('Hazards Data'), and is collected in Wellington only. Substance information and intent indication are compared to NMDS data of the same presentations to see how clinical coding to International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) affects data properties and interpretations that can be made from these two datasets. The comparison

of these two datasets is done to investigate whether specific data collection offers any advantages over the current national hospital presentation dataset, NMDS.

Chapter 4: Collecting and creating national hospitalisation data presents Study 2, which investigates and describes the process of identifying people presenting to an ED as cases of poisoning, and how clinicians in this environment assess intent behind the poisoning, to facilitate treatment decisions. These results are discussed in the context of implications for MOH data quality, especially when considering how cases result in being coded as intentional or unintentional poisonings, and as poisonings of undetermined intent.

Chapter 5: Specific substances used in intentional self-poisoning and the sources for obtaining them presents Study 3, which collects cross-sectional data prospectively from three New Zealand EDs about the specific substances that people use in episodes of intentional self-poisoning, and the sources of these substances.

Chapter 6: Discussion reviews the findings of the four studies presented in Chapters 2, 3, 4, and 5, presents answers to the research questions set in Chapter 1, and the recommendations based on the results. The limitations and strengths of the studies are summarised, and comparisons are made to other researchers' findings. **Implications** that the project findings have for public health, and specifically intentional self-poisoning prevention efforts in New Zealand, are discussed. Finally, a brief conclusion summarises the key messages of this PhD work.

Supplementary material

Study 1 involves using larger clinical groupings of substances, and some examples of substances from these groups are presented in Appendix 1 to give the reader a more practical context for what these groups incorporate.

As both Study 2 and Study 3 involve human participants, participant information sheets, consent forms, and data collection forms are presented in Appendix 2 for Study 2, and in Appendix 3 for Study 3.

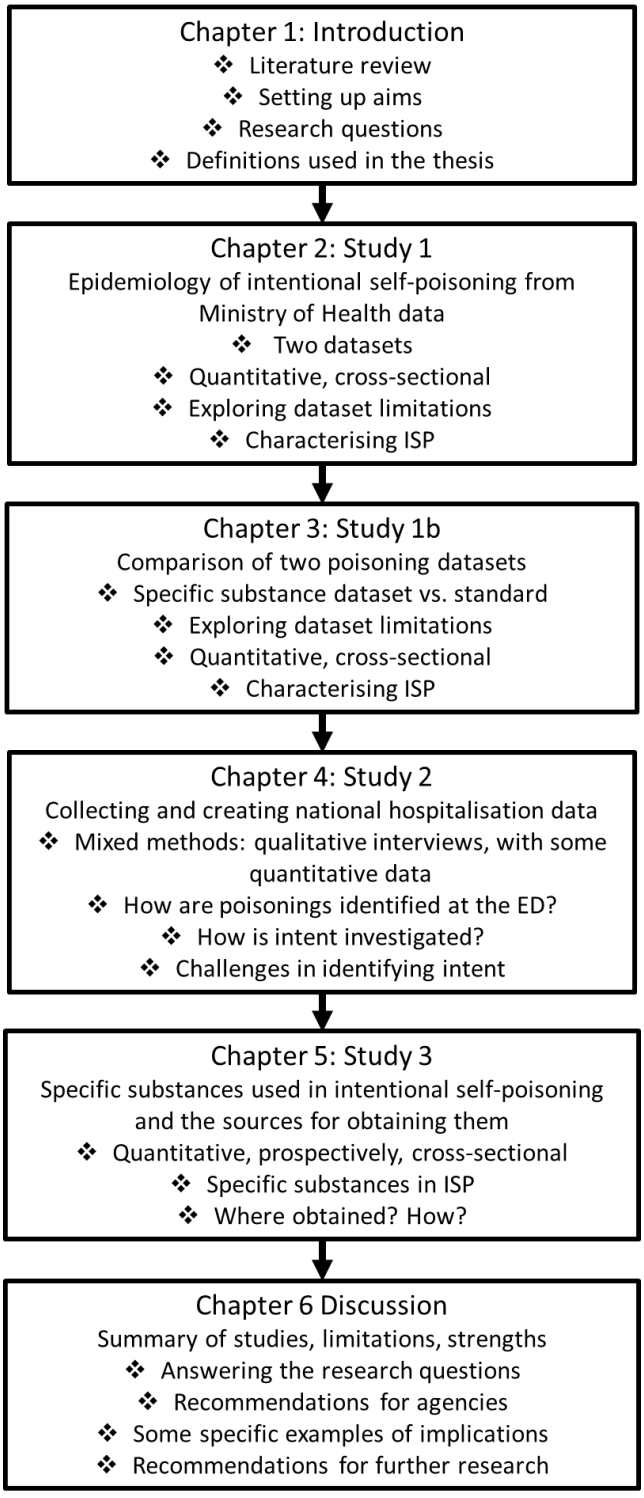

Figure I. The structure of the thesis.

[page intentionally blank]

CHAPTER 1 : INTRODUCTION

1.1 Purpose of the thesis

This Doctor of Philosophy (PhD) thesis in Pharmacy investigates intentional self-poisoning (ISP) in New Zealand from a pharmacist's perspective, in the greater context of harm caused by inappropriate use of medicines and other substances in ISP, and how some of that harm could be prevented. The main emphasis is on preventing or reducing inappropriate access to substances that may be used in intentional self-poisoning (defined in 1.3.1) – this frames discussion about the study implications throughout the thesis. An overarching aim of the project is to understand what is currently known about the topic through national poisoning injury datasets, how these data are collected and what their properties and limitations are, and how these could be improved to better inform national policy on preventing poisonings. This involves first investigating what is already known about the topic through searching scientific literature for relevant papers to identify gaps in existing knowledge, and to determine the aims of the project to investigate and fill some of these gaps. The literature searches are described in 1.2, while findings are presented in sections 1.3 to 1.7. This literature underpins the development of the aims, which are presented in 1.8.

1.2 Literature review search strategy

For the purposes of understanding the recent history and current status of ISP in New Zealand and in the context of defining the research topic and setting the project aims (in 1.8), a literature search strategy was developed. The search focused on journal articles and review articles written in the English language and published from 1990 onward. This start point was chosen as there have been significant changes in the formulary (an official list of prescription medicines available in a jurisdiction such as a country), substance availability, and prescribing practices since that time. These include, for example, the introduction of selective serotonin re-uptake inhibitor (SSRI) antidepressants as a safer alternative to older antidepressants such as tricyclic antidepressants (TCAs), and the deliberate population-

level reduction in the use of barbiturates in many countries to reduce deaths from those drugs (Retterstøl, 1993, Carlsten et al., 1996, Buckley and McManus, 2004). The main aim of these literature searches was to give an overall snapshot of what is known about ISP in New Zealand, and where the gaps in knowledge may lie, thereby guiding the setting of aims for this PhD project.

1.2.1 Geographical and topic limits

The main focus of the literature search was on studies done in New Zealand, as this would be the geographical and demographic environment of the empirical part of the PhD project. As the topic of interest was intentional overdosing by the person themselves, food poisonings and poisonings occurring as part of clinical care (iatrogenic) were excluded.

1.2.2 Databases used

The databases used for the searches were Ovid, Scopus, ProQuest Central, Science Direct, Web of Science, and PubMed. Ovid included the following databases: Your Journals@Ovid, PsycARTICLES Full Text, EBM Reviews, AMED, Embase, ERIC, International Pharmaceutical Abstracts, Ovid MEDLINE, Philosopher's Index, PsycEXTRA, PsycINFO. These databases were chosen based on content topics, search engine strength, and on availability through the University of Otago Library website.

1.2.3 Determining the search terms

The search terms were determined based on relevant literature obtained through initial non-systematic searches, as it was noted early in the search that many 'key articles' used different terms about ISP. The various terms were determined through careful inspection of these articles and initial testing on the search engines.

The final search term combination was: ("intentional self-poisoning" OR "intentional selfpoisoning" OR "intentional drug overdose" OR "intentional medication overdose" OR "intentional medicine overdose" OR "intentional drug overdose" OR "intentional overdose"

OR "deliberate self-poisoning" OR "deliberate selfpoisoning" OR "deliberate overdose" OR "deliberate medicine overdose" OR "deliberate medication overdose" OR "deliberate drug overdose" OR "deliberate overdose" OR "self-inflicted poisoning" OR "selfinflicted poisoning" OR "self-inflicted overdose" OR "selfinflicted overdose" OR autointoxicat*) AND ("New Zealand") AND (LIMIT-TO(LANGUAGE,"English")) AND (LIMIT-TO(DOCTYPE,"ar") OR LIMIT-TO(DOCTYPE,"re")) AND (LIMIT-TO(AFFILCOUNTRY,"New Zealand")) [+ time limit, from 1990 onwards]

1.2.4 The combined search results

These searches were done in March 2015 (literature search time frame: 1st January 1990 to 15th March 2015) and they yielded a total of 45 articles which were considered relevant to the study by their abstracts (Figure 1.1). Full texts of these articles were obtained to investigate what is currently known about ISP in New Zealand. The resulting papers underpin sections 1.3 to 1.7, informing the setting of aims for the PhD project in 1.8. Outside of the keyword searches, other relevant papers of interest were also found through references used in the papers identified in the searches, and these were also used for the literature review. When New Zealand literature was not available on a topic of interest, some international examples were used to scope the topic and inform setting the aims of the project. This search was repeated on 19th March 2018, and again on 4th August 2018, and no new papers describing ISP epidemiology in New Zealand were identified.

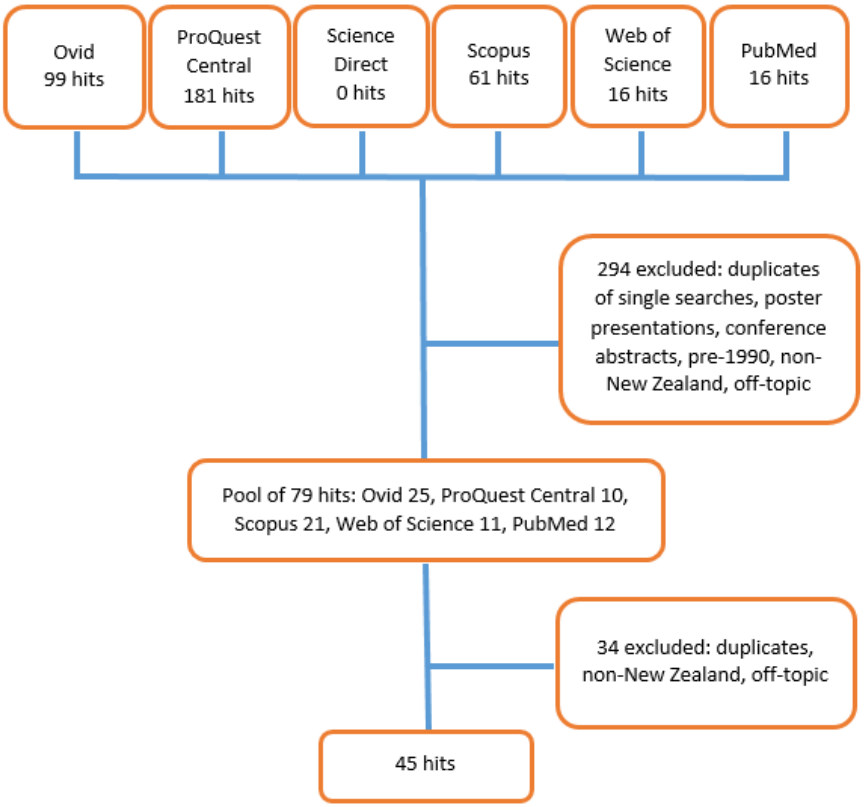

Figure 1.1: The literature search results presented as a flow chart.

1.3 Intentional self-poisoning in New Zealand

This section presents rates and figures relating to the extent of ISP behaviours in New Zealand. It aspires to give the reader an understanding of how many people are affected by ISP behaviour, and what is known about who those people may be.

It has been argued that suicide and intentional self-harm (ISH) could be used as an indicator of the mental health and social wellbeing of the population (New Zealand Injury Prevention Strategy Secretariat, 2012). One significant form of self-injury in New Zealand is ISP, which may be involved in over 70% of self-harm presentations to Emergency Departments (EDs)

depending on the population and location investigated (Bennett et al., 2002, Hatcher et al., 2009). ISP is therefore a significant source of population morbidity.

Hospitalisation numbers from 2000-2009 for all New Zealanders aged 25 or older indicate that 65% of non-fatal poisoning admissions to public hospitals involve ISP, whereas 28.8% are unintentional (accidental), and 6.6% are of undetermined intent (Peiris-John et al., 2014). A substantial number of poisonings of undetermined intent (UDP) may in fact be intentional (Bethell and Rhodes, 2009), as determining intent in poisoning cases can be difficult if the patient does not wish to reveal it.

1.3.1 Definition of intentional self-poisoning in the study

For the purposes of this PhD project, a definition of intentional self-poisoning was required. From the literature found in the searches, and some additional international papers on the subject found while searching for New Zealand literature, a definition used in several other studies (Hatcher et al., 2009, Lilley et al., 2008, Harriss et al., 2005) was chosen:

Intentional self-poisoning is defined as the intentional ingestion of more than the prescribed or advised amount of any drug, recreational drug, non-ingestible substance, or excess alcohol for self-harming purposes, regardless of whether there is evidence of intent to die of the poisoning or not.
– Adapted from Hatcher et al. (2009).

This specifically means that ISP by this definition does not only include suicide attempts, but all intentional overdoses where the person fully understands that they are taking too much of their chosen substance, intending to harm themselves, regardless of whether there is any indication of intent to die by the poisoning. Suicidal ideation can fluctuate from inaction to action and back, and may significantly change over time (Wasserman and Wasserman, 2009). This change in suicidal intent may happen suddenly or over an extended period of time, for example from the actual attempt time to recovering at the

hospital. Having a definition for ISP with a set level of 'minimum' suicidal intent required to meet it would therefore be difficult and impractical.

Because this definition of ISP allows the inclusion of cases where the ultimate aim of the poisoning could not be fully determined, just that the overdose was intentional and intended to cause harm to self, we arrive at a better understanding of the extent of ISP behaviour in New Zealand and the burden that intentional overdoses cause on health services. It can be argued that an intentional overdose will require a significant amount of treatment and care regardless of whether it was done for suicidal purposes or for some other purpose, such as relieving stress, expressing internal anguish, or 'punishing' a loved one.

1.3.2 Describing the extent of ISP behaviour in New Zealand

Intentional self-harm causes a significant burden of morbidity in New Zealand. An estimated 4,900 people are involved in 6,200 episodes of ISH every year (Hatcher et al., 2009). A total of 3,031 New Zealanders (rate: 71.0 per 100,000 population) were hospitalised in 2012 for ISH (Ministry of Health – Manatū Hauora, 2015d). This is thought to be a significantly underestimated figure due to data collection issues. These challenges include differences between how the twenty District Health Boards (DHBs) collect data, especially in recording short hospital stays (length of stay under three hours), leading to omissions of a significant number of such short stays from national datasets (Ministry of Health – Manatū Hauora, 2015d, Hatcher et al., 2009, Langley et al., 2002). The Ministry does not currently report rates of ISH by methods of self-harm in their yearly publication about suicide and self-harm in New Zealand (Ministry of Health – Manatū Hauora, 2016), and therefore ISP cannot be investigated separately from those reports.

Rates of intentional self-poisoning in New Zealand from previous studies

A recent study looking at poisoning deaths and public hospital presentations in New Zealand found that rate of death due to ISP for males in 1999-2008 was 7.3 per 100,000 compared to a female rate of 3.0 per 100,000; more than doubled for males compared to

females (Peiris-John et al., 2014). In non-fatal ISP the rates were reversed, with females hospitalised for ISP at a rate of 95.8 per 100,000 and males at a rate of 51.1 per 100,000.

A New Zealand study found that 77.3% of all ISH in four North Island DHBs in 2006-2007 was by ISP, and although there were differences between DHBs in this percentage, ISP was the most common method used in hospital presentations due to ISH throughout New Zealand (Hatcher et al., 2009). It is unknown whether this is also the case for those engaging in ISH behaviour in the community and not seeking help from hospitals, as this has not been researched in New Zealand. Evidence from an Australian community telephone survey indicated that those who had engaged in ISP in a suicide attempt were more likely to seek treatment after their attempt than those who chose other means such as hanging (Milner and De Leo, 2010). This is encouraging from a suicide prevention point of view, but as the evidence base about ISH in the community (where no treatment is sought from hospitals) is very limited, the Royal Australian and New Zealand College of Psychiatrists (RANZCP) recommend doing further research on community prevalence and features of ISH (Carter et al., 2016).

Differences between age groups and genders

ISP is most prevalent in younger age groups aged 15 to 34, especially in females (Hatcher et al., 2009). The mean age of ISP patients presenting to Christchurch hospital in 1989, 1992, and 1999 was 26 (range 13-87), 29 (range 11-84), and 31.8 (range 14-82), respectively (Buchanan, 1991, Hall and Curry, 1994, Ardagh et al., 2001).

These Christchurch studies also showed that there were more women presenting to the hospital due to ISP than men, with 1.5:1 (Hall and Curry, 1994), 2.1:1 (Buchanan, 1991), or 2.2:1 (Ardagh et al., 2001) female-to-male ratios. In contrast to this sex ratio in ISP hospital presentations, 64% of accidental poisonings were found to involve males in a 2001 New Zealand community telephone survey (Coggan et al., 2002).

Rates of ISP by ethnicity and domicile area deprivation

In a recent study, New Zealand Europeans had the highest incidence rates (rates of new people being affected by the behaviour) of fatal and non-fatal ISP in all age groups, and the

non-fatal ISP incidence rate of 25.6 per 100,000 was three times that of the Māori incidence rate of 7.7 per 100,000 (Peiris-John et al., 2014). Unintentional poisoning rates, however, both fatal and non-fatal, were higher for Māori and Pacific Island people in this study than for New Zealand Europeans.

Other studies have also found differences between ethnic groups in ISP prevalence: 80.6% of New Zealand European ISH patients had engaged in ISP, compared with 75.6% of Māori and 66.1% of Pasifika patients (Hatcher et al., 2009). These ethnicity differences may be due in part to differences in access to medications. Access to means is an important factor in which method is chosen for ISH (Mann et al., 2005). Māori and Pasifika people have, for example, less antidepressants dispensed than people of other ethnicities (Exeter et al., 2009). Previous New Zealand research from Christchurch suggests that people use medications prescribed to them in ISP events (Buchanan, 1991), and this may subsequently be reflected in these differences between ethnicities. Understanding patient choices of ISP agents is important to assist in informing prescription practices, and medication availability decisions. Specific substances which have been encountered in ISP presentations in New Zealand will be discussed further in 1.5.

Higher levels of domicile area deprivation were found to increase incidence rates of hospital presentations due to ISP, and also of ISP mortality (Peiris-John et al., 2014). This has implications for any prevention efforts which may be undertaken. While frequent dispensing (weekly, or more frequent) does not cost the patient anything in increased dispensing fees, the indirect costs from presenting to the pharmacy to collect the medications may negatively affect people with limited financial resources.

Rate of re-presenting after an episode of intentional self-poisoning

Of all the ISP patients presenting to Christchurch Hospital ED in 1989, 42% had engaged in ISP behaviour previously (Buchanan, 1991). An Auckland ED study from 2001-2002 estimated a re-presentation rate of 18%, and a suicide rate of 1.1% over the 12 months following a presentation for ISH, including ISP (Howson et al., 2008).

Regional differences in rates of suicide and intentional self-harm

The twenty New Zealand DHBs have very different suicide rates (Ministry of Health – Manatū Hauora, 2015d; Table 1.1) and rates of hospital-treated ISH (Table 1.2; Ministry of Health – Manatū Hauora, 2016). South Canterbury and Wairarapa DHBs had high rates of suicide and ISH, whereas Auckland and Counties Manukau DHBs had low rates, compared to all of New Zealand and other DHBs.

There are no DHB-specific rates published describing different methods of self-harm, including ISP, though these would be of interest for suicide and self-harm prevention planning. Previous research in the Canterbury DHB in 1989 and 1992 showed that hospital presentation rates due to ISP in that region were 20 incidents per 100,000 population in 1989 (Buchanan, 1991) and 17 per 100,000 population in 1992 (Hall and Curry, 1994). More recent DHB-level information on ISP is not available and should be investigated.

As described above, different demographic groups have different risks of ISP and ISH, and therefore regional differences in ISH and ISP may be significantly affected by local population demographics. Prevention activities need to be informed by local knowledge and tailored to meet local needs and resources available for optimal results. Young people are of particular concern, as those younger than 25 have not been recently investigated nationwide: a recent study (Peiris-John et al., 2014) excluded this age group.

Table 1.1: Age-standardised rates of suicide of the total population and youth (aged 15-24) by DHB, 2008-2012.
(Ministry of Health – Manatū Hauora, 2015d).

DHB	Total rate; per 100,000	CI 95%	Youth rate (15-24); per 100,000	CI 95%
South Canterbury	20.6	(13.0-28.2)	60.8	(25.8-95.8)
Wairarapa	20.0	(10.8-29.2)	38.9	(5.5-72.3)
Tairawhiti	17.7	(10.3-25.1)	40.3	(11.5-69.1)
Lakes	16.1	(11.4-20.8)	27.6	(11.3-43.9)
Whanganui	15.3	(9.5-21.1)	18.6	(7.6-29.6)
Bay of Plenty	14.9	(11.7-18.1)	30.1	(17.7-42.5)
Hawke's Bay	14.8	(11.2-18.4)	26.0	(12.9-39.1)
MidCentral	14.8	(11.4-18.2)	26.4	(14.9-37.9)
Southern	14.3	(11.8-16.8)	21.2	(13.6-28.8)
Northland	13.7	(10.1-17.3)	29.8	(15.5-44.1)
Taranaki	13.4	(9.4-17.4)	15.5	(3.4-27.6)
Canterbury	11.8	(10.1-13.5)	17.3	(11.7-22.9)
All of New Zealand	***11.6***	***(11.0-12.2)***	***19.8***	***(17.8-21.8)***
Waikato	11.6	(9.6-13.6)	19.3	(12.4-26.2)
West Coast	11.6	(4.9-18.3)	-	
Nelson Marlborough	11.0	(7.9-14.1)	14.9	(3.8-26.0)
Hutt Valley	10.8	(7.7-13.9)	18.6	(7.6-29.6)
Counties Manukau	10.2	(8.5-11.9)	22.2	(16.0-28.4)
Waitemata	9.4	(7.9-10.9)	13.7	(8.8-18.6)
Auckland	8.9	(7.3-10.5)	14.6	(9.4-19.8)
Capital & Coast	7.8	(6.0-9.6)	12.2	(6.2-18.2)

Table 1.2: Age-standardised rates of hospital-treated intentional self-harm across DHBs, for men, women, and the total populations, 2011-2013.
(Ministry of Health – Manatū Hauora, 2016)

DHB	Men; per 100,000	DHB	Women; per 100,000	DHB	Total; per 100,000
West Coast	85.3	Wairarapa	239.8	Wairarapa	158.7
Wairarapa	78.0	Nelson	208.0	West Coast	141.9
South Canterbury	70.4	West Coast	198.7	Nelson	130.6
Hutt Valley	68.3	Capital & Coast	171.7	Capital & Coast	120.9
Tairawhiti	67.9	South Canterbury	133.3	South Canterbury	101.6
Capital & Coast	67.0	Hutt Valley	132.8	Hutt Valley	101.1
Northland	64.1	Bay of Plenty	127.4	Bay of Plenty	95.0
Lakes	63.3	Southern	123.0	Southern	92.1
Bay of Plenty	62.6	Northland	119.2	Northland	91.9
Southern	60.6	Waitemata	100.5	Tairawhiti	78.9
Nelson	56.0	***All of New Zealand***	***94.7***	Lakes	76.7
Waitemata	52.1	Canterbury	92.2	Waitemata	76.3
Whanganui	50.7	Lakes	90.5	***All of New Zealand***	***71.0***
Taranaki	49.0	Tairawhiti	90.5	Waikato	67.7
Waikato	47.5	Waikato	87.8	Canterbury	64.5
All of New Zealand	***47.4***	Taranaki	78.8	Whanganui	64.1
Canterbury	38.1	Whanganui	78.1	Taranaki	63.7
MidCentral	37.7	MidCentral	76.2	MidCentral	57.1
Hawke's Bay	31.6	Hawke's Bay	50.4	Hawke's Bay	41.1
Auckland	29.8	Auckland	40.0	Auckland	34.7
Counties Manukau	26.6	Counties Manukau	34.1	Counties Manukau	30.2

1.4 The Emergency Department as a care environment

People engaging in intentional self-harm commonly choose to present at the ED, and will present due to ISH, but also due to a variety of other (somatic, i.e. non-psychiatric) complaints (Gorman and Masterton, 1990, Colman et al., 2004). There are groups of ISH

patients who present very frequently and subsequently skew the repetition rates, but nevertheless ISH patients as a population group in general present more frequently than, for example, asthma patients (Colman et al., 2004).

Approximately 1% of all New Zealand public hospital ED presentations involve ISP (Parr et al., 1990, Buchanan, 1991, Weir and Ardagh, 1998, Ardagh et al., 2001). Many people who have engaged in ISP present to EDs, which are an important entryway to care. Only 4% of ISP patients seen at Christchurch ED in 1989 had presented to a general practitioner (GP) first, and had then been referred on to the ED, while the majority of patients presented to the ED directly (Buchanan, 1991). Despite this, not everyone engaging in self-harming behaviour seeks help. A recent New Zealand study suggested that less than a third of the estimated 16,000 suicide attempts a year present to hospitals (Hatcher et al., 2009). As a result, it is currently unknown what the consequences and experiences are for those people not presenting to a hospital.

1.4.1 Presentation features

A study from Christchurch Hospital ED in 1989 found that ISP patients arrived at the hospital by ambulance in 51% of the cases, by police vehicle in 7%, and by private transport in 42% of the cases (Buchanan, 1991). Most ISP patients in this study presented between 4pm and midnight (Figure 1.2), which challenges resource allocations at EDs. Toxicology testing or psychiatric services, for example, may not be available at night to support treatment of ISP patients. More than half of ISP patients in this study arrived at the ED fairly soon after their overdose: 30% arrived within one hour, and 24% within two hours of the substance exposure (Buchanan, 1991).

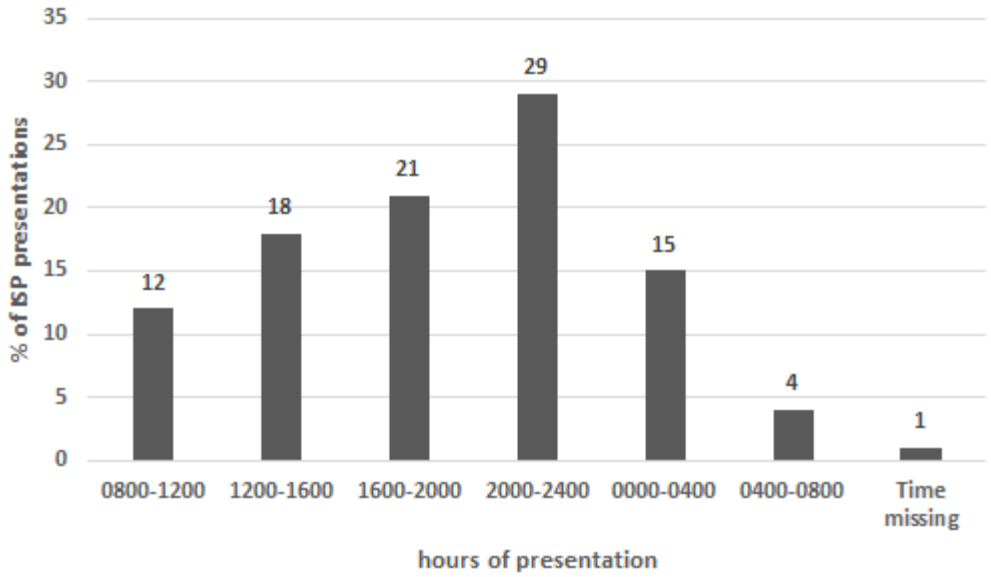

Figure 1.2: Time of day distribution of ISP presentations to Christchurch ED. Adapted from Buchanan (1991).

Initiating care at the ED

The RANZCP recommends that all patients who have engaged in any form of ISH, including ISP, receive prompt access to medical care at the ED (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004, Carter et al., 2016). Their previous recommendation was that ISH patients, especially young adults, should be triaged to Australasian Triage Scale (ATS; Ministry of Health – Manatū Hauora (2015a) category 3 (to be seen within 30 minutes) or higher (seen sooner). The updated RANZCP recommendation does not specify an ATS category, but stresses the importance of keeping the patient safe, and seeing them in a timely manner (Carter et al., 2016).

RANZCP also highlight the importance of ensuring safe, reasonably private surroundings for ISH patients at the ED to prevent further ISH occurring while in the hospital, repeated

assessments of patient status, especially in transitions in care, and good record-keeping to ensure changes in mental state can be detected (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004). Particularly in cases of ISP, where the patient's overall mental state may be affected by the poisoning agent, psychiatric assessment should not be assumed completed until the patient's cognitive function is no longer affected by the substance. If an ISP patient refuses treatment while in the hospital under the influence of substances, doctors are permitted to give life-saving treatment to the patient regardless, until the patient is deemed no longer intoxicated and able to make informed decisions about their own care (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004).

Treatment of poisonings at the ED

Regardless of intent behind them, poisonings are often treated by supportive measures, including monitoring the patient and supporting their vital functions as necessary (Abbott et al., 2012). Decontamination measures are performed based on timeliness. This means simply whether decontamination will significantly reduce or prevent substance absorption (access) to tissue(s) of the body. Another consideration is whether the decontamination procedure is suitable for the patient's overall condition and individual characteristics.

Older decontamination methods such as induced emesis by syrup of ipecacuanha, and gastric lavage ('stomach pumping', to physically remove ingested substances from the stomach) are rarely used in current practice for decontamination in poisoning cases, as the use of activated charcoal has replaced them (Ardagh and Balasingam, 1996). Overall, the use of decontamination has declined, with 86% of ISP patients presenting in Christchurch Hospital ED in 1999 having no decontamination procedures performed at all, with no adverse outcomes as a result (Ardagh et al., 2001).

If there is a specific antidote available to the substance causing the poisoning, it may be used to counteract or prevent adverse effects. New Zealand public hospitals stock most

antidotes at a satisfactory level, and have existing safety plans for obtaining further stock from other hospitals/providers in the country (Abbott et al., 2012).

1.4.2 Patient pathways after presenting due to intentional self-poisoning

After assessment at the Christchurch Hospital ED, 70% of ISP patients were admitted to the hospital: 7% to the intensive care unit (ICU), 19% to a general medical unit, 0.4% to surgical wards, with the remainder sent to a short-stay ward at the ED for observation for up to eight hours (Ardagh et al., 2001). The trend at Christchurch Hospital ED has been that over time, from the early to late 1990s, more patients have been observed in the short stay unit, rather than admitted to inpatient wards (Ardagh et al., 2001). The number of admissions to ICU has declined at Christchurch Hospital in the same time period. More recent information on these patient destinations within New Zealand public hospitals is not available. This information should be updated to better understand the resource requirements of ISP placed on DHBs, and to understand patient pathways through care facilities.

Facilitating access to follow-up care after ISP events should be one of the tasks of ED staff. RANZCP recommend an active role for ED clinicians during the treatment process, including liaising with community psychiatric services, to ensure patients transition as smoothly as possible when leaving the ED, and do not lose touch with services (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004, Carter et al., 2016). Focus should not be solely on (brief) mental health interventions performed at the ED, but engagement with community mental health services should be encouraged when the ISH patient is present at the ED and can be referred onto community care (Howson et al., 2008).

A significant challenge is that emergency departments operate in a busy environment, with many demands on staff time. A study from Wellington Regional Hospital ED, investigating the care of ISH patients, found that mental health assessments were performed and

recorded less frequently than perhaps recommended by guidelines (Kuehl et al., 2012). Prior to discharge from Christchurch Hospital, 66.3% of ISP patients had psychiatric follow-up care in the hospital, whereas 18.4% were seen by the psychiatric services and then transferred to a psychiatric hospital, 4.1% were the subject of a tele-consultation with a psychiatric service, and 1.4% self-discharged without meeting the psychiatric services (Ardagh et al., 2001). Alarmingly, 8.7% of the ISP patients in this study were not referred to psychiatric services at all. As patients may be lost to contact with mental health services after discharge from the ED, this information on referral rates should be updated.

Some ISP patients may choose to leave the ED too early, against the advice of ED staff. If they are not considered mentally unfit to make such decisions, staff have no authority or ability to force them to stay. A study from Christchurch Hospital found that self-referred ED patients were most likely to leave the ED before follow-up care was organised, with 80% of people who self-discharge also having self-referred themselves to the ED (Hider et al., 2001). While this study did not specifically look into people presenting due to ISP, it gives an indication of how self-referring ED patients in general may leave the ED too soon. This has implications for keeping them safe in the community where the factors that made them take an intentional overdose may still be present and not under their control. If no follow-up care is organised, people may be left with no formal support. Updating this information about patient pathways during and after acute medical care would be useful for ISP prevention planning.

1.5 Substances encountered in previous New Zealand studies

To further scope the PhD project and determine its aims, the literature on ISP in New Zealand was investigated as described in 1.2, with special interest on 1) what people were taking in intentional overdoses, and 2) how and why. A key observation from the literature was that people commonly use what is readily available to them in ISP events, either because it was prescribed to them, or because it was easily available for purchase (Ardagh

et al., 2001). A total of 75% of ISP cases in Christchurch ED involved prescription medicines, and 50% of these were prescribed to the patient by a GP (Buchanan, 1991).

Approximately 10% of New Zealand suicides in the years 2000-2012 were through poisoning by solid and liquid substances, and 16% involved poisoning by gases and vapours (Figure 1.3). Over time, the proportion of suicide deaths through poisoning by solids and liquids has stayed fairly constant at near the 10% mark, whereas the proportion of suicides through poisoning by gases and vapours has declined, from 25% in 2000 to 8% in 2012 (Ministry of Health – Manatū Hauora, 2012b, Ministry of Health – Manatū Hauora). The gas in question in many of these cases is carbon monoxide (CO; Gallagher et al., 2012). A reduction in suicides by CO may be due in part to reduced CO emissions from on-road vehicles in 2001-2012, with an estimated 39% reduction through newer, less polluting cars (Ministry for the Environment – Manatū Mō Te Taiao and Statistics New Zealand, 2014). Carbon monoxide from vehicular and other sources remains a significant poison in suicide attempts through relatively high method lethality, ease of access, and perhaps at least moderate general awareness of its toxicity (Hampson et al., 1994, Liu et al., 2007).

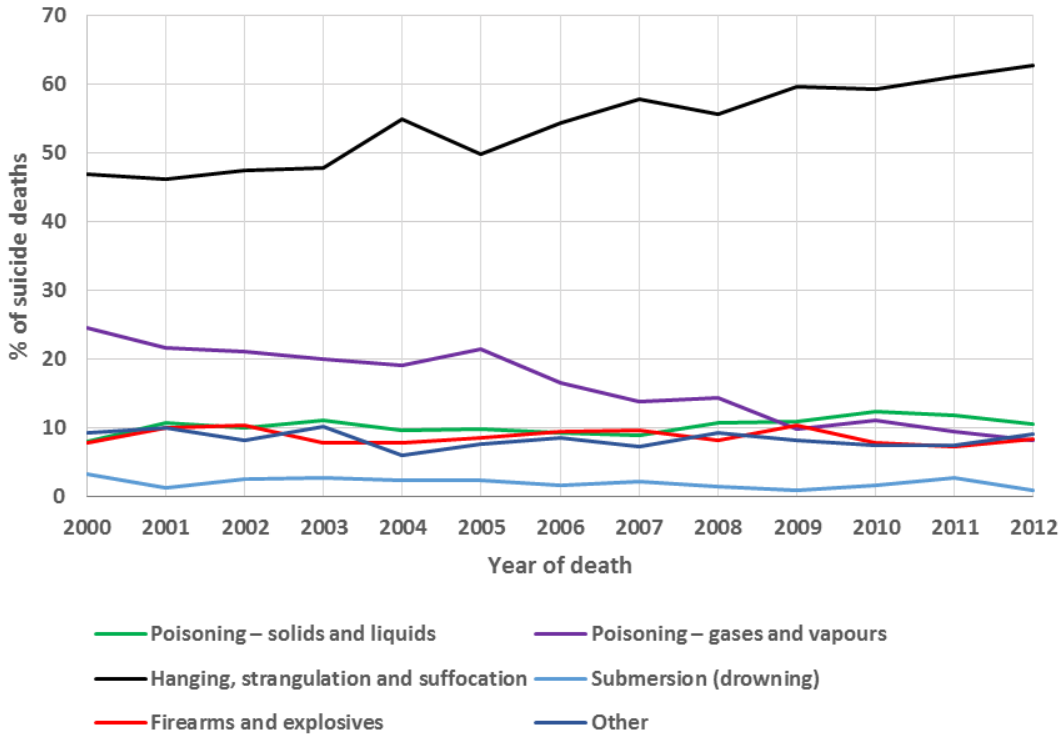

Figure 1.3: Suicide deaths by methods: time trends in New Zealand, 2000-2012. Adapted from Ministry of Health (2012b, 2015d).

About the classification and description of poisonings

For ease of reporting on larger populations, the World Health Organization (WHO) International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10; World Health Organization, 2015) classification of poisonings is often used in public health publications. This classification system involves grouping by intention behind the poisoning, as well as by larger substance groups with some functional or structural similarity, and groups where unknown substances and substances that do not fit well into other groups can be allocated. The ICD-10 groups involving intentional and undetermined intent poisoning are presented in Table 1.3. Poisonings of undetermined intent are included here as they are investigated in Study 1 (Chapter 2). The reason for

including them in that study is that there is evidence to suggest some of them may be intentional (Bethell and Rhodes, 2009). These ICD-10 groups are used in this PhD project, particularly in Study 1 (Chapter 2). Examples of individual substances in each of these groups are presented in Appendix 1 (Table A1.1).

These ICD-10 groups are commonly used to describe New Zealand injury statistics. A recent New Zealand study (Peiris-John et al., 2014) describing fatal and non-fatal, hospital-treated poisonings found that 63.9% of fatal ISP involved the ICD-10 group 'other gases and vapours' ('X67'), and the remaining one third involved ICD-10 groups 'X60'-'X64' (pharmaceuticals), with 17.9% of ISP deaths caused by 'antiepileptics, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' ('X61'). In the same study, 19.2% of non-fatal ISP involved alcohol, and three quarters involved 'X60'-'X64', mainly 'X61' (43.2%), as in fatal ISP cases. Specific substances involved in these deaths and hospital presentations were not described.

Table 1.3: Descriptions of the ICD-10 groups involving intentional and undetermined intent poisonings.
(World Health Organization, 2015)

Code	Description of group
X60	Intentional self-poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics
X61	Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, NEC
X62	Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], NEC, unspecified place, during unspecified activity
X63	Intentional self-poisoning by and exposure to other drugs acting on the autonomic nervous system
X64	Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances

Code	Description of group
X65	Intentional self-poisoning by and exposure to alcohol
X66	Intentional self-poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours
X67	Intentional self-poisoning by and exposure to other gases and vapours
X68	Intentional self-poisoning by and exposure to pesticides
X69	Intentional self-poisoning by and exposure to other and unspecified chemicals and noxious substances
Y10	Poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics, undetermined intent
Y11	Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, NEC, undetermined intent
Y12	Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], NEC, undetermined intent
Y13	Poisoning by and exposure to other drugs acting on the autonomic nervous system, undetermined intent
Y14	Poisoning by and exposure to other and unspecified drugs, medicaments and biological substances, undetermined intent
Y15	Poisoning by and exposure to alcohol, undetermined intent
Y16	Poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours, undetermined intent
Y17	Poisoning by and exposure to other gases and vapours, undetermined intent
Y18	Poisoning by and exposure to pesticides, undetermined intent
Y19	Poisoning by and exposure to other and unspecified chemicals and noxious substances, undetermined intent

*NEC = 'not elsewhere classified'

There are differences between males and females in the substances used in ISP. A New Zealand study looking at data from 2001-2005 found that suicides by CO were more common in men than women, with a 5:1 men-to-women occurrence, whereas suicides by other chemicals were nearly equally common in men and women, with 1.1:1 occurrence

(Gallagher et al., 2012). Although data are available on which ICD-10 groups occur most frequently in ISP public hospital presentations and deaths, more detailed information would be required for planning prevention activities, as discussed in 1.5.2.

1.5.1 The number of substances

Previous research indicates that ISP events often involve only a single substance. Studies done at Christchurch ED at different times have found that approximately two thirds, or 57.9% (Ardagh et al., 2001) to 61.4% (Weir and Ardagh, 1998) to 66% (Buchanan, 1991) of ISP patients presenting to the hospital had ingested only one substance. A total of 22% (Ardagh et al., 2001) to 23.3% (Weir and Ardagh, 1998) of patients had taken two substances, and 8.6% (Weir and Ardagh, 1998) to 10.5% (Ardagh et al., 2001) had taken three substances. Only 6.7% had taken four substances or more (Weir and Ardagh, 1998).

In suicides by ISP from 2001 to 2005, 89% of people who died had used one substance only, whereas 8.4% had used multiple substances (Gallagher et al., 2012). This may perhaps be explained in part by the high proportion of CO used as the means of suicide in this study. Evidence from Sweden suggests that while half had alcohol detectable in their post-mortem blood tests, less than a tenth of people who died by suicide through vehicular CO had medicines detectable in their toxicology results (Öström et al., 1996). A more recent study from the state of Washington (in the United States; US) found a slightly higher percentage of 15% co-ingestion of medications and other drugs, with alcohol as a co-ingestant bringing that number to 43% (Hampson and Bodwin, 2013).

1.5.2 Specific substances used in intentional self-poisoning

To understand what is currently known about the most ‘problematic’ substances in New Zealand intentional overdoses, the papers in the literature search were investigated to collect all study findings together that reported on individual substances, not just ICD-10 substance groups. In order to understand what could be done to reduce the risk of

intentional overdose with them, we need to know which specific substance is used, not merely which broader group it belongs to.

While international findings on substances used in overdoses can be useful, availability of substances varies across nations. Because of these differences in national formularies, information on what people are specifically using in New Zealand is needed. A few New Zealand studies have reported on individual substances or substance groups encountered in non-fatal (Buchanan, 1991, Hall and Curry, 1994, Weir and Ardagh, 1998, Ardagh et al., 2001, Howson et al., 2008) and fatal (Gallagher et al., 2012) ISP. A summary of the findings of these studies is presented in Table 1.4, to give an approximate indication of the prevalence of specific substances reported in these previous studies.

The most common substances in non-fatal ISP, when calculated as a simple mean of the results of the non-fatal ISP studies presented in Table 1.4 were antidepressants (all types combined; 27% of cases), minor tranquillisers (26%; mainly anti-anxiety medications, many of which are benzodiazepines), paracetamol (20%), alcohol (19%), benzodiazepines (17%), specifically selective serotonin re-uptake inhibitor (SSRI) and serotonin-noradrenaline re-uptake inhibitor (SNRI) antidepressants combined (16%), and tricyclic antidepressants (TCAs; 14%).

For fatal ISP, in the Gallagher (2012) study also summarised in Table 1.4, antidepressants were also the most common substances encountered (all types combined; 31% of ISP deaths), followed by TCAs specifically (29%), and total opioids (14%). The larger percentages of TCAs and total opioids in fatal ISP (29% and 14%, respectively), compared to non-fatal ISP with the same substances (14% and 7%, respectively) reflect the serious effects of these substance groups in overdose.

Simple time trends may be observed in Table 1.4, though the studies presented here are heavily centred in Christchurch, which may cause bias based on trends possibly specific to the location. It appears that the proportion of antidepressants involved in ISP has increased from the 1980s to the 2000s, while the proportion of TCAs has decreased and SSRIs has increased. Evidence from the United Kingdom (UK) and France also indicates an increase in

antidepressant involvement during the 1990s (Townsend et al., 2001, Camidge et al., 2003, Staikowsky et al., 2004), and specifically that the proportion of TCAs decreased in ISP in the UK, and that of SSRIs increased (Hawton et al., 2003).

The extent of paracetamol involvement in ISP appears to have increased over time. Studies from the UK regarding paracetamol in ISP indicate a similar, increasing trend from the 1980s to the 2000s, with its prevalence going from 31% in 1985 to 44% of presentations due to in 2000 (Townsend et al., 2001, Hawton et al., 2003). No clear trend is evident for benzodiazepine prevalence changes in Table 1.4, but evidence from France indicates that their prevalence was reduced from the early 1990s to the early 2000s (Staikowsky et al., 2004).

While a few psychotropics (medications with psychiatric effects, such as antidepressant effects) and paracetamol were identified specifically in these studies, not many individual substances were reported on (Table 1.4). Some substances found in these studies, such as dextropropoxyphene, are no longer available in New Zealand, while others, such as zopiclone, are fairly new and their appearance in ISP appears to perhaps have an increasing trend over time (Table 1.4).

The high prevalence of medicines being the cause of hospital-treated ISP, almost to the exclusion of other substances, is evident throughout the Western world (for example, France: Staikowsky et al., 2004, Italy: Mauri et al., 2005, UK: Prescott et al., 2009, Norway: Hovda et al., 2008, Gjelsvik et al., 2012, Belgium: Hendrix et al., 2012, Australia: Rahman et al., 2014, Chitty et al., 2017), while pesticides are the main agents in the developing world (Gunnell et al., 2007). Trends in prevalence, and in proportions changing over time reflect changes in prescribing practices and medication availability. These correlate directly with frequency of appearance in ISP (Crombie and McLoone, 1998). More recent, updated data are therefore needed to investigate which substances are appearing in intentional overdoses at present. This information can be used to plan specific prevention measures. These more detailed poisoning data will be collected in this PhD project.

Alcohol

The percentage of ISP cases indicating alcohol intoxication ranged from less than 10% up to one-third between the investigated studies (Table 1.4). This may, however, also reflect definitions changing by location and/or over time. Some hospitals only mark a case with alcohol involved in the poisoning if a specific threshold level of blood alcohol concentration (BAC) is met (Dr Paul Quigley, personal communication, Wellington Regional Hospital ED, 21st February 2016). This threshold may vary between locations, and BAC is not always measured in overdose patients. This may be due to clinician assessment of the intentional overdose patient, with the determination of relative relevance and 'seriousness' of different toxicants present in the patient in relation to the overall presentation. If the clinician sees one toxicant as the most relevant and causing the most immediate risk to the patient's health, this toxicant may be coded in the presentation. Alcohol may be considered a contributing factor to toxicity, but not as the main toxicant (Rygnestad et al., 1990). All these factors combined may leave reporting on alcohol-positive cases unreliable. A systematic approach to collecting alcohol intoxication data is therefore needed, and will be investigated in this PhD project.

Table 1.4: A summary of New Zealand studies listing substances encountered in intentional self-poisoning.

Authors	Buchanan (1991)	Hall & Curry (1994)	Weir & Ardagh (1998)	Ardagh et al. (2001)	(Howson et al., 2008)		% of cases; Range of applicable studies	Gallagher et al. (2012)
Patient inclusion	ISP, those aged 14+	ISP	ISP	ISP	ISH, those aged 15+			suicides by ISP **(fatal ISP)**
Location	Christchurch ED	Christchurch ED	Christchurch ED	Christchurch ED	Auckland ED (North Shore)			All of New Zealand
Years investigated in the study	1989	1992	1995-1996	1999	2001-2002		**non-fatal ISP; synthesis**	2001-2005
					ED presentation			
					1st time	**2nd time**		
Sample size / people	531	622	713	561	754	136	N/A	643
Substance/ group	**Substance prevalence: % of cases involving substance/substance group in study sample**							
Alcohol	33	11.6	9.8		24	19	9.8-33	1.7
TCA	15.7	19.6	10.4	12.8	12	13	10.4-19.6	29
MAOI		1.5	1.7	1.2	<1	2	<1-1.7	
SSRI			8	16.8			8-16.8	
Fluoxetine		3.4					3.4	
SSRI + SNRI					13	19	13-19	
total antidepressants		24.4	20.1	30.8	26	34	20.1-34	30.7
Paracetamol	10.6	16.9	16.7	23.5	19	32	10.6-32	2.7
NSAID		9.8	9.2	9.5	12	11	9.2-12	
Dextropropoxyphene	3.6	2.9	1.6				1.6-3.6	3.1
total opioids			3.9	10.7	6	9	7	13.8
Minor tranquillisers					16	36	26	

Authors	Buchanan (1991)	Hall & Curry (1994)	Weir & Ardagh (1998)	Ardagh et al. (2001)	(Howson et al., 2008)		% of cases; Range of applicable studies	Gallagher et al. (2012)
Benzodiazepines		18	11	23			17	3.6
Zopiclone		5.6	4.6	9.4			7	2.7
Lithium				2.5	1	2	2	
total antipsychotics		16.1	10.7	17.8	4	15	13	0.4
total anticonvulsants (antiepileptics)	2.7	4.2	1.8	8.9	13	28	10	1.3
total anticholinergics			1.6	2.9			2	
Promethazine				3.6			4	
Theophylline	2.7	0.5					2	
Thyroxine				1.2			1.2	
Insulin				0.5			0.5	2.7
Recreational (cocaine, heroin, methadone)					1	0	0.5	
Stimulants (amphetamines etc.)					1	0	0.5	0.4

ISP = intentional self-poisoning; ED = Emergency Department; TCA = tricyclic antidepressant; MAOI = monoamine oxidase inhibitor; SSRI = selective serotonin re-uptake inhibitor; SNRI = serotonin-noradrenaline re-uptake inhibitor; NSAID = nonsteroidal anti-inflammatory drug.

1.5.3 Lethality

Further admission into the ICU for intensive interventions can be used as a general indicator of the seriousness of an ED presentation. In a study of Christchurch Hospital ED ISP patients, 50% of ISP patients who were admitted to ICU had taken TCAs, and 10% had taken benzodiazepines (Buchanan, 1991). The overall lethality of poisonings is not very high, however, as in this study of 12 months duration, only 0.5% of ISP patients died from the poisoning, and incidences of complications (5%) and coma (7%) were considered low by the author.

Poisoning mortality is generally considered to be low in the population presenting to public hospitals in New Zealand (Weir and Ardagh, 1998). A study looking into deaths by poisoning in New Zealand for 2001-2002 found that two-thirds of poisoning deaths were intentionally self-inflicted, and rates of death from all poisonings were only 4.2 deaths per 100,000 population (McDowell et al., 2005). In another study of New Zealanders aged 20-64, Kool et al. (2011) reported that the ratio of hospitalisations to deaths for accidental poisonings was 11:1 or 8.3%, which was higher than the finding of 0.5% intentional self-poisoning lethality from 1989 (Buchanan, 1991). This difference may be due to different, more harmful chemicals being involved in the more recent study of accidental overdoses.

1.6 Implications for health services and society

This section discusses some of the impacts that ISP may have for individuals and society. Financial aspects are discussed in the New Zealand context, based on the literature searches described in 1.2 and additional exploration informed by papers found in the original literature review.

1.6.1 Impact on population health and well-being

Intentional self-poisoning can be an indicator of significant future morbidity and mortality risk. A New Zealand study found that previous inpatient hospitalisation for intentional self-

injury, including ISP, involved a relative risk of suicide of 105.4 compared to those who did not have such hospitalisations (Conner et al., 2003). In the same study, hospitalisation due to injury of undetermined intent involved a relative suicide risk of 164.1 compared to those with no hospitalisation. The relative risk of a further self-injury hospitalisation after an initial event of intentional self-injury was 175.7, and 13.7 after an injury event of undetermined intent or cause.

A British study found that individuals who had previous events of non-fatal ISP had an overall 2.2-fold long-term risk of all-cause mortality (of both natural and unnatural causes) compared to the general population (Karasouli et al., 2011). Similarly, a study from the US found that people with a history of previous suicide attempts had a 2-fold risk of dying by self-poisoning suicide compared to those who had no such history (Jamison and Bol, 2016). This suggests that these people at risk may have made suicide attempts in the past that might have been opportunities for intervention. The risk of suicide appears to be the highest in the first one or two months after an ED presentation for intentional self-harm (Howson et al., 2008). These high risks of further injury events, morbidity and suicide mortality therefore highlight the need for effective treatment and follow-up care after intentionally self-injurious and undetermined intent injury events such as ISP.

High further self-injury and suicide risks observed after undetermined cause index injuries underlie the need to determine intent in injuries to the best of the clinician's ability (Conner et al., 2003). As poisoning as an injury method is perhaps not as self-implicating as for example hanging (Walsh and Rosen, 1988), assessment of intent can be challenging. Intent, or the objective behind ISP may not be clear, sometimes even to the patient themselves (Buchanan, 1991, Buykx et al., 2012). If more intentionally self-inflicted poisoning injuries can be identified, however, thereby potentially reducing the number of cases of 'undetermined intent', resources could be focused more aggressively on engaging these high-risk patients in follow-up care. The decision-making procedures and cues used by clinicians in identifying in poisoning patients in the ED setting have not been described in the New Zealand setting and need to be investigated to understand this process better. Some of the challenges in this are discussed further in 1.7.

Many people who engage in ISP are in contact with health services before self-poisoning. A fifth of ISP patients presenting at Christchurch Hospital ED had seen a GP in the previous 24 hours, 52% in the past week, and 79% in the past month (Buchanan, 1991). This implies that there are opportunities for intervention, if patients at risk of ISP are identified in primary care or during GP contacts. This identification can be challenging, however, if the patient does not wish to reveal their distress to their GP. In cases where the GP (or other treating clinician) suspects that the patient may be at risk of ISP, they should take this into account in planning the therapeutic approach. In cases where medication is prescribed and there are several alternative medicines available, treating physicians should choose one that has the lowest relative toxicity, to avoid severe effects in a potential overdose (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004). Prescribers should also limit the number of units of a medicine released to the patient at a single dispensing if there is cause to suspect a risk of ISP in the patient, or when the medicine has the potential for severe poisoning in overdose (Gresham et al., 2013). The extent to which these interventions happen, however, has not been described in New Zealand literature.

1.6.2 Financial impact

Self-injurious events such as ISP cause a significant financial burden on health services. ISP patients accounted for 16.5% of ICU admissions at Christchurch Hospital (Buchanan, 1991). In another study from Christchurch Hospital, ISP patients had a mean hospital stay of 2.43 days, though the median was one day (Hall and Curry, 1994). Together, these results indicate significant direct costs from treatment, although costings were not reported in these studies. Simple length of stay data do not describe other direct or indirect costs from care in the community or in primary care services.

1.6.2.1 Accident Compensation Corporation claims

The Accident Compensation Corporation (ACC) is a national government organisation, providing comprehensive, no-fault personal injury cover (Accident Compensation

Corporation, 2015). The ACC covers medical treatment costs, loss of income, and rehabilitative equipment and treatment in cases of injury for all New Zealand residents and visitors to New Zealand.

The Ministry of Justice (2014) investigated the negative effects of alcohol and also presented ACC-provided data on claim numbers for 2007-2010 involving suicide and self-harm (Figure 1.4, adapted from Ministry of Justice (2014)). These ACC claims costs included weekly compensation, independence allowance, death benefits (grants and weekly compensation) lump sums, vocational rehabilitation, support for independence (care, capital, assessment and other costs), medical treatment, hospital treatment, dental treatment, conveyance for medical treatment, conveyance by ambulance, and miscellaneous benefits/expenditure (Ministry of Justice – Tāhū o te Ture, 2014).

There were significant numbers of ACC claims in the age groups 0-17 and 18-24, especially in females (Figure 1.4). The average cost of these suicide and self-harm related ACC claims, however, was very low in younger age groups in 2010 (in 2010/2011 New Zealand dollars; NZ$), while the highest average cost per claim was in the age group 45-64 (Figure 1.5; adapted from Ministry of Justice (2014)).

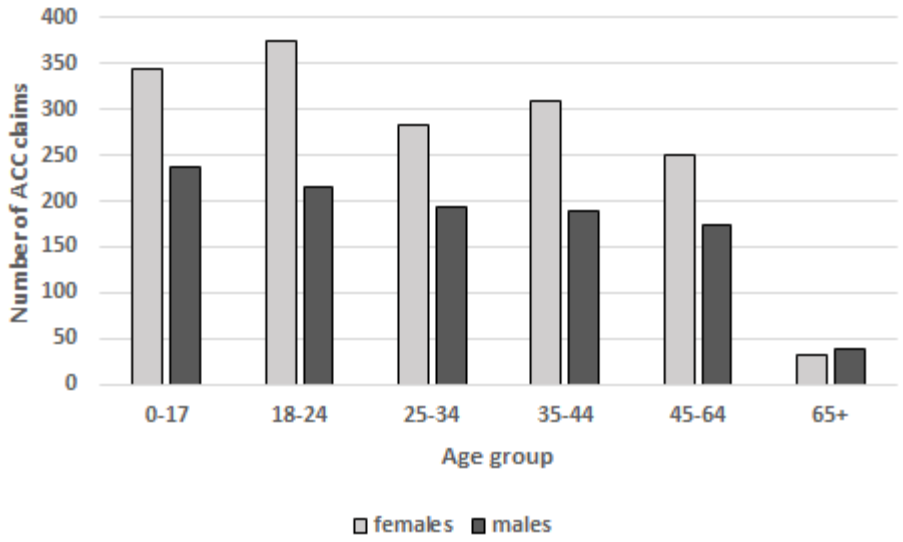

Figure 1.4: The average number of ACC claims for suicide and self-harm per year, by age groups, in 2007-2010.
Adapted from Ministry of Justice (2014).

When estimated yearly ACC claim cost loads from suicide and self-harm were calculated by multiplying the average number of cases per year by the average 2010 cost, the age group 45-64 was responsible for 38% of costs, with those aged 35-44 forming 32% of the costs (Figure 1.6, adapted from Ministry of Justice (2014)). The average cost per case for those aged 65+ was NZ$9,582 (Figure 1.5). This was the third highest case cost for an age group, while this oldest age group only corresponded to 2% of average yearly suicide and self-harm ACC claim costs (Figure 1.6).

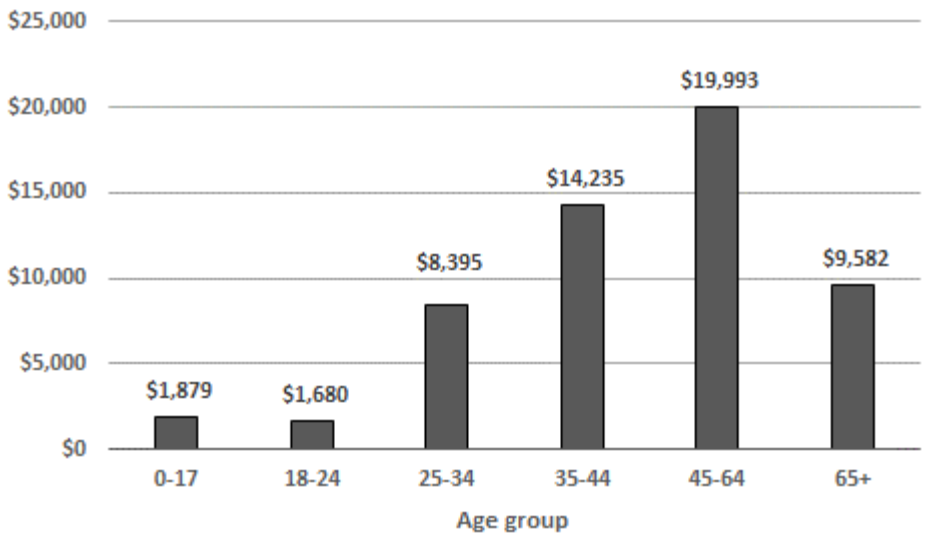

Figure 1.5: The average cost per ACC claim for suicide and self-harm, by age groups, in 2010 (in 2010/2011 dollars).

Adapted from Ministry of Justice (2014).

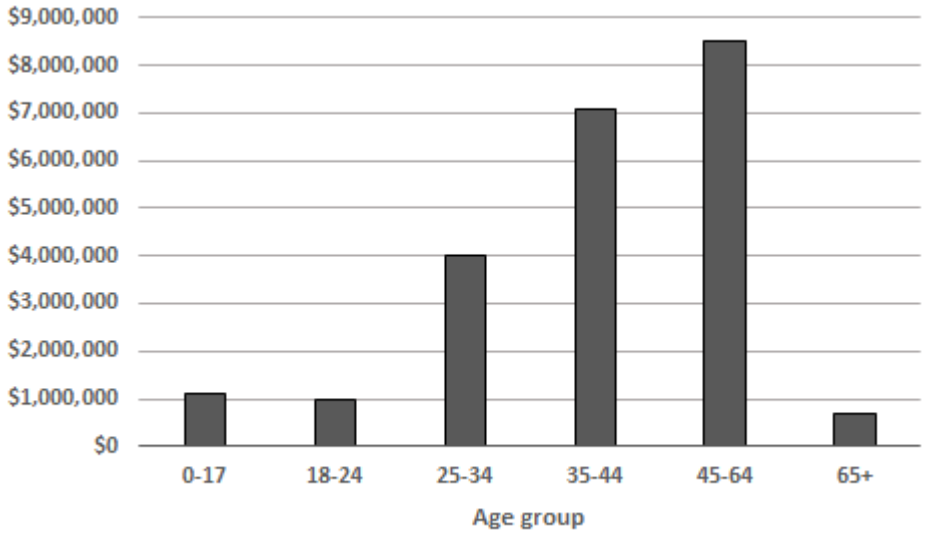

Figure 1.6: The total yearly cost estimate of ACC claims due to suicide and self-harm, by age groups, in 2010 (in 2010/2011 dollars).

Adapted from Ministry of Justice (2014).

While these ACC claim numbers are for suicide and self-harm, not just ISP, they highlight the significant yearly costs to society from self-harming behaviours, with an estimated total of NZ$22 million paid out in claims yearly (Figure 1.6). Due to the often non-lethal nature of injuries through poisoning, it could be expected that ISP events result in ACC claims afterwards, as the person survives the injury. The ACC only covers direct medical treatment of poisoning injuries where there is a measurable injury such as damage to an organ, however, and cases where no such physical injury is able to be evidenced do not qualify for compensation. While the ACC covers many costs that occur as a result of self-injurious behaviour, it is currently unknown how much is left for the person injured to cover through other means, and what level of financial or other hardship is incurred in this way.

1.6.2.2 Expenditure on awareness and prevention campaigns

While raising public awareness of health conditions and problems may lead to people being more mindful of their own conditions and aware of how they can access help for them, it may also lead to people acting as peer monitors for health events occurring in people around them. The effectiveness of such awareness campaigns in suicide prevention, however, has been questioned. A large international review pointed to health personnel education (especially doctors), means restriction or preventing access to means of suicide, and education of so-called gatekeepers, or peer persons, as the most effective means of suicide prevention, rather than large, national awareness campaigns (Mann et al., 2005).

The Ministry of Health (MOH) spent approximately NZ$15 million on suicide and self-harm prevention in 2008/2009 (New Zealand Injury Prevention Strategy Secretariat, 2010). The total expenditure on prevention, including the MOH expenditure, was NZ$25 million, with the Department of Corrections, Ministry of Education, Ministry of Social Development, and the ACC also having their own prevention activities. This MOH expenditure, which was 58% of the total NZ$25 million spent, included leading the development and implementation of suicide prevention strategies for specific population groups, funding suicide prevention coordinators in DHBs, and funding research, postvention (interventions to family and friends after a suicide), and ‘suicide first aid’ training (Applied Suicide Intervention Skills

Training, ASIST) in the community. The total government expenditure on suicide and ISH prevention was only 1.2% of the estimated costs incurred by these behaviours on society, while by comparison, the expenditure on motor vehicle accident (MVA) prevention was 38.9% of the costs incurred by MVAs (New Zealand Injury Prevention Strategy Secretariat, 2010).

1.6.2.3 Estimating the costs of a suicide or a suicide attempt

The New Zealand Injury Prevention Strategy Secretariat (2012) have argued that the rate of non-fatal, serious self-injuries will increase in the long term, and that the social and economic costs of suicide and self-harm will increase both in the short and long term. They reported an increase in yearly total social and economic costs from NZ$2.0 billion in 2007 to almost NZ$2.2 billion in 2010 (New Zealand Injury Prevention Strategy Secretariat, 2012). These costs in 2010 consisted of NZ$3 million to rehabilitation and care, NZ$360 million from lost economic contribution, and NZ$1.8 billion in human costs (calculated from years of life lost to premature mortality and years of life lost to disability), and in total formed 21% of all injury costs in 2010 (O'Dea and Wren, 2012).

Estimating the total costs of a single ISH event can be difficult, as there are indirect costs from loss of income to the person involved, and subsequently loss of economic contribution to the economy. O'Dea and Tucker (2005) attempted such an estimate, taking into account indirect as well as direct costs. They calculated that the cost of a suicide in 2002, including direct costs and loss of productivity, was NZ$448,250, and the similar cost of a suicide attempt in 2001/2002 was NZ$6,350 (both in June 2004 dollars, excluding Goods and Services Tax; GST). In their calculations, they argued that the average economic costs of services used as the result of a suicide attempt would be NZ$3,750 (in June 2004 dollars, excluding GST). While these are averages for all methods of suicide, and may not necessarily directly match costs from non-suicidal self-harm presentations, or indeed specifically ISP events, they give an indication of the extent of the financial burden suicide and self-harm can incur on society, in addition to the negative effects on human wellbeing and quality of life.

Factoring in all possible direct and indirect costs when estimating the cost of a single injury event is very challenging, but an update on these figures presented above would be useful. Separating costs by suicides and non-fatal events, as done by O'Dea and Tucker (2005) previously, would be justified to understand the financial impacts of these different self-injurious behaviours.

1.6.2.4 Estimating costs of an intentional self-poisoning event

The costs of ISP events may differ from those of other ISH events such as cutting or intentional MVAs due to the differences in the mechanism of injury and subsequent treatment and level of care needed, and possibly the length of stay in hospital. There are no New Zealand figures available specifically on the costs of ISP events. Older data from Christchurch Hospital indicates that the 531 ISP patients seen at the hospital had 270 ambulance transfers to hospital, 100 ambulance transfers between hospitals, 124 ICU bed days, and 660 hospital bed days (Buchanan, 1991). In addition to these costs, there were costs involved in running toxicology tests, using psychiatric services to support the patients, and also costs from 280 gastric lavages which required a large number of staff to be present for the procedure. The hours spent by these services were not able to be quantified in the study. While gastric lavage is hardly used in cases of overdose anymore (Weir and Ardagh, 1998, Ardagh et al., 2001), the other cost events described are expected to be relevant. There could also be additional medical specialities involved, such as nephrology (kidney specialist) and transplant services in poisoning cases involving significant organ damage. An update on these costs would be very useful for justifying further research into what works in ISP prevention, and how savings could be made by investing in prevention and reducing incidence and prevalence of ISP.

1.7 Problems in definitions

As described in 1.3 previously, intentional self-poisoning is defined in this study as the *intentional ingestion of more than the prescribed or advised amount of any drug, recreational drug, non-ingestible substance, or excess alcohol for self-harming purposes, regardless of whether there was intent to die or not* (adapted from Hatcher (2009)). The number of ISP events is not, therefore, an estimate of suicide attempts, as people engage in ISP for various reasons. These may include seeking help through the behaviour, attempting to get a specific reaction from a loved one, relieving tension or anxiety, or temporarily 'escaping' a negative state of mind (Buykx et al., 2012, Chapman et al., 2006).

Ambiguity of intent

In their study of Australian ED patients presenting due to an overdose, Buykx and colleagues (2012) found that intent was not dichotomous, 'completely intentional' or 'completely accidental', but the patients self-rated their intent somewhere between these two extremes of scale. When 'completely intentional' was given a score of 5, and 'completely accidental' a score of 1, the mean score for the overdose in this study population was 3.4. In this same study, only 17% of the people indicated that they had a strong wish to die at the time of taking the overdose. Many felt ambiguous about dying, for example at once thinking they were 'worthless to live' but also being afraid of dying. Interestingly, none of these people reported that they would have been feeling the same strong intent to die by the time of data collection, indicating that their minds had changed over time. Intent, therefore, cannot be seen as a straightforward or stable variable over time.

Recreational self-poisoning

A grey area in the definition of ISP used in this PhD project are cases of substance abuse, as assessing true intent in such cases – whether the person really attempted to intentionally harm themselves or just 'get really high' – can be difficult. Distinguishing 'intentional, recreational overdoses' from true intentional self-harm through poisoning can be made

complex as the person themselves may be unable to clearly or accurately recall, or even be undecided about what outcome they hoped for as a result of the overdose.

Hawton et al. (1981) and Hawton and Fagg (1990) have previously used the definition "Self-poisoning is defined as the intentional self-administration of more than the prescribed dose of any drug whether or not there is evidence that the act was intended to cause self-harm" and commented that it therefore also included cases of 'drugs for kicks', or recreational use, in their study populations. The more recent definition, developed from this earlier work and used for example by Hatcher and colleagues (2009) previously, refers to a poisoning presentation not needing to have 'evidence of intent to die'. The wish to harm self, other than the wish to die, is not clearly stated or included in the definition. Hatcher and colleagues (2009) therefore also included a requirement for included cases to be "cases of which the clinical staff considered to be an act of intentional self-harm". This approach was adopted in this PhD project, and the definition presented in 1.3.1 includes reference to specific intent to harm self.

Recreational misuse of drugs and alcohol, and deliberate self-harm related to intellectual disability, are excluded from the RANZCP deliberate self-harm definition (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004). Correctly identifying recreational misuse and deliberately overdosing to cause harm to self is made even more difficult as sometimes people change their mind over time about what they were trying to achieve with their intentional overdose (Buykx et al., 2012).

When identifying cases of ISP from ED and government data, ICD-10 codes for intentional self-harm through poisoning are often used to find matching cases. This should be done with caution, however, as clinical coding decisions may result in coding the eventual symptom or problem instead of the way in which the injury was obtained, for example coding certain poisonings as 'abdominal pain' (Hatcher et al., 2009). Additionally, if intent cannot be determined definitely, the case may be coded as 'of undetermined intent'. As discussed previously, a significant number of these cases may actually be intentional

(Bethell and Rhodes, 2009). To address these concerns about health data quality, the process of identifying cases as poisonings, and determining intent in the ED setting need to be investigated and described through this PhD project.

The following section discusses the aims of the PhD project, as formed by the literature review presented in sections 1.3 to 1.7. The items of concern or interest, or gaps in literature identified when reviewing the literature, are formulated into specific aims for the project.

1.8 Defining the aims of the PhD project

The topics of interest and gaps in knowledge identified in the previous sections include the following:

- There is a paucity of DHB-level information about rates of intentional self-poisoning in New Zealand;
- Young people have high rates of ISP but the features of their ISP presentations have not been investigated and described on a national level in New Zealand;
- Up-to-date details of which specific substance was involved in the ISP event are not available;
- Recording alcohol intake/abuse intertwined in ISP events may vary between geographic locations and therefore the overall image of the effect of alcohol on ISP may be distorted;
- Patient choices of self-poisoning agents are not well understood (*Which substance? How? Why?*);
- The process of identifying poisoning cases presenting at the ED, and investigating intent behind them, eventually leading to national data about ISP has not been described previously;
- The experiences and needs of those choosing not to present to New Zealand hospitals for treatment after ISP events are largely unknown;

- Patient (self-perceived) needs for and access to follow-up care after a hospital presentation due to ISP are not well understood;
- Costs incurred from ISP to society and individuals are not known.

While all of the topics above are important to further our knowledge about the features and impacts of ISP in New Zealand, practical constraints of funding and time available for a PhD project determined that only a few items could be investigated. As a first step therefore, the focus was placed on understanding current national data on ISP and what its properties are from a poisoning prevention perspective. To support this understanding, the process of gathering information and producing national data were also included in the aims. To suggest possible improvements to the current format of national data, and to gain preliminary data on sources of specific substances, another aim was to prospectively collect data on presentations due to ISP. These aims were then used to formulate the research questions to address the identified gaps in knowledge. The remaining topics form potential lines of study in future research projects stemming from this thesis work.

Restricting means to injure oneself is one of few methods with proven effectiveness in suicide prevention (Mann et al., 2005), and therefore opportunities for means restriction in cases of intentional self-poisoning will be explored as much as possible during the project. Means restriction will frame the studies and analysis of results. As discussed previously, research from Christchurch suggests that many ISP patients use their own prescription medicines in the overdose (Buchanan, 1991). It is vital to update and expand on this information, as there have been changes in substance availability since that particular study.

This PhD project therefore aims to answer the following research questions, and address the implications of the findings:

I. What information about intentional self-poisoning can be obtained from Ministry of Health datasets to plan poisoning prevention initiatives? What are the gaps in these data, and how could these be addressed?

II. How do emergency medicine professionals identify poisonings and investigate intent behind them, and how does that information become national hospital presentation data?

III. Which specific substances do people use in episodes of intentional self-poisoning, and where do they obtain these substances?

The main outcome of this project will be information impacting on medication safety and availability through a better understanding of current patterns of national data, and what could be improved in these datasets to better inform and assist policy-making. Substances identified during the project which are considered 'high-risk' due to their narrow therapeutic index (difference between a therapeutic and a toxic dose), frequent appearance in cases of ISP combined with easy access to significant amounts, or relatively high case fatality ratios, will be discussed and suggestions will be made about potential further research and medication safety improvements.

To meet the aims formulated through detected gaps in current knowledge, this PhD project aimed to investigate the current state and prevalence of ISP events in New Zealand through health statistics data from DHBs collected by the Ministry of Health (MOH; Chapter 2). Detailed poisoning data collected by a single ED were sampled to investigate the implications of such data collection for poisoning prevention activities (Chapter 3). Interviews with emergency medicine specialist clinicians were used to describe the process

of creating national hospitalisation data relating to poisonings (Chapter 4). Along with these data, more detailed ISP data were separately collected prospectively from selected hospitals in New Zealand (Chapter 5), to explore feasibility of such data collection.

1.9 Terminology used in this thesis

Some terms relating to suicide and self-harm have different versions between countries and research groups despite attempts to harmonise terminology (De Leo et al., 2006). For clarity, the following terminology was adopted for use in this thesis.

Intentional self-poisoning (ISP) has been discussed previously in 1.3 and 1.7. Intentional self-poisoning is defined as the intentional ingestion of more than the prescribed or advised amount of any drug, recreational drug, non-ingestible substance, or excess alcohol for self-harming purposes, regardless of whether there is evidence of intent to die of the poisoning or not.

Intentional self-harm (ISH) was chosen as a term instead of deliberate self-harm. This was done to match the term 'intentional self-poisoning' chosen earlier, for consistency. No distinctions were made regarding degree of suicidal intent behind the ISH or ISP, but the range of behaviours from suicide attempts to self-harm without any suicidal intent were included. This lack of distinction was adopted as the studies in this PhD project did not have the resources, or in the case of retrospective data (Study 1 – Chapter 2; Study 1b – Chapter 3), practical means to measure suicidal intent.

The term '**indication**' was used to describe a rational reason for taking a specific medication. This would, specifically in the context of this thesis, be a medical condition which makes a particular treatment (such as a prescription medication) or procedure advisable or necessary (National Cancer Institute, 2018).

The term '**iatrogenic**' was used to describe a condition such as poisoning, resulting from a diagnostic procedure or treatment performed by a professional carer (Steel et al., 1981).

This could be, for example, a severe, unintended drop in blood pressure caused by administration of an antidote to treat a poisoning at the ED.

The term '**psychotropic medication**' or 'psychotropic' was used to describe medicines which have psychiatric effects such as antidepressant or antipsychotic effects. They could also be described as 'affecting the mind'.

1.10 Summary of Chapter 1

This chapter reviewed the literature on ISP in New Zealand, and highlighted some of the gaps in knowledge, and challenges faced when assessing or treating ISP patients. These led to the development of the PhD project aims in 1.8. In the following Chapter 2, addressing these research questions begins with investigation of MOH data on intentional and undetermined intent poisoning deaths and hospital presentations.

[page intentionally blank]

CHAPTER 2 : EPIDEMIOLOGY OF INTENTIONAL SELF-POISONING FROM MINISTRY OF HEALTH DATA

This chapter is based on the manuscript published as:

Kumpula, E.-K., Nada-Raja, S., Norris, P. & Quigley, P. 2017. A descriptive study of intentional self-poisoning from New Zealand national registry data: exploring the challenges. *Australian and New Zealand Journal of Public Health,* 41, 535-540.

2.1 Aims of Study 1

As argued in Chapter 1, intentional self-poisoning (ISP) is a significant public health issue in New Zealand. To combat some of this self-injurious behaviour or to limit its impact, we need to understand what the challenges are, which substances are currently causing the most harm, and to whom. In order to obtain this information, descriptive data on ISP are needed. A recent national study only described broad groups of medicines instead of specific substances, and only investigated those aged 25 and over (Peiris-John et al., 2014). This study expands on this previous work and investigates fatal and non-fatal ISP behaviour in all age groups in New Zealand through Ministry of Health (MOH) Mortality and Hospitalisation data, and describes and discusses some of the limitations of these datasets.

In this chapter I will describe the basic characteristics of people who died through ISP or presented to Emergency Departments (EDs) due to ISP, and the substance groups encountered in fatal and non-fatal ISP. I will identify and describe variation between geographic areas as determined by the twenty District Health Boards (DHBs), based on the MOH datasets. Most importantly, I will identify what data are currently collected on ISP in these datasets and describe some of the key limitations of these data from a poisoning prevention perspective. These limitations are further explored in Study 1b (Chapter 3), Study 2 (Chapter 4), and Study 3 (Chapter 5). While the study focuses on data qualities, describing ISP in New Zealand is done to better understand the significance of the data limitations.

This chapter will not present or suggest specific poisoning prevention initiatives beyond suggesting some further lines of study, but will focus on describing and understanding the limitations of official data as described above. The chapter discussion addresses how data collection could be improved to enhance the usefulness of these data.

This study addresses research question I, presented in 1.8:

> ***I. What information about intentional self-poisoning can be obtained from Ministry of Health datasets to plan poisoning prevention initiatives? What are the gaps in these data, and how could these be addressed?***

To answer this research question, and to facilitate other studies in the PhD project, the specific aims of Study 1 are to:

1) investigate the extent of poisoning information available in MOH data which could be used in designing interventions to prevent poisoning;
2) identify limitations of existing data and make recommendations based on these;
3) inform planning of an investigation of how these MOH data are collected, in Study 2 (Chapter 4);
4) plan for study locations to collect prospective poisoning data for Study 3 (Chapter 5); these locations need to have relatively high rates of ISP.

This chapter describes how ISP and undetermined intent poisoning (UDP) cases were extracted from MOH data for the analysis, and how the analysis was performed. This study was published as a paper (Kumpula et al., 2017), and this chapter expands on what was presented and discussed therein.

This study informs the planning of Study 1b – 'Comparison of two poisoning datasets' (Chapter 3), Study 2 – 'Creating and collecting Ministry of Health Hospitalisation data' (Chapter 4), and Study 3 – 'Prospective data on substances used in intentional self-poisoning and the sources for obtaining them' (Chapter 5). The methods used in Study 1 are described first, followed by ethical approvals and considerations required, results

of fatal poisonings, results of public hospital presentations, and finally a discussion of the implications: what they mean for the subsequent studies in this PhD project, locating them in the larger context of intentional poisoning prevention. An overarching discussion of the whole PhD project findings, incorporating those from this study, and the public health implications, are presented in Chapter 6.

2.2 Methods of Study 1

This section describes the methods used to achieve the aims presented in the previous section, and the two government datasets used in this descriptive study. The basis for choosing cases from the datasets for analysis is defined, as well as exclusion criteria that were used to screen out cases in different analyses. Methods of analyses are described, and key considerations relating to these are highlighted, including some known limitations of the data.

Both intentional (ISP) and undetermined intent self-poisonings (UDP) were included in this analysis. Cases of UDP were included because some of these may be intentional self-poisonings (Bethell and Rhodes, 2009). One previous study looking into ISP excluded undetermined intent poisonings because their number was so low (Howson et al., 2008), but to better understand the burden of non-accidental poisonings in New Zealand (NZ), undetermined intent cases were included in this study.

2.2.1 Descriptions of the two datasets

Two MOH national datasets were used in this study to investigate intentional self-poisoning events. These datasets are the Mortality Dataset which contains deaths registered in New Zealand, and the National Minimum Dataset (NMDS) which contains hospital presentations.

2.2.1.1 Mortality data

The MOH collects population health data from all DHBs and some private health care providers. Mortality data on underlying causes of all deaths occurring in New Zealand are collected from:

- death certificates specifying the cause of death, obtained from Coroners and in some cases doctors;
- post mortem (PM) examination reports by pathologists and doctors, and;
- death registration forms filled in by funeral directors.

These are registered in the Births, Deaths, Marriages, and Citizenship Registry (Ministry of Health – Manatū Hauora, 2014a). Sudden, unexpected deaths, such as suicides, are always reported to and investigated by a Coroner. A Coroner in New Zealand is a qualified lawyer specifically appointed to the position, who may order a PM examination to be performed. A Coroner does not thereby need to have a medical degree. They will decide whether an inquest into the death is held, and they can make recommendations to prevent such deaths in the future based on the inquest (Coronial Services of New Zealand – Purongo O te Ao Kakarauri).

The MOH Mortality data investigated here include cases of death from intentional and undetermined intent poisoning. These de-identified data for the years 2000-2012 were obtained from the MOH in October 2015. Mortality data obtained by special request directly from the MOH have individual, de-identified case details. Some data fields, however, such as mental health disorders due to alcohol and substance use, and the substances encountered in the cases are not currently filled in for some cases, limiting analysis of these factors. This was scoped in this study to understand these limitations better.

As the cause of death in intentional poisoning deaths (‘chemical suicides’) is always formally investigated by a Coroner and there are legal requirements for ruling a death a suicide, toxicological analysis is likely to be used in the determination of cause of death unless the body is in a condition that does not allow testing (advanced decomposition,

skeletal remains). Therefore cause of death data are expected to be reliable in this dataset.

Due to delays in Coroners' investigations and inquests in complex cases, the Mortality database is fluid and the coding of some cases may change over time as verdicts are given (Ministry of Health – Manatū Hauora, 2014a). Until final verdicts are in, a small number of cases are initially coded as International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) code 'other ill-defined and unspecified causes of mortality' ('R99') and 'exposure to unspecified factor' ('X59'), but may change to other classes later. As this study examined Mortality data from 2000 to 2012, most cases from 2012 were expected to be finalised by the time of data extraction (October 2015), with the correct cause of death codes given. Despite this, it is possible that a small number of ISP cases may have been missed and not included in the analysis in this way. Due to the scarcity of background details available in these cases in MOH data, it was not possible to obtain all 'R99' and 'X59' cases and decide on their status. These cases need to be officially decided on by a Coroner with all relevant details available to them, and were therefore left out of this analysis.

Inclusion criteria

Intentional self-poisoning and undetermined intent poisoning cases where the year of death was 2000-2012 were identified by MOH analyst staff by cause of death, including ICD-10 codes X60-X69 (intentional self-poisoning), and Y10-Y19 (poisoning of undetermined intent; (World Health Organization, 2015); see Table 1.3). Some examples of substances in each of these ICD-10 groups are presented in Table A1.1 (Appendix 1). Exclusion criteria used in the study are summarised in 2.2.4.

2.2.1.2 Hospitalisation data (National Minimum Dataset)

Hospitalisation data are reported by DHBs and some private hospitals, and public hospital discharges and private hospital discharge returns are collected into the NMDS by MOH. These data generally become available three (Mortality) or two years (NMDS) after the end of the year of data reported. ICD-10 coding was implemented for MOH

data from the year 2000 onward. Therefore cases were included in the study if the year of admission was 2000-2014, as these were the most recent years available at the time of acquiring the data.

As NMDS data are not available for all private hospitals when only some of them report to the MOH, and private hospitals have varying conventions in coding discharges (Langley et al., 2002), the analysis was limited to public hospital data only. The MOH hospitalisation data, in the NMDS, include cases of hospital stays of at least three hours' duration (Ministry of Health – Manatū Hauora, 2015c, Ministry of Health – Manatū Hauora, 2016). Prior to 1 July 2012, reporting on hospital stays shorter than two days was very variable between DHBs, and therefore the MOH recommend excluding these cases from analysis of data from before July 2012 (Ministry of Health – Manatū Hauora, 2015b). Hospital stays which were discharged under the ED speciality, with stays shorter than 24 hours, are called 'short stays' by the MOH (Ministry of Health – Manatū Hauora, 2016). As other New Zealand studies have done previously, only cases of a minimum of 24 hours stay in a public hospital were included in this study (Langley et al., 2002, Peiris-John et al., 2014). The discharge diagnosis code has been used to find ISP cases from ED-derived data in previous New Zealand studies (Ardagh et al., 2001).

Inclusion criteria

National Minimum Dataset public hospital presentations of at least 24 hours duration which had at least one of the ICD-10 codes X60-X69 or Y10-Y19 (similar to deaths) as one of the discharge diagnosis codes, for the years 2000-2014 (admission year) were obtained from the MOH in October 2015. Exclusion criteria are summarised in 2.2.4.

2.2.2 Ethnicity data

The ethnicity variable requested in both Mortality and NMDS data was 'prioritised ethnicity', ranging in priority from Māori to New Zealand (NZ) European (Ministry of Health – Manatū Hauora, 2004) as described in Table 2.1. This approach has been used previously by Gallagher and colleagues (2012) to describe poisoning cases in the New Zealand context. In this coding, if the person identifies with multiple ethnicities, one

ethnicity is prioritised and coded as the ethnicity for that person. While this may lead to some loss of the variety of ethnicities people may identify with, this more simplified grouping is nevertheless useful to highlight some of the health disparities that different ethnic groups may face. If a population group is very small, prevalence rates cannot be calculated, but through combining smaller ethnicity groups in a systematic way, their rates can also be obtained.

Ethnicity information registered in the Mortality data is obtained from family members assisting in the registration of the death to the Births, Deaths, Marriages, and Citizenship Registry (Ministry of Health – Manatū Hauora, 2014a). Obtaining ethnicity information through self-reporting is important for data quality, as neglecting to do this may lead to incorrect ethnicity assumptions and (for example) under-estimation of Māori numbers (Gallagher et al., 2012). This can lead to inaccurate health information, which does not serve to assist in reducing inequalities in health between Māori and other New Zealanders (Mr Mark Brunton, Kaitakawaenga Rangahau Māori (Facilitator Research Māori), personal communication, 16th July 2015; Ellison-Loschmann and Pearce, 2006).

In the analysis of deaths and hospital presentations due to ISP and UDP, ethnicities were grouped into broader groups of Māori, Pasifika (including 2-9 in Table 2.1), Asian (10-14 in Table 2.1), and 'Other' ethnicity, including NZ European (15-21 in Table 2.1). This higher level of ethnicity coding with four groups (and also 'Unknown ethnicity' in hospital presentations) was used to avoid negatively labelling or accidentally identifying members of very small ethnic groups, but also because this has been shown to be more accurate for Pacific peoples' National Health Index (NHI) number data (Lepa et al., 2013). The NHI is a unique identifier, and can be used to link a person's health details in various healthcare databases (Ministry of Health – Manatū Hauora, 2009). The MOH uses an encrypted version of the NHI in data released for research to de-identify data and preserve patient confidentiality.

2.2.3 Data analysis

Mortality and hospitalisation data were formatted into two separate databases in SPSS software (IBM, statistics version 22), and analysed in SPSS and Excel (Microsoft, 2013 version). Graphs depicting the results were made in Excel.

Table 2.1: 'Prioritised ethnicity' used in data coding.
(Ministry of Health – Manatū Hauora, 2004)

Priority order	Ethnic group
1	Māori
2	Tokelauan
3	Fijian
4	Niuean
5	Tongan
6	Cook Island Māori
7	Samoan
8	Other Pacific Island
9	Pacific Island NFD*
10	South East Asian
11	Indian
12	Chinese
13	Other Asian
14	Asian NFD*
15	Latin American/Hispanic
16	African
17	Middle Eastern
18	Other
19	Other European
20	European NFD*
21	NZ European (Pākeha)

*NFD = 'not further defined'; NZ = New Zealand. If a person has several ethnicities listed, the highest priority ethnicity (smallest order number) is coded in the data.

2.2.3.1 Demographic descriptors

Intentional self-poisoning and undetermined intent poisoning deaths and public hospital presentations were characterised by sex and age, using age groups 0-14, 15-24, 25-34, 35-44, 45-54, 55-64, and 65+. In Mortality data, age was naturally age at death. In hospitalisation data, age was 'age at admission', as this is thought to better describe the circumstances of the person at the time of the ISP and UDP event, rather than 'age at discharge'. These would be the same in many cases, but in some extreme cases with long stays in the hospital, age at discharge may be one or even two years older. Prioritised ethnicity in the broader group priority order, or 1. Māori, 2. Pasifika, 3. Asian, 4. 'Other' (including NZ European), was used in analysis by ethnicity, as described in the previous section.

Domicile area deprivation by NZDep2006 index (White et al., 2008), which describes the general socioeconomic circumstances in the area of residence, though not necessarily those of the individual in question, was used to analyse data by socioeconomic deprivation. NZDep2006 assesses among other factors: unemployment; household income; car and telephone access; sole parenting; home ownership; home living space; educational qualifications; and receipt of means-tested benefits within the area. NZDep2006 deprivation is described by deciles, or quintiles, with the quintile 1-2 holding the least deprived 20% of the areas, 3-4 the second least deprived 20%, and so forth, with 9-10 being the most deprived quintile.

2.2.3.2 Death or hospital presentation descriptors

The cause of death or hospital presentation was investigated, along with substance use details (where available). Hospital presentation parameters such as length of stay (in days excluding leaves or stays in other facilities and other absences from the hospital) and time until next presentation due to ISP/UDP were calculated from the data.

Number of presentations

Readmissions for the same initial presentation, or rehabilitative phases as opposed to the acute, were identified as a person with the same encrypted NHI number presenting

again within 24 hours of the previous discharge for the same reason, as recommended by others (Langley et al., 2002, Kypri et al., 2002). Any two hospital presentations due to ISP and UDP during the same 24-hour period were treated as one presentation, not two separate presentations, when analysing time until the next presentation.

Prevalence rates of methods of poisoning

If a death or hospital presentation had the same ICD-10 diagnosis code multiple times (multiple substances present from the same group), it was only counted once for that case to avoid over-estimating prevalence rates. Prevalence (cases appearing over time) was chosen rather than incidence (new cases appearing over time), as repeats of ISP would be of as much, if not more, concern than new events.

Population particulars and rates

Individual patients were identified from the NMDS dataset by their encrypted NHI numbers. This enabled identification of repeat presentations. The 2006 population (Statistics New Zealand – Tatauranga Aotearoa, 2016) was used for overall rate calculations as this was the Census year closest to the midpoint of the time periods investigated. The 2001, 2006, and 2013 populations were used for 5-year time-trend analyses depicting time periods of 2000-2004, 2005-2009, and 2010-2014, as these were the Census years in those time periods.

The direct age-standardising method (Borman, 1995) using the WHO World Standard Population (Ahmad et al., 2001, Ministry of Health – Manatū Hauora, 2014a) as a reference population was used to age-standardise prevalence rates where necessary. Age-standardising to a standard population age group distribution allows comparison of rates in population groups with differing age structures. Where the total numerator was less than 20, a rate was not calculated, as it would have been too unstable and not reliable. Overlapping of 95% confidence intervals (CIs) was investigated to compare rates between different groups.

2.2.3.3 Substance data

The substance groups, as described by ICD-10 codes, which were encountered in poisoning cases were described, prevalence rates of fatal and hospital-treated poisonings caused by them were calculated, and the extent of substance level data available was investigated and described. As discussed previously, the ICD-10 codes X60-X69 and Y10-Y19 that indicate intent were used to include cases in the study. In addition to these, the ICD-10 contains the codes T36-T50 ('Poisoning by drugs, medicaments and biological substances') and T51-T65 ('Toxic effects of substances chiefly nonmedicinal as to source') to also describe poisoning injuries without indicating intent (World Health Organization, 2015). These diagnosis codes were also investigated after first using the intent-indicating codes to identify cases of ISP and UDP. These ICD-10 'T codes' are listed in Table A1.2 (Appendix 1).

The 'indicator substances'

The nine substances most frequently encountered in overdose and medication misuse at Wellington Regional Hospital ED in the years 2007-2012 were used to investigate NMDS data content. These substances are paracetamol, zopiclone, quetiapine, codeine, ibuprofen, citalopram, clonazepam, fluoxetine, and diazepam (Freeman and Quigley, 2015), and they are described briefly in Table 2.2. The main aim in this current study was to determine whether these individual substances could be identified in the NMDS data so that the rates of them appearing in ISP could be determined. Quantifying the rate of their appearance would assist in assessing the harm they cause through ISP.

Table 2.2: The nine most commonly misused substances encountered at Wellington Regional Hospital ED in 2007-2012.
Adapted from Freeman and Quigley (2015).

Substance	Indication
Citalopram	Antidepressant (SSRI)
Clonazepam	Antiepileptic (benzodiazepine derivatives)
Codeine	Analgesic (opioid)
Diazepam	Anxiolytic (benzodiazepine derivatives)
Fluoxetine	Antidepressant (SSRI)
Ibuprofen	Analgesic (nonsteroidal anti-inflammatory drug, NSAID)
Paracetamol	Analgesic (other analgesics and antipyretics)
Quetiapine	Antipsychotic (atypical, diazepine derivative)
Zopiclone	Hypnotic (benzodiazepine related drugs)

2.2.3.4 Substance abuse and mental health assessments

Mental and behavioural disorders due to psychoactive substance use are described by ICD-10 codes F10-F19, and indicate the substance group involved, as well as whether usage at the time was acute or chronic, and whether it resulted in, for example, psychosis or withdrawal symptoms, significantly affecting the hospital presentation (World Health Organization, 2015). These diagnoses are of interest when investigating ISP, as further information about the extent of the person's use of substances could be obtained. The ICD-10 codes are described briefly in Table 2.3. Details on mental health assessments performed during a hospital presentation were expected to be very limited in these datasets, as also noted previously by Kiel and colleagues (2012), and therefore only scoping of available data was done.

2.2.4 Exclusion criteria

The ISP and UDP cause of death or hospital presentation ICD-10 codes were used to include or exclude cases as described previously. As noted above, private hospital presentations and stays that were shorter than 24 hours were excluded. Hospital presentations occurring within 24h for the same reason as another presentation by the same person (as defined by the encrypted NHI number) were considered extensions of

care for the same condition, and were not counted as re-presentations as also done in previous New Zealand studies (Kypri et al., 2002). Also, cases where the year of death was not 2000-2012 (Mortality data), or the year of hospital admission was not 2000-2014 (NMDS data), were excluded.

Unintentional poisonings (poisonings not coded as X60-X69 or Y10-Y19) were excluded, as were poisoning injuries through medical or surgical procedures (as also previously excluded, for example, by Conner et al. (2003)). These poisoning deaths and hospital presentations occurring due to complications of medical and surgical care (ICD-10 codes Y40-Y84) are beyond the scope of this project due to the different nature of prevention efforts in professional medical care where the exposure to the substance is beyond the control of the patient.

Table 2.3: Mental and behavioural disorders due to psychoactive substance use, ICD-10 coding.
(World Health Organization, 2015)

ICD-10 group	Mental and behavioural disorders due to use of:
F10	alcohol
F11	opioids
F12	cannabinoids
F13	sedatives and hypnotics
F14	cocaine
F15	other stimulants, including caffeine
F16	hallucinogens
F17	tobacco
F18	volatile solvents
F19	multiple drug use and use of other psychoactive substances
ICD-10 group extension	Substance use type *
.0	Acute intoxication (acute drunkenness)
.1	Harmful use (pattern of use damaging to health)
.2	Dependence syndrome (chronic alcoholism)
.3	Withdrawal state (time-limited set of symptoms, related to substance use)
.4	Withdrawal state with delirium (delirium tremens)
.5	Psychotic disorder (paranoia, psychosis, not explained by acute intoxication)
.6	Amnesic syndrome (recent memory affected)
.7	Residual and late-onset psychotic disorder (alcoholic dementia)
.8	Other mental and behavioural disorders (not covered by any of the above)
.9	Unspecified mental and behavioural disorder (related to the substance use)

*For example: F10.0 = alcohol, acute intoxication; F13.3 = sedatives and hypnotics, withdrawal state

Alcohol overdoses without self-harming intent were also excluded when the case was not coded as ‘X65’ or ‘Y15’ (see Table 1.3). One previous study of poisonings only included cases of alcohol poisoning where the blood alcohol content was measured to be above 20 mg/100ml (McDowell et al., 2005); however, since this toxicological information was not available in the MOH datasets for the vast majority of cases, all cases that had ‘X65’ or ‘Y15’ coded were included. As the clinician and/or the clinical

coder had made the decision to include the code, it was considered significant to the presentation. This could not be confirmed from the datasets.

Cases of self-immolation (using an accelerant to set oneself on fire) were excluded from the analysis, unlike in the chemical suicide analysis by Gallagher et al. (2012). It could be argued that because the accelerant used in self-immolation is a chemical, therefore with possibilities for controlling (inappropriate) access to it, those cases should be included. As the mechanism of injury in self-immolation is perhaps more external than for other types of poisoning injury where something is ingested or inhaled, it was felt that this exclusion was warranted. Self-immolation is classified under 'Intentional self-harm by smoke, fire and flames' ('X76') in ICD-10.

2.3 Ethics approvals for Study 1

This section describes the ethical approvals involved in preparation for the study. Previously in November 2013, the Ngāi Tahu Research Consultation Committee (NTRCC) discussed the research proposal for the whole PhD project, and found the topic of intentional self-poisoning to be of interest to Māori. They recommended that attention be paid to collection of ethnicity data through using self-identified ethnicity, to correctly identify Māori in datasets. The NTRCC also recommended dissemination of the final results to Māori health organisations, as well as requesting that a copy be sent to the NTRCC. This consultation covered all four studies presented in this thesis.

As Study 1 involved using de-identified health data previously collected by the MOH, the University of Otago Human Research Ethics Committee (Health) 'Departmental Conditional Approval of Projects' pathway B was used. This involved peer review of the application by a colleague at the School of Pharmacy, as well as approval from the Dean of the School of Pharmacy.

Peer review in this context involves assessment of the relative merit of the research, its design and methods, feasibility of the research proposed, and presentation of the application. Dean's assessment involves review of the proposed measures to maintain data security and the ethical challenges involved in the study.

This Departmental Conditional Approval application was approved by the School of Pharmacy departmental ethics committee on 28 October 2015 (reference number: 25-15). The University of Otago Human Research Ethics Committee (HREC) reviewed this approval and ratified it. MOH data were subsequently purchased.

As the MOH data are de-identified (encrypted NHI numbers only), there was no concern that individual persons could be identified from it. Despite this, the material was kept on a password-protected computer only, on the University of Otago secure server, and only aggregate level results were reported. In conclusion, this research was approved by the appropriate ethics committee and conducted in accordance with the University's Responsible Practice in Research – Code of Conduct.

2.4 Results of Study 1

This section describes the findings made in the analysis of MOH Mortality and hospital presentation (NMDS) data. Ministry of Health analyst staff identified the cases from their databases by diagnosis codes X60-X69 and Y10-Y19, and by year of death (2000-2012), and hospital presentations by year of admission or discharge (2000-2014), from which presentations where the admission year was 2000-2014 were selected. Fatal poisonings are presented first in 2.4.1, and hospital presentations are described in 2.4.2.

2.4.1 Mortality data

In the 13-year time period investigated (2000-2012), a clear majority (n = 1,751; 93%) of the 1,881 ISP and UDP poisoning deaths were intentionally self-inflicted, while 130 (7%) were of undetermined intent.

2.4.1.1 Demographic descriptors

Two thirds (n = 1,258; 67%) of those who died of ISP and UDP were men. It should be noted that the sex distribution in the general New Zealand population is close to 51% females and 49% males (Statistics New Zealand – Tatauranga Aotearoa, 2016). Of all the deaths, 155 people (8%) were Māori, 25 (1%) were Pasifika, 47 (2%) were Asian, and

1,654 (88%) were of 'Other' ethnicity (including NZ European; for a further breakdown, see Table 2.4).

Those who died of ISP and UDP were fairly young, with 50% of Māori, 68% of Pasifika, 40% of Asian, and 27% of 'Other' ethnicity decedents aged younger than 35. There were only three deaths in those aged 0-14 (one male and two females), and these were all coded as ISP, not UDP. The rates of ISP and UDP deaths per 100,000 population by ethnic group, by age group, and by indicator of domicile area deprivation are presented in Table 2.5.

Table 2.4: Numbers of deaths due to ISP and UDP by broader ethnic groups, with an additional breakdown of the broader 'Other' ethnicity group.

Broader ethnic group	Deaths, n (%)
Māori	**155 (8.2%)**
Pasifika	**25 (1.3%)**
Asian	**47 (2.5%)**
Other	**1,654 (87.9%)**
European NFD	13 (0.7%)
NZ European	1,413 (75.1%)
Other European	223 (11.9%)
Middle Eastern	3 (0.2%)
Latin	1 (0.05%)
Other	1 (0.05%)
Total	**1,881 (100%)**

NFD: 'not further defined'; NZ = New Zealand

[page intentionally blank]

Table 2.5: Prevalence rates of intentional self-poisoning (ISP) and undetermined intent poisoning (UDP) events; events per 100,000 population.

	ISP and UDP deaths, 2000-2012					ISP and UDP public hospital presentations, 2000-2014				
Overall ASR* of ISP and UDP by sex and ethnicity										
Ethnic group	**Māori**	**Pasifika**	**Asian**	**Other**	**All of NZ**	**Māori**	**Pasifika**	**Asian**	**Other**	**All of NZ**
Men	2.88	***	0.98	5.01	4.46	54.11	19.23	11.41	45.56	45.67
Women	1.45	***	***	2.25	2.05	97.11	30.34	27.13	98.51	95.61
Women's/Men's rate ratio	***0.5***	-	-	***0.4***	***0.5***	***1.8***	***1.6***	***2.4***	***2.2***	***2.1***
Total	2.12	0.70	0.88	3.59	3.21	76.24	24.82	19.48	72.29	70.86
Age-specific rate of ISP and UDP										
Age group	**0-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65+**	**0-14**	**15-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65+**
Men	***	3.33	7.46	7.41	7.17	5.62	5.41	4.44	73.99	75.06	66.02	52.32	35.03	31.22
Women	***	1.62	2.74	3.92	3.69	2.40	2.23	23.73	203.86	127.76	128.58	97.11	49.85	32.61
Women's/Men's rate ratio	-	***0.5***	***0.4***	***0.5***	***0.5***	***0.4***	***0.4***	***5.3***	***2.8***	***1.7***	***1.9***	***1.9***	***1.4***	***1.0***
Total	***	2.48	5.01	5.60	5.40	3.99	3.65	13.85	138.31	102.38	98.52	75.14	42.54	31.99
ASR* of ISP and UDP by deprivation, NZDep2006**														
Deprivation quintile	**1-2**	**3-4**	**5-6**	**7-8**	**9-10**	**1-2**	**3-4**	**5-6**	**7-8**	**9-10**				
Men	3.63	4.26	4.61	5.17	4.40	24.73	32.24	42.66	61.50	61.80				
Women	1.86	1.83	2.01	2.27	2.37	65.98	77.14	92.93	124.72	116.73				
Women's/Men's rate ratio	***0.5***	***0.4***	***0.4***	***0.4***	***0.5***	***2.7***	***2.4***	***2.2***	***2.0***	***1.9***				
Total	2.73	3.02	3.28	3.68	3.36	45.10	54.43	67.58	93.26	89.71				

Table 2.5, continued:

ASR* of ISP and UDP by method used	ISP and UDP deaths, 2000-2012				ISP and UDP public hospital presentations, 2000-2014			
Intentional and undetermined intent poisoning by and exposure to:	**Men**	**Women**	**W/M RR***	**Total**	**Men**	**Women**	**W/M RR****	**Total**
X60+Y10 (nonopioid analgesics, antipyretics and antirheumatics; for example paracetamol, NSAIDs, salicylates)	***	***	-	0.05	12.31	39.62	***3.2***	26.04
X61+Y11 (antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs; for example antidepressants, antipsychotics, minor tranquillizers)	0.66	0.69	***1.0***	0.68	26.43	56.15	***2.1***	41.53
X62+Y12 (narcotics and psychodysleptics [hallucinogens], not elsewhere classified; for example opioids, cannabis, cocaine)	0.32	0.35	***1.1***	0.33	6.66	13.05	***2.0***	9.88
X63+Y13 (other drugs acting on the autonomic nervous system; for example parasympatolytics, sympatolytics)	***	***	-	***	1.86	3.57	***1.9***	2.72
X64+Y14 (other and unspecified drugs, medicaments and biological substances; for example anaesthetics, hormones, systemic antibiotics, therapeutic gases)	0.20	0.13	***0.7***	0.16	7.82	17.47	***2.2***	12.67
X65+Y15 (alcohol; for example ethanol, methanol, propanol)	***	***	-	***	10.28	17.56	***1.7***	13.97
X66+Y16 (organic solvents and halogenated hydrocarbons and their vapours)	***	***	-	***	0.57	0.50	***0.9***	0.53
X67+Y17 (other gases and vapours; for example carbon monoxide, helium)	3.01	0.72	***0.2***	1.83	2.90	1.23	***0.4***	2.04
X68+Y18 (pesticides)	***	***	-	0.04	0.62	0.45	***0.7***	0.53
X69+Y19 (other and unspecified chemicals and noxious substances; for example corrosive acids and caustic alkalis, glues, detergents)	0.08	***	-	0.05	1.69	2.37	***1.4***	2.03

*ASR = Age-standardised rate; ** W/M RR = women's rate to men's rate ratio; ***Total numerator less than 20, rate not calculated; ****NZDep2006 = Socioeconomic deprivation index, 2006 localities. NSAID = nonsteroidal anti-inflammatory drug

ISP and UDP deaths by sex and age group

The male rate of ISP and UDP deaths (4.46 per 100,000 population) was 2.2-fold compared to that of females (2.05 per 100,000; Table 2.5). This was the case for people of Māori and 'Other' ethnicity, but not for Asian people. The rate in Asian males was only 1.3-fold compared to the corresponding female rate. The highest ISP and UDP death rate was in the age group 35-44 (5.60 per 100,000), though the rates of those aged 25-34 and 45-54 were nearly as high (5.01 and 5.40 per 100,000 population, respectively). The male rate in the age group 15-24 (2.48 per 100,000) was 0.4-fold, and 0.7-fold in those aged 55-64 (3.99 per 100,000) and 65+ (3.65 per 100,000), compared to men aged 35-44 (7.41 per 100,000). The age group distribution of ISP and UDP deaths differed from the New Zealand general population, as the proportion of those aged younger than 35 was 29% compared to 49% in the general population (Figure 2.1).

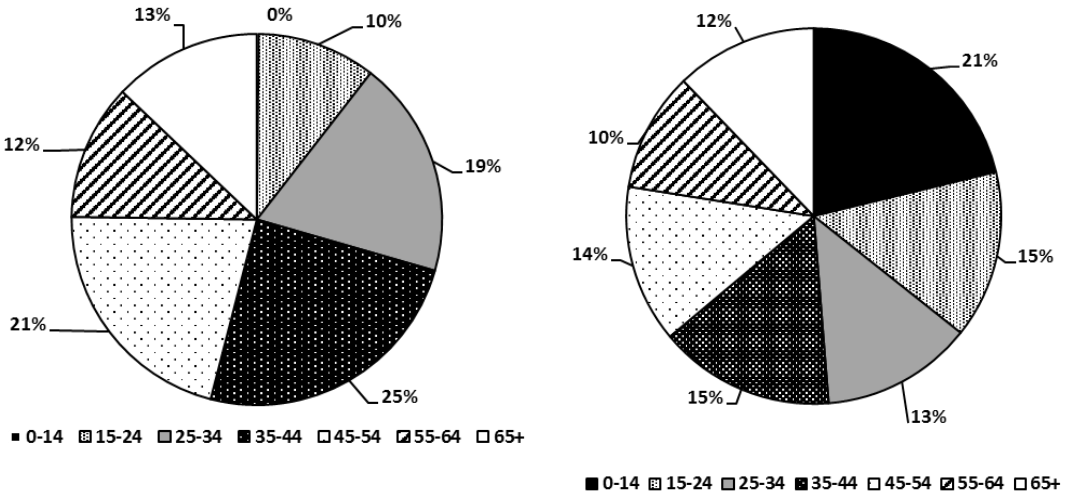

Figure 2.1: The age group distribution of ISP and UDP deaths (left), and the general 2006 New Zealand population (right).

ISP and UDP death rates by ethnicity

Of all ISP and UDP deaths in 2000-2012, 8% were Māori, 1% were Pasifika, 2% were Asian, and 88% were of 'Other' ethnicity. The numbers of deaths of people of Pasifika ethnicity were very low (a total of 25 deaths), and therefore rates could not be calculated for Pasifika men and women separately. The highest overall rate of ISP and UDP death was for people of 'Other' ethnicity (3.59 per 100,000), which was slightly higher than the NZ overall rate (3.21 per 100,000), 1.7-fold that of Māori (2.12 per 100,000), 4.1-fold that of Asians (0.88 per 100,000), and 5.1-fold that of people of Pasifika ethnicity (0.70 per 100,000; Table 2.5).

ISP and UDP death rates by domicile area deprivation

The overall rates of death by NZDep2006 quintile groups (1-2 least deprived, 9-10 most deprived areas) did not vary appreciably (Table 2.5). The female-to-male rate ratio remained at about 0.5 across all quintiles, and the lowest overall ISP and UDP rate was in the 1-2 quintile (2.73 per 100,000), and the highest in the 7-8 quintile (3.68 per 100,000).

2.4.1.2 Mental and behavioural disorders due to psychoactive substance use

Only 251 (13%) of all ISP and UDP death cases had details recorded about mental and behavioural disorders due to psychoactive substance use. Of these cases, 173 (69%) indicated alcohol, 59 (24%) tobacco, 29 (12%) cannabinoids, 20 (8%) opioids, 18 (7%) multiple drug use and use of other/unspecified psychoactive substances, 11 (4%) other stimulants including caffeine, six (2%) hypnotics, and three (1%) volatile solvents as the substance used. Some 45 cases were coded as 'acute intoxication', 104 as 'harmful use', 81 as 'dependence syndrome', while the remaining 21 cases were combinations of these. As expected, no details were available about mental health assessments in this dataset, though due to unknown yet likely large proportions of deaths happening outside of healthcare facilities with unknown timelines, this is understandable.

2.4.1.3 Causes of death

The most common cause of death for men was 'other gases and vapours' (ICD-10 codes 'X67' or 'Y17') with 841 men (67% of the total) dying through these methods. Only three of these cases were of undetermined intent, while the rest were ruled intentional. A total of 211 women (34% of the total) died of 'X67' or 'Y17', while 215 (35% of women) died of 'antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' ('X61' or 'Y11'), compared to only 187 men (15%). The number of deaths due to 'X67' per year had a downward trend over time, going from 106 in 2000 to only 41 in 2012 (Figure 2.2). Rates of deaths by method and sex are shown in Table 2.5. The rate of 'X67' and 'Y17' death for men, 3.01 per 100,000 population, was 4.3-fold that of women's (0.72 per 100,000). The male and female rates of death through 'X61' and 'Y11' were almost equal, 0.66 and 0.69 per 100,000 population, respectively.

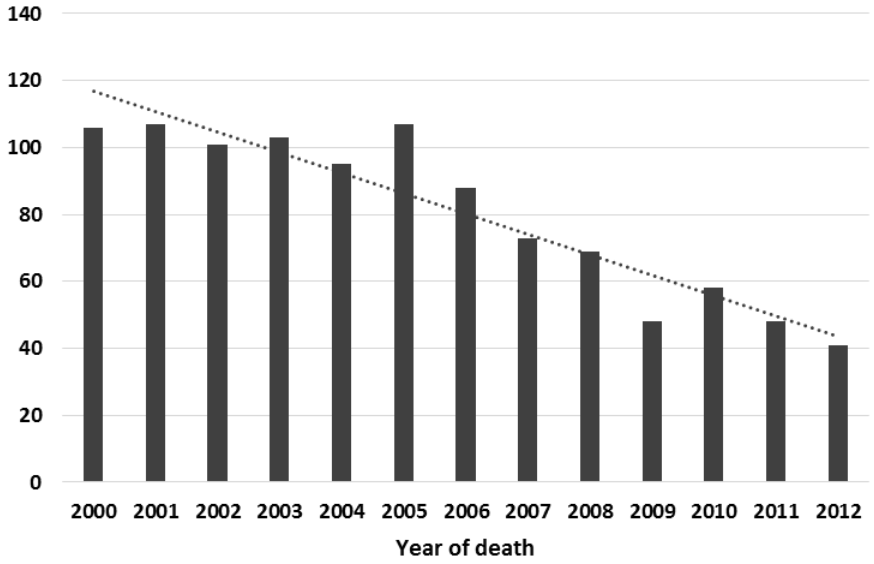

Figure 2.2: Intentional and undetermined intent poisoning deaths due to 'other gases and vapours' over time.

By pure proportions, the most common methods of ISP and UDP death in New Zealand in 2000-2012 were 'gases and vapours' ('X67' and 'Y17'; 56% of deaths), 'antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs' ('X61' and 'Y11'; 21%), and 'narcotics and psychodysleptics [hallucinogens]' ('X62' and 'Y12'; 11%). Together, these three diagnosis groups were coded in 88% of all ISP and UDP deaths (Figure 2.3; ICD-10 codes are listed in Table 1.3).

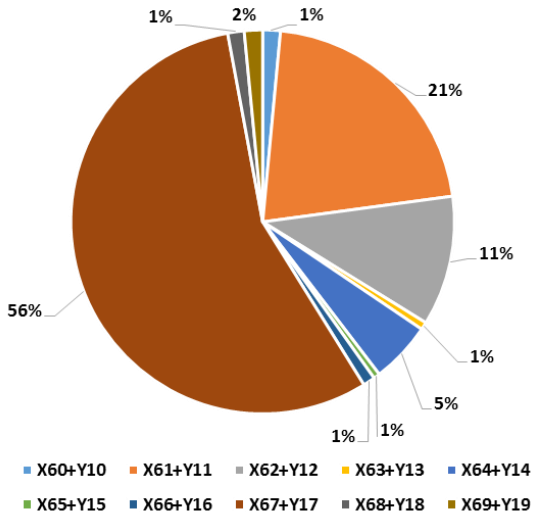

Figure 2.3: Methods of intentional and undetermined intent self-poisoning resulting in death, as recorded as cause of death, 2000-2012.

Specific details about toxicology testing results

There were no details available about specific substances used in the poisonings in the majority of cases, except in 603 cases (32%) where some details were available. These were recorded in a free text field variable ('drug and alcohol details'), a variable for blood alcohol level, or a field for 'alcohol involved' where the value 'yes' were considered to indicate a positive result and 'trace' (indicating trace amounts) was not.

The twenty most frequently observed substances indicated in the 603 cases with details available are presented in Table 2.6. There were a further 68 substances or substance groups indicated in fewer cases but not listed here. In summary, individual substances could be identified from these 603 cases. The results for all the toxicants suggested by the ICD-10 coding were not listed in all of these cases, however, and therefore from the Mortality data alone it was impossible to ascertain whether there were other substances besides the ones listed involved in the poisoning or not.

Table 2.6: The twenty substances which were recorded most frequently in intentional and undetermined intent deaths, 2000-2012.

Substance in death case	Number of cases	% of 603 cases*	% of all deaths	Brief description
Alcohol	267	44.3	14.2	ethanol
Carbon monoxide	178	29.5	9.5	source not specified
Zopiclone	70	11.6	3.7	benzodiazepine-related hypnotic
Codeine	40	6.6	2.1	opioid analgesic
Morphine	35	5.8	1.9	opioid analgesic
Venlafaxine	25	4.1	1.3	SNRI antidepressant
Amitriptyline	24	4.0	1.3	TCA antidepressant
Nortriptyline	19	3.2	1.0	TCA antidepressant
Citalopram	18	3.0	0.96	SSRI antidepressant
Diazepam	17	2.8	0.90	benzodiazepine hypnotic
Paracetamol	16	2.7	0.85	non-opioid analgesic
Quetiapine	14	2.3	0.74	antipsychotic
Tramadol	13	2.2	0.69	opioid analgesic
Oxycodone	11	1.8	0.58	opioid analgesic
Dothiepin (Dosulepin)	10	1.7	0.53	TCA antidepressant
Fluoxetine	10	1.7	0.53	SSRI antidepressant
Methadone	10	1.7	0.53	opioid analgesic
Olanzapine	10	1.7	0.53	antipsychotic
Lorazepam	9	1.5	0.48	benzodiazepine hypnotic
Triazolam	8	1.3	0.43	benzodiazepine hypnotic

*Deaths where substance details were listed.

2.4.1.4 Certification of death

A total of 1,831 deaths (97%) were certified by a Coroner, and a PM examination was registered in the data in 1,783 cases (95%). The proportion of ISP and UDP deaths certified by a Coroner with an inquest, to determine the identity of the decedent and to determine the cause of death, ranged from 99% to 51% over the time period 2000-2012 (Figure 2.4).

There was an increase in Coroner's verdicts without inquest in 2008-2010, but in 2012 they decreased back to 10%, with a corresponding increase in Coroner's verdicts with an inquest (Figure 2.4). In 2012, the last year studied in this project, eight ISP and UDP cases (7% of that year's cases) had a Coroner's interim report, so they were not finalised yet. In the whole study period, 43 cases (2%) had an interim report recorded in the data.

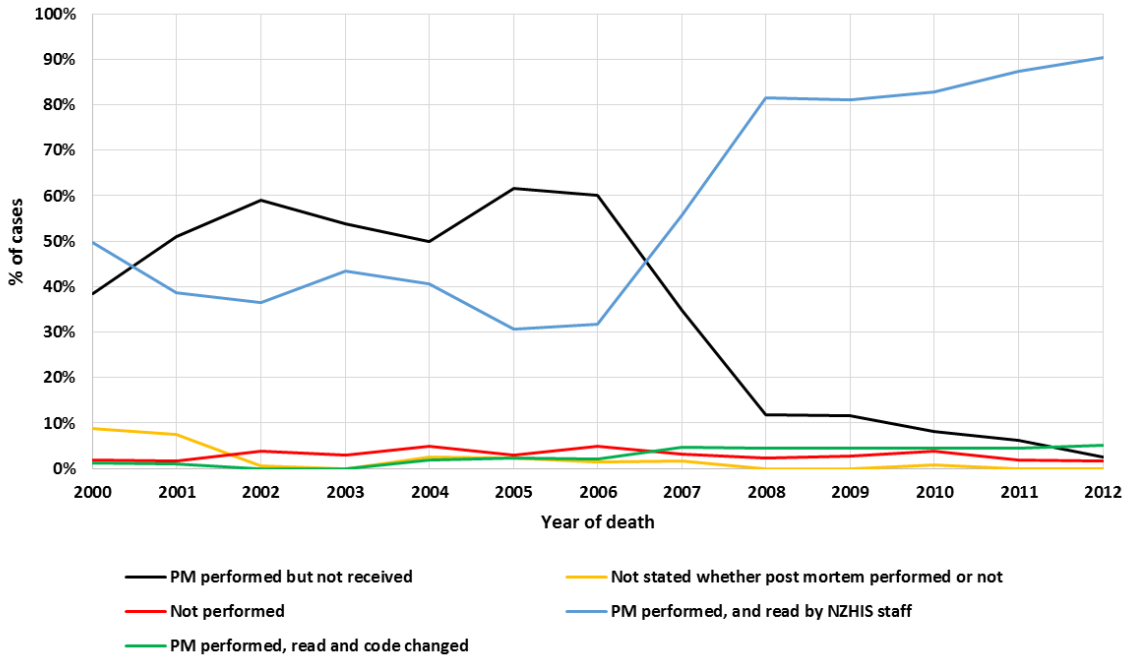

Figure 2.4: The proportion of ISP and UDP deaths certified by different methods in 2000-2012.

In a total of 1,658 ISP and UDP deaths (88%), the death was certified by a Coroner in an inquest. In 173 cases (9%) the Coroner delivered their verdict without an inquest, and in only seven cases (0.4%), the death was certified by a doctor instead of a Coroner. The percentage of cases still unfinished (Coroner's interim report) was slightly higher for Māori than for non-Māori: 5% vs. 2%, respectively. The percentage of cases finalised by the Coroner but without an inquest was slightly higher for non-Māori compared to Māori: 10% vs. 6%, respectively.

2.4.1.5 Forensic examinations

The percentage of ISP and UDP death cases with a PM performed, and results being available for the New Zealand Health Information Service (NZHIS) for coding increased over the time period 2000 to 2012 from a low of 33% in 2005 to 95% in 2012 (Figure 2.5; blue and green lines combined). The percentage of no PM being performed was fairly stable, at about 3% throughout 2000-2012. There was no information about whether a PM had been performed or not in only 2% of all cases (down from 9% in 2000 to 0% in 2012), and the proportion of cases where PM results were not received though a PM was performed decreased from a high of 62% in 2005 to only 3% in 2012.

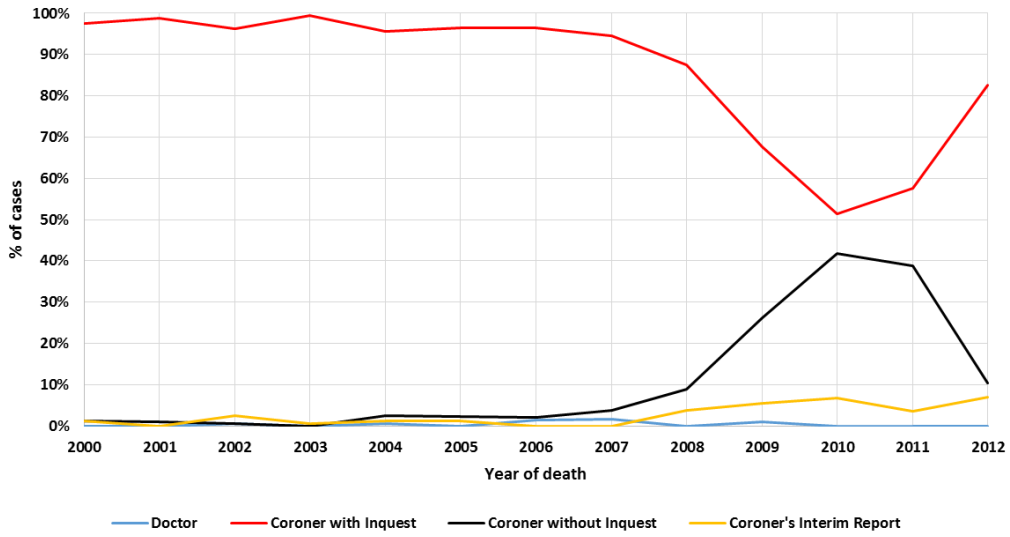

Figure 2.5: The proportions of ISP and UDP death cases with a post mortem examination performed, and information available for case coding, 2000-2012.

2.4.1.6 Regional analysis

Of the 1,881 ISP and UDP deaths in 2000-2012, the home (domicile) DHB of the deceased was known in all but five cases (0.3%). One of these unknown cases involved a woman, and four were men. One person was Māori, and four were of 'Other' ethnicity. It is important to note that people may have died in another DHB area: only the domicile DHB is coded in these MOH data (Ministry of Health – Manatū Hauora, 2014a).

The highest rate of ISP and UDP death was in West Coast DHB (5.7 per 100,000; Table 2.7), with Whanganui DHB almost as high (5.5 per 100,000). Auckland DHB had the lowest rate, 2.4 per 100,000 population, similar to Counties Manukau DHB (2.5 per 100,000), Capital & Coast DHB (2.7 per 100,000), and Waitemata DHB (2.8 per 100,000). The West Coast DHB rate was 1.8-fold that of the overall New Zealand rate.

Table 2.7: Age-standardised rates of deaths due to intentional and undetermined intent poisoning in 2000-2012, by DHBs, per 100,000 population.

DHB	ASR; deaths per 100,000
West Coast	5.7
Whanganui	5.5
MidCentral	4.4
South Canterbury	4.4
Nelson Marlborough	4.1
Wairarapa	4.1
Canterbury	3.8
Bay of Plenty	3.7
Hutt Valley	3.6
Southern	3.6
Northland	3.5
All of New Zealand	***3.2***
Taranaki	3.2
Hawke's Bay	3.1
Lakes	3.0
Waikato	2.9
Waitemata	2.8
Capital & Coast	2.7
Counties Manukau	2.5
Auckland	2.4
Tairawhiti	*

*Total numerator smaller than 20, age-standardised rate (ASR) not calculated.

2.4.2 Hospital presentation data

In the 15-year time period investigated (2000-2014), there were 43,777 public hospital presentations by 28,648 people for ISP and UDP (short stays excluded).

2.4.2.1 Demographic descriptors

Two-thirds of the people (n = 18,444; 64%) and presentations (n = 29,727; 68%) were women. About a third (n = 14,392; 33%) of the presentations were by people aged younger than 25. The age-standardised rates (ASRs) of ISP and UDP hospital presentations by sex, prioritised ethnicity, and NZDep2006 index, and crude rates by age group, are presented in Table 2.5.

A third of the presentations were by men. These presentation proportions by sex varied by age group (age at admission), ranging from 16% men and 84% women in the age group 0-14, to 44% men and 56% women in the age group 65+. The proportion of women was larger than the proportion of men in every age group (Figure 2.6).

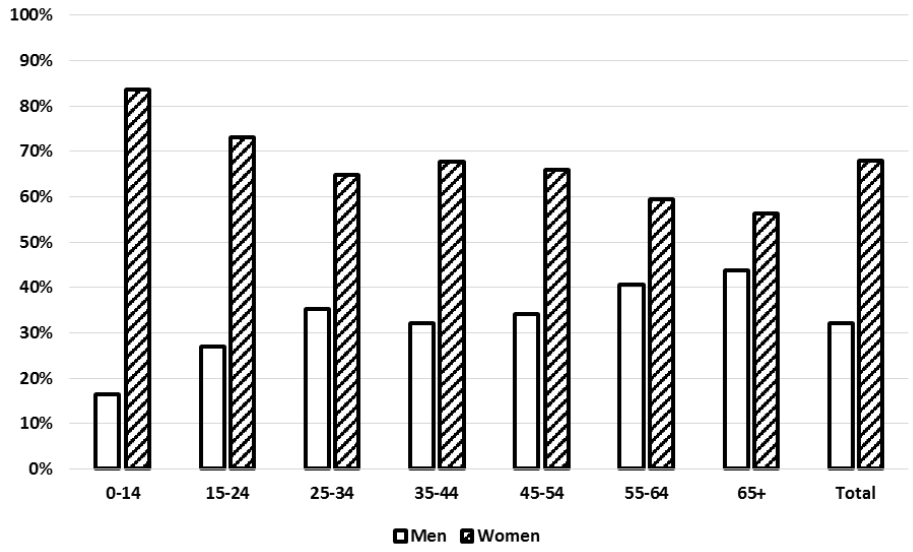

Figure 2.6: The proportions of men and women within age groups: public hospital presentations due to intentional and undetermined intent poisoning, 2000-2014.

Ethnicity

Prioritised ethnicity information was missing for 503 cases (1%). Of all public hospital presentations due to ISP and UDP, 16% were by Māori, 2.5% by Pasifika, 2.9% by Asian, and 77.5% by people of 'Other' ethnicity: a further breakdown of the 'Other' ethnicity group in hospital presentations is presented in Table 2.8. The largest ethnic group by absolute numbers in the study sample was NZ European (Pākeha), with two thirds of all presentations occurring in this group.

Table 2.8: Numbers of public hospital ISP and UDP presentations and people presenting by ethnic groups, 2000-2014.

Ethnic group	Presentations, n (%)	People, n (%)
Māori	**6,992 (16.0%)**	**5,136 (17.9%)**
Pasifika	**1,078 (2.5%)**	**886 (3.1%)**
Asian	**1,291 (2.9%)**	**1,073 (3.7%)**
'Other'	**33,913 (77.5%)**	**21,142 (73.8%)**
European NFD*	773 (1.8%)	
NZ European	29,385 (67.1%)	
Other European	2,864 (6.5%)	
Middle Eastern	130 (0.3%)	
Latin American/Hispanic	29 (0.1%)	
African	126 (0.3%)	
Other	606 (1.4%)	
Unknown	**503 (1.1%)**	**412 (1.4%)**
Total	**43,777 (100%)**	**28,648 (100%)**

* NFD: 'not further defined', NZ = New Zealand

The proportions of major ethnic groups of ISP and UDP presentations varied between age groups (age at admission), with a particularly high proportion of Māori and Pasifika people presenting to hospitals due to ISP and UDP in the younger age groups 0-14, 15-24 and 25-34, and a high proportion of 'Other' ethnicity in the older age groups 55-64 and 65+ (Figure 2.7). This perhaps reflects the relative youth of Māori and Pasifika populations in

general: the proportion of those aged 0-34 in 2006 was 67% in Māori, 69% in Pasifika, 61% in Asian people, and 45% in people of 'Other' ethnicity (Figure 2.8; adapted from Statistics New Zealand – Tatauranga Aotearoa, 2016). The proportion of Māori in ISP and UDP presentations went from 29% of the total in the youngest age group to only 4% in the oldest age group (Figure 2.7). The proportion of Pasifika went down from 4% in the youngest age group to only 1% in the oldest age group. The proportion of Asian people varied between 4% and 2% across the age groups.

When presentation rates were standardised to the WHO World Standard Population, Māori had the highest age-standardised rate of ISP and UDP hospital presentations with 76.24 events per 100,000 population, compared to 72.29 per 100,000 for 'Other' ethnicity (includes NZ European), 24.82 per 100,000 for Pasifika, and 19.48 per 100,000 for Asian people (Table 2.5). The highest rate of ISP and UDP among men was in Māori men, 54.11 per 100,000, while women of 'Other' ethnicity had the highest rate among women, 98.51 per 100,000, with the rate for Māori women almost at a similar level, at 97.11 per 100,000.

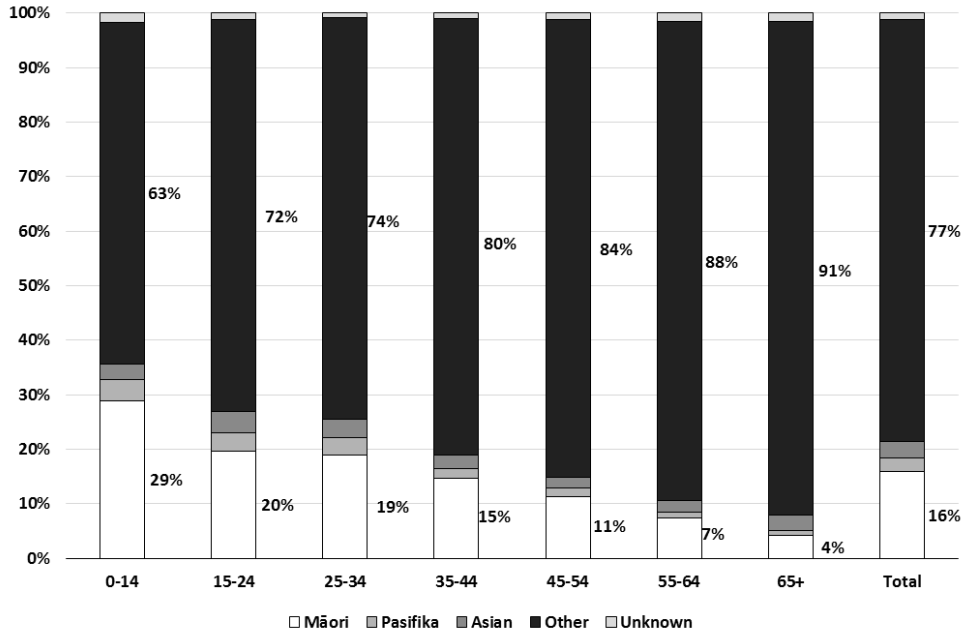

Figure 2.7: The proportions of ethnicities by age groups: presentations to public hospitals due to intentional and undetermined intent poisoning, 2000-2014.

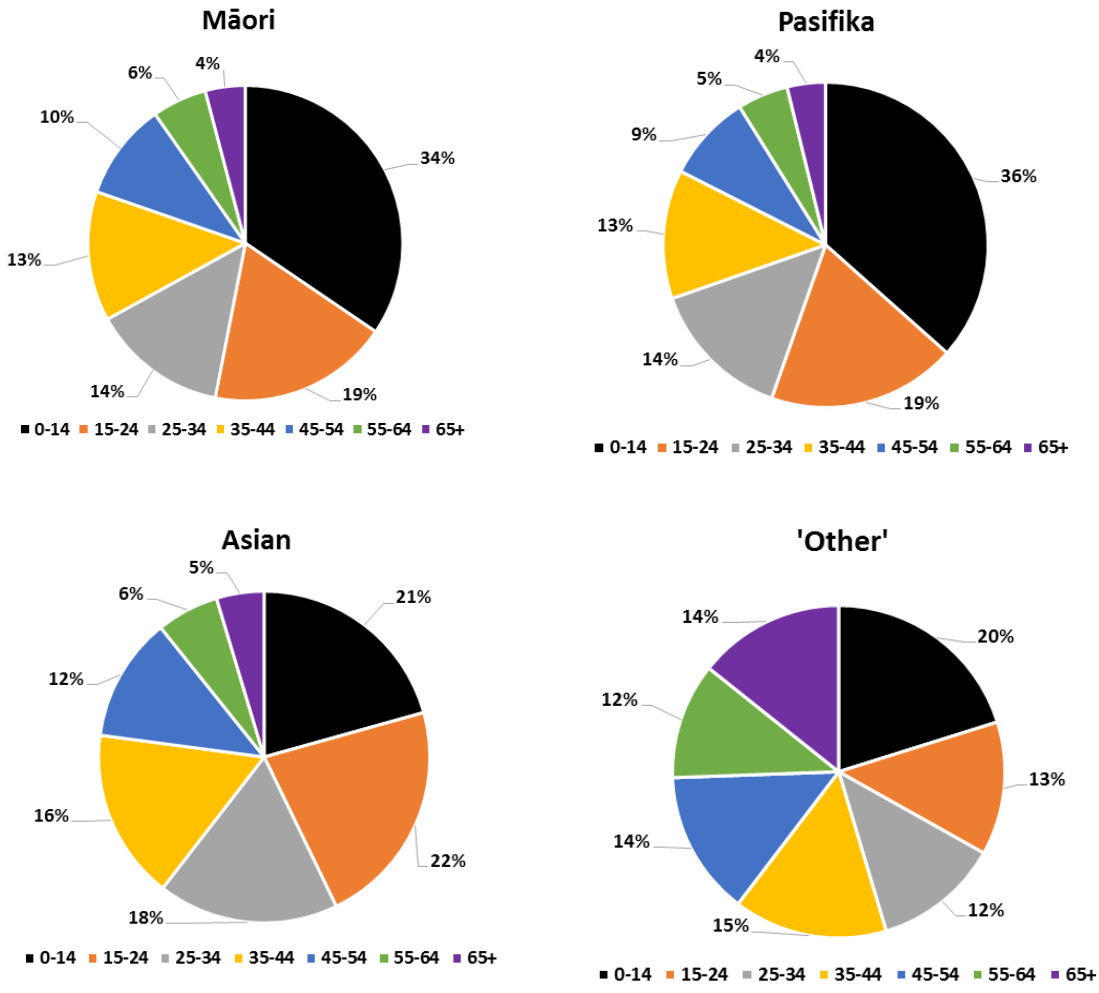

Figure 2.8: Age group proportions by ethnic group, based on the 2006 general population.

Domicile area deprivation

The NZDep2006 domicile area deprivation index values were investigated, and these were missing for 258 presentations (0.6%). The 2006 general population NZDep2006 quintile proportions were obtained from the Office for Disability Issues – Te Tari Mō Ngā Take Hauātanga (2016) website for comparison.

A total of 54% of the ISP and UDP cases were from the two most deprived quintiles (9-10 and 7-8), while only 34% of the general population in 2006 fell into these two quintiles (Figure 2.9). The rates of ISP and UDP deaths were not dramatically different by domicile area deprivation quintile (Table 2.5), however, the rate of hospital presentations was 2-fold in the two most deprived quintiles compared to the rates in the least deprived quintile (1-2).

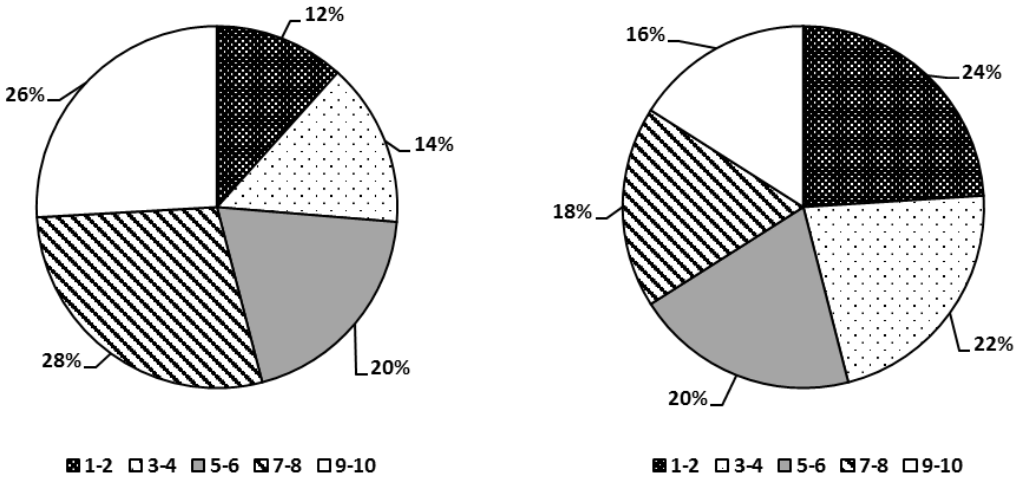

Figure 2.9: Quintiles of domicile area deprivation: NZDep2006 quintile proportions of intentional and undetermined intent presentations (left), and the general New Zealand population in 2006 (right).

2.4.2.2 Mental and behavioural disorders due to psychoactive substance use

A total of 5,327 presentations (12%) had at least one 'F code' (see Table 2.3) for mental and behavioural disorders due to psychoactive substance use. The frequency varied by age group, with 0.1% of those aged 0-14 having an 'F code', 2.3% of those aged 15-24, 2.7% of those aged 25-34, 3.4% of those aged 35-44, 2.3% of those aged 45-54, 0.8% of those aged 55-64, and 0.4% of those aged 65+ having at least one such code.

A total of 4,493 (84%) of the 5,327 presentations with at least one 'F code' indicated alcohol, 462 (9%) indicated opioids, 952 (18%) cannabinoids, 239 (4%) sedatives or hypnotics, seven (0.1%) cocaine, 229 (4%) other stimulants, 17 (0.3%) hallucinogens, 128 (2%) tobacco, 48 (1%) volatile solvents, and 530 (10%) multiple drug use and use of other psychoactive substances. Of all the 'F codes', 985 (18%) involved acute intoxication, 2,214 (42%) harmful use, 3,167 (59%) dependence syndrome, 487 (9%) a withdrawal state, and 49 (1%) a withdrawal state with delirium. A further 106 (2%) indicated a psychotic disorder, nine (0.2%) an amnesic syndrome, 11 (0.2%) a residual and late-onset psychotic disorder, 32 (0.6%) other mental and behavioural disorders, and 43 (0.8%) unspecified mental and behavioural disorders. As these presentations could involve more than one 'F code', the totals for the above are greater than 100%.

2.4.2.3 Cause of presentation

The majority of presentations (n = 38,985; 89%) involved at least one ISP code (X60-X69), while 4,838 (11%) involved at least one UDP code (Y10-Y19; Table 2.9). Most presentations (n = 38,938; 89%) had no UDP codes, while 4,791 (11%) had no ISP codes. The proportion of presentations having an ISP code appeared to be slightly lower in the age groups 0-14 (84%) and 65+ (81%) than for the total sample (89%). The reverse was observed for UDP codes, with the age groups 0-14 (16%) and 65+ (19%) having proportionally more presentations with UDP codes than the total sample (11%). Half of the ISP and UDP presentations (n = 22,536; 52%) had one ISP or UDP code, while 13,371 (31%) had two, 5,454 (13%) had three, 1,789 (4%) had four, and 627 (1%) had five codes. The same ISP or UDP code appeared more than once within 796 presentations (2% of all presentations), and when calculating ICD-10 code rates (Table 2.5), any given ISP or UDP code was counted only once within the same presentation. This was done so that the prevalence rates of the ICD-10 codes would not be over-estimated through multiple 'replicates' of the same code appearing in any one presentation.

Table 2.9: Proportions of public hospital presentations with at least one ISP code, and at least one UDP code, by age groups, 2000-2014.

Age group	Is there at least one true ISP code?		% ISP within age group	Is there at least one UDP code?		% UDP within age group	Total presentations in age group within the study sample
	No	Yes		No	Yes		
0-14	297	1,549	84%	1,549	297	16%	1,846
15-24	1,366	11,180	89%	11,165	1,381	11%	12,546
25-34	820	7,571	90%	7,565	826	10%	8,391
35-44	846	8,539	91%	8,529	856	9%	9,385
45-54	623	5,788	90%	5,779	632	10%	6,411
55-64	371	2,371	86%	2,364	378	14%	2,742
65+	468	1,987	81%	1,987	468	19%	2,455
Total	4,791	38,985	89%	38,938	4,838	11%	43,776*

*One presentation had the person's age missing, therefore the total here is missing one presentation.

Methods by age groups

There were differences in methods used in the ISP and UDP event by age groups. The two youngest age groups, 0-14 and 15-24, had 'nonopioid analgesics, antipyretics and antirheumatics' ('X60+Y10') in 39% and 32% of the presentations, respectively (Table 2.10). These are higher than the 22% whole sample, overall rate of the same codes, or the 14-20% rates in the other age groups. By contrast, these two youngest age groups had less 'antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' ('X61+Y11'), at rates of 23% and 31%, respectively, while all other age groups had over 40% of 'X61+ Y11' presentations.

Table 2.10: Proportions of public hospital presentations which have at least one matching ICD-10 code, by age groups, 2000-2014.

Age group	X60+ Y10	X61+ Y11	X62+ Y12	X63+ Y13	X64+ Y14	X65+ Y15	X66+ Y16	X67+ Y17	X68+ Y18	X69+ Y19
0-14	***39%***	23%	8%	2%	***19%***	5%	1%	0%	1%	3%
15-24	32%	31%	9%	2%	12%	10%	0%	1%	0%	2%
25-34	20%	42%	8%	2%	10%	13%	1%	2%	0%	2%
35-44	17%	42%	8%	2%	10%	15%	0%	2%	1%	1%
45-54	16%	41%	9%	3%	11%	15%	0%	2%	0%	2%
55-64	15%	40%	8%	4%	14%	13%	0%	3%	1%	2%
65+	14%	***43%***	10%	3%	15%	8%	1%	3%	1%	3%
Total	22%	38%	9%	2%	11%	13%	0%	2%	0%	2%

The ICD-10 codes used in this table are described in Table 1.3.

Methods of ISP and UDP by sex

Age-standardised rates of presentations by sex and by diagnosis code (method of poisoning) are presented in Table 2.5. The male 'other gases and vapours' ('X67+Y17') hospital presentation rate, 2.90 per 100,000, was 2.4-fold that of females (1.23 per 100,000). The highest rates for hospital presentations for both men and women were due to 'X61+Y11', 26.43 per 100,000 and 56.15 per 100,000, respectively. Other significant causes of hospital presentation for men were 'X60+Y10' and 'alcohol' ('X65+Y15'), with rates of 12.31 per 100,000 and 10.28 per 100,000, respectively. The rates for hospital presentations due to 'X60+Y10' and 'X65+Y15' in women, also common causes, were 39.62 per 100,000 and 17.56 per 100,000. A fourth significant cause for women to present was ISP or UDP due to 'other and unspecified drugs, medicaments and biological substances' ('X64+Y14'), with a rate of 17.46 per 100,000.

Time trends in methods of ISP and UDP

Since the time period investigated spanned 15 years, simple time trends were described. There appeared to be an increase in hospital presentations due to 'narcotics and psychodysleptics [hallucinogens], not elsewhere classified' ('X62+Y12') and 'X65+Y15' ISP

and UDP poisonings over time, whereas 'X67+Y17' poisonings appeared to decrease (Figure 2.10).

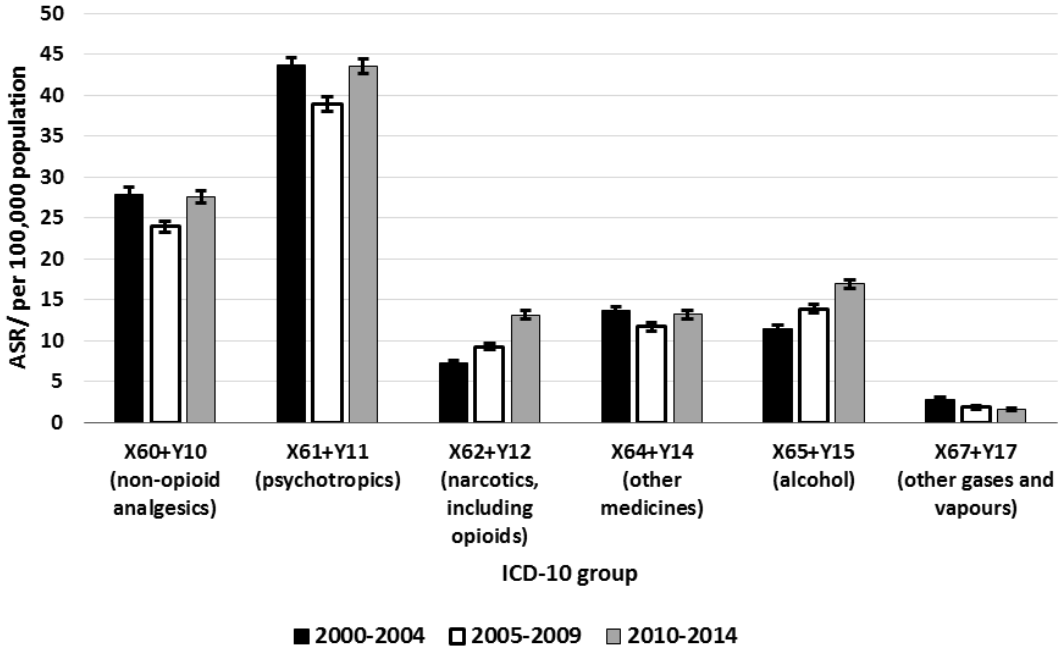

Figure 2.10: Age-standardised rates of ISP and UDP public hospital presentation rates (with 95%CI error bars) by methods over three 5-year periods.

Specific substances investigated with 'indicator substances'

The ICD-10 groups X60-X69 and Y10-Y19 are too broad to effectively describe individual substances, however, presentation details may also include 'T codes' that describe poisoning agents by the ICD-10 codes T36-T65 Table A1.2 (Appendix 1). 'T codes' were used to describe the substances encountered in the ISP and UDP presentations. There were no free text fields available in NMDS cases to record the specific substances involved in the poisoning.

A total of 1,240 presentations (2.8%) included diagnosis codes that by definition did not give details about the specific substances: T50.9 ('Other and unspecified drugs,

medicaments and biological substances'), T65.8 ('Toxic effect of other specified substances'; there is no free text field to specify these in this dataset), and T65.9 ('Toxic effect of unspecified substance'). A total of 14,786 presentations (34%) had at least one diagnostic code of the 'unspecified substance' within the T code group. This was inclusive of across a wide range of agents from 'Nonopioid analgesic, antipyretic and antirheumatic, unspecified' (T39.9) through to 'Toxic effect of contact with unspecified venomous animal' (T63.9; see Table A1.2 in Appendix 1 for full listing). Although a class of drugs or other agents was provided, the specific agent was not. The broadness of the drug class described by the 'unspecified' code varied according to the ICD-10 group in question.

Agent-specific information is likely to be reliable in the following ISP subcodes, where the frequency of unspecified agents was low (<15%). 'Nonopioid analgesics, antipyretics and antirheumatics' ('X60+Y10') only had 1% unspecified coding (T39.9), while 82% of these presentations indicated paracetamol (T39.1) and 27% indicated 'non-steroidal anti-inflammatory drugs (NSAIDs) other than salicylates' (T39.3). Ibuprofen alone could not be identified (Table 2.11). 'Narcotics and psychodysleptics [hallucinogens], not elsewhere classified' ('X62+Y12') had 3% unspecified codes from within the class (T40.6; T40.9), and 88% indicated opioids (T40.0-T40.4). Codeine alone could not be identified. 'Other drugs acting on the autonomic nervous system' ('X63+Y13') had 15%, and 'other and unspecified drugs, medicaments and biological substances' ('X64+Y14') had 14% presentations where there was an unspecified code from within the class. 'Alcohol' ('X65+Y15') presentations had 5% unspecified alcohols (T51.9), and 92% indicated ethanol (T51.0). 'Organic solvents and halogenated hydrocarbons and their vapours' ('X66+Y16') presentations had 9% unspecified codes (T52.9, T53.9), while 'other gases and vapours' ('X67+Y17') had 1% unspecified codes (T59.9), and 85% had a code for carbon monoxide (CO; T58). 'Pesticides' ('X68+Y18') presentations had 10% unspecified pesticides (T60.9).

In contrast, 'antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' ('X61+Y11') had a 47% non-specified rate (T42.7; T43.2; T43.5; T43.9), making it very difficult to advise on which specific agents are causing harm. Of presentations classed 'X61+Y11', 17% had a code indicating 'tricyclic and tetracyclic

antidepressants' (T43.0), 31% indicated 'other and unspecified antidepressants' (T43.2) which includes citalopram and fluoxetine, 23% indicated 'other and unspecified antipsychotics and neuroleptics' (T43.5) which includes quetiapine, 32% indicated benzodiazepines (T42.4) which includes clonazepam and diazepam, and 31% indicated 'Other antiepileptic and sedative-hypnotic drugs' (T42.6) which includes zopiclone (Table 2.11). None of these 'X61+Y11' class 'indicator substances' could be identified separately. 'Other and unspecified chemicals and noxious substances' ('X69+Y19') not surprisingly comprised 34% of unspecified codes (T54.9, T59.9, T57.9, T61.9, T62.9, T63.9, T65.8, and T65.9).

In summary, paracetamol could be identified separately from the NMDS data, as well as ethanol and CO (from 'all sources', meaning vehicles, burning fuel material, etc.). Otherwise the structure of the ICD-10 clinical coding system prevented or reduced the ability to identify the specific 'indicator substances'.

Table 2.11: Summary of 'indicator substance' detection in hospital presentations.

ICD-10 group (T code)	% of ISP and UDP presentations	'Indicator substance'	Individually identified?
4-aminophenole derivatives (T39.1)	29%	Paracetamol	**Yes**
Benzodiazepines (T42.4)	19%	Clonazepam	No
		Diazepam	No
Other and unspecified antidepressants (excl. MAOI, TCA, Tetracyclics; T43.2)	18%	Citalopram	No
		Fluoxetine	No
Other antiepileptic and sedative-hypnotic drugs (incl. valproic acid; T42.6)	18%	Zopiclone	No
Other and unspecified antipsychotics and neuroleptics (T43.5)	13%	Quetiapine	No
Opioids (T40.0-40.4)	12%	Codeine	No
NSAID (excl. salicylates; T39.3)	10%	Ibuprofen	No
Other substance of interest: Ethanol (T51.0)	19%	Ethanol	**Yes**

2.4.2.4 Presentation descriptors

Three quarters of people (n = 21,703; 76%) presenting with symptoms of self-poisoning, as identified by their encrypted NHI number, presented only once during the 15-year study period, while 6,946 people (24%) presented more than once. Interestingly, there were 97 people who presented at least 15 times in the 15-year study period, and the range of the number of presentations per person was from one to 124.

There were 603 presentations occurring on the same day as another one by the same person (by encrypted NHI), and these were investigated and excluded. In 97 of these excluded cases (16%) the data available suggested that it may have been another, new presentation on the same day, while for 431 cases (72%) they indicated patient transfers for the same presentation. Seventy-five cases (12%) were unclear. Based on the level of information available in the data, the possibility cannot be excluded that an ISP or UDP event occurring for a second time during the same day might have involved a new event.

There were only a maximum of three presentations by the same person per day in the dataset, with 27 people having one episode of three presentations on the same day (a triplicate presentation), while 530 people had two presentations on the same day (duplicate). Additionally, one person had a duplicate and a triplicate presentation, one person had three duplicate events, two people had four duplicates, and one person had five duplicate presentations. These were all excluded as described previously.

The number of times a person presented, the length of stay in hospital, and the number of days between two consecutive ISP or UDP presentations (where applicable), are described in Table 2.12, and excluded same day presentations by the same person. Total hours spent in an intensive care unit was listed for 3,221 presentations (7%), and for these, the mean hours spent in ICU was 39.6 (95% CI 38.1-41.2).

Table 2.12: Characteristics of public hospital presentations due to intentional self-poisoning and poisoning of undetermined intent, 2000-2014.

	Number of times presented		Length of stay in hospital*; days		Number of days between two ISP and UDP presentations	
	n**	**Mean [95% CI]**	**n*****	**Mean [95% CI]**	**n******	**Mean [95% CI]**
Everyone	28,645	1.53 [1.50-1.55]	43,777	4.3 [4.1-4.5]	15,128	409 [397-421]
Māori	5,135	1.33 [1.30-1.36]	6,992	3.5 [3.2-3.9]	1,856	533 [495-572]
Pasifika	886	1.20 [1.15-1.26]	1,078	3.7 [3.2-4.2]	192	464 [338-590]
Asian	1,073	1.20 [1.15-1.25]	1,291	4.4 [3.7-5.1]	218	353 [266-440]
Other	21,551	1.61 [1.57-1.64]	34,416	4.5 [4.3-4.7]	12,862	391 [379-404]

* Hospital stays shorter than 24h excluded. **People. ***Presentations. ****Only presentations where there are subsequent other presentations for the same person.

Discharge events

A total of 1,254 presentations (3%) ended by the patient self-discharging from the hospital against medical advice and before formal discharge, while treatment may have been ongoing. A third of these presentations (388) signed an indemnity form, declaring their understanding that they left the hospital at their own risk before treatment was finished, while in 866 self-discharging ISP and UDP presentations the patient did not sign indemnity.

Public hospital presentation due to poisoning led to death in the ED, hospital, or eventually after an irreversible, non-survivable injury in only 259 presentations (0.6%). A total of 1,863 presentations (4%) were finalised as ‘a psychiatric patient discharged into community care’, and 879 (2%) as ‘a psychiatric patient transferred for further psychiatric care’. A clear majority, or 33,815 presentations (77%) indicated that the presentation ‘ended routinely’, while 5,485 (13%) indicated discharges to other facilities or healthcare units.

The most common medical specialty seen last, prior to discharge was general medicine (57% of presentations). The second most common specialty were various mental health

specialities, with a combined total of 21% of presentations seen by mental health specialty last before discharge. It is important to note that the proportion here does not necessarily reflect possible contacts with mental health services prior to seeing the formally discharging hospital entity, or later in the community setting.

2.4.2.5 Treatment locations

The ten hospitals with the most ISP and UDP presentations by absolute numbers in the country over the 15-year study period were Christchurch Hospital (8% of all cases), North Shore Hospital - Auckland (8%), Wellington Hospital (8%), Hutt Hospital – Lower Hutt (5%), Middlemore Hospital - Auckland (5%), Waikato Hospital – Hamilton (5%), Dunedin Hospital (4%), Tauranga Hospital (4%), Palmerston North Hospital (4%), and Henry Rongomau Bennett Centre - Hamilton (a mental health inpatient hospital, 4%). The DHB of the person's domicile was the same as the DHB of the presentation hospital in 94% of cases, while 6% of cases presented to a DHB different from their registered domicile DHB. The DHB of the facility was chosen for rate calculations, as this would indicate the burden of ISP and UDP in each DHB.

Age-standardised rates of ISP and UDP hospital presentations were calculated for men, women, and people (the total population) in the twenty DHBs in three-year periods, with the 30 June 2007, 30 June 2010, and 30 June 2013 population estimates (Statistics New Zealand – Tatauranga Aotearoa, 2016). The time periods investigated were 2006-2008, 2009-2011, 2012-2014, and the population estimates were chosen to be as close to the middle of these time periods as possible.

Counties Manukau, Auckland, and Hawke's Bay DHBs had the lowest rates for men, and these were below the national rates (Table 2.13). West Coast, South Canterbury, and Wairarapa DHBs had higher rates than the national rates, but also relatively small populations (Statistics New Zealand – Tatauranga Aotearoa, 2016), limiting the reliability of ASR calculations when even a small change in hospitalisation numbers can change the rate significantly. Capital & Coast DHB had a relatively high rate of ISP and UDP hospital

presentations for both men and women, while the rate for ISP and UDP deaths (Table 2.7) was well below average among the DHBs. The male rate in Lakes DHB was higher than the national male rate, while the female rate was lower than the national female rate.

Similar to men, three-year ASRs of ISP and UDP for women were lowest in Counties Manukau, Auckland, and Hawke's Bay DHBs (Table 2.14). Age-standardised rates of hospital presentations due to ISP and UDP were highest in women in Wairarapa, South Canterbury, West Coast, and Nelson Marlborough DHBs. The Nelson Marlborough female rate was 2-fold the national female rate, while the male rate was slightly below the national male rate. Therefore the female-to-male rate ratio was 4.6 for Nelson Marlborough DHB, while for most DHBs it was close to 2. The lowest female-to-male rate ratio was in Auckland DHB (1.3).

The DHBs with the lowest and highest ASR of ISP and UDP hospital presentations were the same for the total sample (all people) as for women (Table 2.15). When national ASRs were compared between women and men, the mean female-to-male rate ratio was 2.1 (range: 1.3 to 4.6).

Table 2.13: Age-standardised rates of ISP and UDP hospital presentations for men, three-year time periods; events per 100,000 population.

MEN	2006-2008	2009-2011	2012-2014
West Coast	70.2	80.4	**124.1**
South Canterbury	103.8	**100.9**	91.1
Capital & Coast	42.5	42.1	86.6
Wairarapa	**140.9**	98.6	81.3
Bay of Plenty	54.5	63.4	73.6
Tairawhiti	53.4	67.1	72.8
Lakes	61.8	55.0	69.4
Southern	55.9	70.4	68.7
Hutt Valley	57.3	43.2	66.5
Northland	56.9	65.5	63.6
Taranaki	59.4	63.6	61.8
Waikato	50.2	52.7	53.6
All of New Zealand	***43.9***	***43.5***	***48.2***
Whanganui	62.7	39.0	47.0
Nelson Marlborough	83.4	72.3	45.3
Waitemata	37.2	42.6	44.6
MidCentral	46.5	27.2	41.4
Canterbury	38.3	35.8	40.6
Auckland	27.4	24.6	23.7
Hawke's Bay	29.5	26.6	21.5
Counties Manukau	**22.8**	**21.0**	**18.6**

The highest and lowest rates per time period are in larger font, bold.

Table 2.14: Age-standardised rates of ISP and UDP hospital presentations for women, three-year time periods; events per 100,000 population.

WOMEN	2006-2008	2009-2011	2012-2014
Wairarapa	**306.8**	**205.1**	**260.6**
South Canterbury	190.1	172.3	232.8
Capital & Coast	94.5	129.7	219.4
West Coast	144.8	163.7	217.2
Nelson Marlborough	215.9	193.8	210.2
Southern	117.1	139.7	164.0
Hutt Valley	128.1	125.2	153.1
Bay of Plenty	91.3	110.1	138.5
Tairawhiti	139.5	116.2	126.2
Northland	119.6	115.4	113.5
Canterbury	90.6	79.1	109.8
All of New Zealand	***89.5***	***85.1***	***107.3***
Taranaki	125.2	108.4	105.8
Lakes	107.2	83.0	102.1
Waitemata	72.5	77.1	93.9
Whanganui	105.0	67.6	92.8
Waikato	106.0	85.0	89.6
MidCentral	93.8	56.1	87.5
Auckland	**35.4**	35.2	57.7
Hawke's Bay	61.3	38.7	46.4
Counties Manukau	42.7	**31.8**	**28.1**

The highest and lowest rates per time period are in larger font, bold.

Table 2.15: Age-standardised rates of ISP and UDP hospital presentations for the total sample, three-year time periods; events per 100,000 population.

TOTAL	2006-2008	2009-2011	2012-2014
Wairarapa	**224.1**	**152.7**	**171.4**
West Coast	105.3	121.1	170.3
South Canterbury	145.6	136.9	160.2
Capital & Coast	69.4	87.5	154.9
Nelson Marlborough	147.9	132.6	126.1
Southern	86.8	105.6	117.0
Hutt Valley	93.2	84.7	110.7
Bay of Plenty	73.0	87.0	106.5
Tairawhiti	96.9	92.0	99.1
Northland	88.1	90.7	88.7
Lakes	84.4	68.8	85.4
Taranaki	92.7	86.3	83.7
All of New Zealand	***66.9***	***64.5***	***77.9***
Canterbury	64.3	57.0	74.4
Waikato	78.6	69.1	71.7
Whanganui	83.8	53.3	69.7
Waitemata	55.1	60.0	69.4
MidCentral	70.5	42.0	64.8
Auckland	**31.4**	29.9	40.6
Hawke's Bay	45.6	32.7	34.2
Counties Manukau	32.8	**26.4**	**23.3**

The highest and lowest rates per time period are in larger font, bold.

2.5 Limitations of Study 1

We were limited in this study by the information available in the datasets and their variables. In the case of public hospital discharge data, this was by how much detail had been recorded by ED staff at various hospitals, and how much of this detail was consequently transferred into the NMDS during the clinical coding process (described in Study 2; section 4.4.6).

Scope of the data, inclusion criteria

Using ICD-10 codes that describe the diagnosis or cause of death to identify cases to be included is a systematic way of extracting data. No additional key word searches were done to identify possible additional cases that did not have matching ICD-10 codes. This would have been too impractical to request from MOH personnel since there was no free text field to be used for this purpose. If a case had been erroneously coded, for example, by the presenting complaint ('abdominal pain') rather than a specific poisoning, a case could have been missed and therefore excluded from the study. Coding errors are known to occur in these data (Hatcher et al., 2009, Ministry of Health – Manatū Hauora, 2014a, Davie et al., 2008), and the level of data recorded may not enable detecting them all during MOH quality control measures or in the analyses done in this study. Peiris-John and colleagues (2014) have argued previously that the completeness and specificity of coding should be improved.

As there are inconsistencies in how private hospitals use discharge codes, and how data are collected (Hatcher et al., 2009), private hospital presentations were excluded and only public hospital data were analysed, as for example Conner and colleagues (2003) chose to do in their study of injury hospitalisations. Excluding private hospital data can lead to under-reporting self-harm in NMDS-based studies (Conner et al., 2003, Hatcher et al., 2009). We think, however, that this is not likely to be a significant issue. While formal evidence on this is lacking, if ISP patients present to private hospitals, they would be likely to be referred to public hospital EDs, as they would need to have a mental health assessment performed there. If an overdose is intentional, private hospital staff would be obligated to ensure the safety of the patient, and if deemed incompetent to make rational decisions about their own care, a patient presenting after ISP would be referred to an ED for further care. If the patient is not deemed incompetent, however, they may choose not to agree to a referral to an ED. In this instance they may be missing from public hospital data. This same potential limitation applies to those presenting to GP clinics. Importantly, those discharged in under 24 hours, and those not presenting to any health care facilities at all were not included in

this study, and their experiences and case features may differ from those who presented to public hospitals.

Population numbers and rates

Population numbers for DHBs were only available by 2015 DHB borders from the Statistics New Zealand website, and therefore these borders were used in all calculations of rates in DHBs. This may have introduced a systematic error, as the borders of DHBs may have been slightly different in earlier years, including population groups that were then incorrectly counted in or left out of total DHB population numbers.

When calculating age-standardised rates, MOH use the WHO World Standard Population (Ministry of Health – Manatū Hauora, 2014), and this was also done in this study. This standard population does not fit Māori or Pasifika very well as they are much 'younger' as a whole population, and have larger proportions of young people in comparison to the Standard. Standardising all applicable rates to the same standard population enables comparisons between different population groups, and can therefore be justified.

NHI numbers

The NMDS data contains encrypted NHI numbers, and therefore enabled identification of individuals as encrypted units, though not giving their actual identities. The possibility of erroneous encrypted NHI numbers in the dataset cannot be excluded, or the possibility that a person may have multiple different NHI numbers in the database despite the best efforts of the MOH to reduce this problem.

When analysing hospital presentation repetition, encrypted NHI numbers were used to identify people presenting more than once in the dataset. Encrypted NHI numbers in NMDS data are considered reliable from the 2007/2008 reporting period (personal communication, Dr Alesha Smith, School of Pharmacy, 20th September 2015), and our period of analysis started from the year 2000. Some re-presentations occurring before 1 July 2007 may therefore have been missed due to incorrect encrypted NHI numbers, but the extent of this occurring could not be investigated due to the de-identified nature of the

data. As the analysis was done fully based on encrypted NHI numbers, we cannot exclude the possibility that this de-identified method of counting numbers of people and identifying cases that are repeat presentations may have led to over- or under-estimations.

Diagnosis code

Regarding deaths, in the last year studied in this project (2012), eight ISP and UDP cases (7%) that year had a Coroner's interim report, so they were not as yet finalised. In the whole study period, 43 cases (2%) had an interim report recorded in the data. It is therefore possible that the cause of death in these cases was later changed as the Coroner reached the final verdict. Suicide mortality data are generally considered reliable, as they involve a Coroner's investigation, often with a post mortem examination, toxicology testing, and a pathologist statement involved in determining the cause of death (Ministry of Health – Manatū Hauora, 2015d).

The discharge diagnosis code is included in all NMDS cases, and classified in ICD-10 codes (World Health Organization, 2015), Australian Modification (ICD-10-AM) and is guided by the WHO Rules and Guidelines for Mortality Coding. One of the issues affecting reliability of these data is that coding may occur based on the symptoms causing the presentation, for example abdominal pain, instead of the cause of the presentation, such as ISP (Hatcher et al., 2009). This is a known coding issue affecting data reliability and validity, and official guidelines from the MOH specify that coding by injury method, i.e. 'car crash', is to be prioritised when entering data on the NMDS (Ministry of Health – Manatū Hauora, 2014a).

As an error rate of 14% may be expected in the first three letters of ICD-10 codes in NMDS data (Davie et al., 2008), it is possible that some cases that may have been miscoded were left out of or were erroneously included in the hospitalisation dataset that was analysed here.

A strength of this study was the additional information on substance groups offered by ICD-10 'T codes' used beside the 'X' (intentional) and 'Y' (undetermined intent) codes. The intent-indicating 'X' and 'Y' codes first identified the cases for the analysis, and the T codes

described the drug groups or drugs involved in more detail to a varying degree, depending on the ICD-10 class structure and level of detail therein.

Including poisonings of undetermined intent

Including poisonings of undetermined intent (Y10-Y19) resulted in 7% more deaths and 11% more hospital presentations, and the justification for these inclusions could not be investigated further, as details about the events were not available. As these cases had not been ruled unintentional, and as poisoning as a method is perhaps less indicative of intent than other forms of self-harm such as hanging (Walsh and Rosen, 1988), this inclusion was thought to be warranted.

Including hospital presentation cases of undetermined intent in the very young age groups, especially in those younger than 10, may be questioned further. Poisonings may be coded as UDP if, for example, assault rather than an unintentional event is suspected. Determining a set 'cut-off' age limit for a child understanding intentional self-harm as such is difficult, and the numbers of hospital presentations by people younger than 10 were low in the study sample. The possible confounding effect of including UDP cases on child/youth rates as descriptors of prevalence of ISP is therefore limited, yet the possibility that a small number of cases not related to intentional self-poisoning were included in our study sample cannot be excluded.

Toxicological information

Toxicological information may have been systematically limited, as only the ICD-10 codes of the main toxicants involved in the poisoning may have been recorded in the cases, especially in the public hospital presentations – this will be explored and described during the PhD project (Chapter 4; Study 2). The possibility of missing some substances if they had not been coded in cannot be excluded, however, the most clinically significant codes are likely to be in. Some ISP and UDP codes in the Mortality data indicated substances that were not reflected by the limited free text toxicology details. The NMDS did not offer such free text fields, but only ICD-10 diagnosis codes.

Hospital presentation timelines

When investigating 'same day presentations' in the NMDS data, only the date of admission was available, so two presentations on both sides of midnight would have been counted as two separate events, even if they were part of the same presentation. In addition to this, if a person presented more than once within the same day, there were not enough details available to definitely determine whether it was a separate presentation or part of the same one. The majority of these appeared to indicate that they were part of the same presentation, suggesting that exclusion was justified. People may have represented after several days for the same complaint, however, and this would not have been revealed in our analysis. The relatively small proportion of people having another presentation during the 15-year time period, and the large mean number of days between two presentations suggest that the effect of this may be negligible.

NMDS data include ED admissions and stays of three hours or more, from 1999 onward (Howson et al., 2008). The MOH (2015b) states that hospital stays of 3-24 hours duration were recorded more consistently only from the 2009/2010 reporting period, and warns against using data for presentations shorter than two days before 1 July 2012. Regardless of this, similar to previous studies (Peiris-John et al., 2014), only hospital presentations lasting 24 hours or more were included. This cut-off is expected to have excluded many ISP and UDP presentations of shorter duration (Ministry of Health – Manatū Hauora, 2015b, Ministry of Health – Manatū Hauora, 2015c). To further characterise the impact of presentation duration on inclusion or exclusion in studies, an Auckland audit study in 2008, which looked at ISH presentations to an ED, found that 1% of ISH patients had already been discharged from the hospital within three hours, therefore being excluded from NMDS data (Howson et al., 2008). Also, as any stay longer than three hours gets recorded as an admission on hospital computer systems, patients may be recorded in NMDS data as longer stays, even if they are only waiting at the ED to be seen by a doctor, and are discharged without treatment after that has occurred (Yates, 2003). Together these timeline-related factors would be expected to cause fluctuation in hospitalisation numbers, and also to

significantly affect hospital presentation numbers based on the time frame chosen as the exclusion limit. This study used 24 hours, as that has been used by similar studies.

2.6 Discussion: Study 1

In this section I will discuss the findings from two foci of impact. Epidemiology of ISP and UDP, as evidenced in the Mortality and NMDS datasets, are discussed first, with implications for suicide and self-harm prevention. Secondly, the impact of observed limitations of substance information are discussed. In the end of this section I will briefly discuss the connections of this present study to the other studies in this thesis.

2.6.1 Findings about the population particulars

The ISP and UDP death rate for men was higher, while the hospital presentation rate was lower than for women. These male and female prevalence rates are similar to previous studies' incidence rates (Peiris-John et al., 2014), taking into account that we included poisonings of undetermined intent, and people younger than 25. We chose to look at prevalence rather than incidence, as repeat presentations would be of as much concern, if not more, than first presentations. Since the majority of people presented to a hospital only once during the time-period investigated, the prevalence rates approach incidence rates in this population.

The highest ISP and UDP hospital presentation rate for men was for Māori men, while the highest rates for women were those for Māori and 'Other' ethnicity (including NZ European) women. Those aged 35-44 had the highest ISP and UDP death rates, while those aged 15-24 had the highest hospital presentation rates. The hospital presentation rates for women were mostly 2-fold compared to men by age groups; however, in the 65+ age group the rates were equal, and in the 0-14 age group women's was 5.3-fold that of men's. The proportion of UDP was highest in the youngest and oldest age groups. There is evidence to indicate that older people who are suicidal do not communicate their intent well (Conwell et al., 1998). Young people may prefer to seek help from peers rather than from

professional sources (Michelmore and Hindley, 2012). Together these observations could indicate that communicating with the youngest and the oldest may be challenging, and therefore intent is not able to be determined accurately, leading to an 'undetermined intent' classification. NZDep2006 indexing by domicile did not change ISP and UDP death rates significantly, but for hospital presentation rates, the rates in the two most deprived quintiles (7-8, 9-10) were double those in the least deprived quintile (1-2). These findings are in line with recent rates of suicide and self-harm in New Zealand (Ministry of Health – Manatū Hauora, 2016), and previous multinational research on self-harm from Europe (Schmidtke et al., 1998).

There appeared to be a trend for Māori, Pasifika, and Asian people to present to hospitals fewer times than people of 'Other' ethnicity (1.20-1.33 vs. 1.61 times). Length of stay in hospital or days between two subsequent presentations did not differ markedly by ethnicity, though Māori appeared to have a shorter mean stay at hospital and longer time until a subsequent presentation than people of 'Other' ethnicity. A quarter of the study sample presented more than once, and the time between two presentations was relatively long; these are in line with similar evidence from Canada (Finkelstein et al., 2016), though the time to next presentation was slightly longer in our study sample. This could be due to differences in study design, as our study only included cases with a stay of 24 hours or longer, whereas the Canadian study did not exclude shorter stays.

'Other gases and vapours' ('X67+Y17') was the most common ISP or UDP cause of death for men, with a rate 4.6 times as high as for the second most common method, 'antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' ('X61+Y11'). While the MOH Mortality data alone do not mostly allow identification of specific substances, the gas in question in deaths due to 'X67' is often carbon monoxide in New Zealand (Gallagher et al., 2012, Peiris-John et al., 2014), as was the case also for hospital presentations due to 'X67' and 'Y17' in our study.

Population-particular implications for suicide and self-harm prevention

It is alarming that there were a significant number of deaths and hospital presentations due to 'other gases and vapours' (X67) in 2012. Throughout the years 2000-2012 the percentage of newly registered cars imported from Japan, with catalytic converters fitted, has been very high, between 60 to 77% (New Zealand Transport Agency – Waka Kotahi, 2006; New Zealand Transport Agency – Waka Kotahi, 2013), which could suggest that overall numbers of cars with catalytic converters have also increased. Catalytic converters convert vehicle exhaust carbon monoxide into less toxic carbon dioxide, providing a form of passive harm reduction, explaining the overall decreasing trend, but are seemingly not able to fully eliminate the problem. Further sources of carbon monoxide include gas from incomplete combustion from barbeques and gas heating, which have been utilised for self-harm. A study by the Ministry of Transport, indicated that for reasons unknown, many Japanese import cars taken for scrapping had their converters removed (Ministry of Transport – Te Manatū Waka, 2009). Due to the relatively high lethality of carbon monoxide poisoning, and the number of deaths from 'other gases and vapours', while not all necessarily from motor vehicle exhaust gas, further investigations of New Zealand motor vehicles would be warranted to assess the risks of vehicle exhaust carbon monoxide poisoning.

The comparatively higher rate of ISP and UDP hospital presentations in those having domiciles in the most deprived areas (by NZDep2006 index) compared to those in less deprived areas, and the high proportion of young people involved in ISP and UDP pose further challenges to any prevention measures: any interventions would need to be cost-free or very low cost to the patient to be acceptable. Innovative approaches are needed to minimise direct financial costs of any prevention activities. One further concern is that no currently collected registry data can identify ISP in the New Zealand community setting, where people may not seek any professional help for the poisoning. The needs and patterns of behaviour of these people may not necessarily reflect those of people presenting to public hospitals. Importantly, people choosing not to present to health services initially after an intentional overdose may present later on, with further complications that may

not be recorded as ISP in MOH data, further complicating ISP behaviour profiling and subsequent prevention planning.

The small number of people presenting to hospitals many times during the study period is of note: 97 people out of 28,648 (0.3%) presented at least 15 times in the 15 years investigated. While this represents a small proportion of all people presenting due to ISP and UDP, it indicates that there is a particularly vulnerable group of people who perhaps are unable to get suitable help to stop self-harming. As the data used here only included hospital stays longer than 24 hours, with possibly as many as 60% of matching cases with shorter stays excluded (Ministry of Health – Manatū Hauora, 2015d), prevalence and the number of repeat presentations are likely underestimated. While only 7% of hospital presentations indicated stays at the intensive care unit, the mean hours spent were 39.6, indicating a significant cost load on services. A New Zealand report estimated that the total social and economic cost of suicide and deliberate self-harm was $2.2 billion in 2010 New Zealand dollars (O'Dea and Wren, 2012). If therapeutic alliances between patients at risk of intentional overdose and their caregivers could be facilitated through, for example, financial support in addition to the fully government-subsidised weekly dispensing of medications in amounts that are tailored and considered safe for the patient in question, the costs from these practices could perhaps be off-set by reductions in some of the significant costs caused by self-harm through poisoning. This, however, requires further study.

2.6.2 Availability of details about specific substances involved in the poisoning

Specific toxicant data were missing or limited in cases of ISP and UDP deaths, though it is likely that toxicological analysis was done during autopsies for Coroner's rulings. Substance information was also somewhat limited in the hospital presentation data due to ICD-10 group structures (in the 'X', 'Y', and 'T codes'), though many cases would be expected to have some toxicant details recorded in hospital data systems. While a third of presentations

had at least one unspecified substance involved, a high prevalence of paracetamol, benzodiazepines, opioids, and ethanol was observed.

As noted with the specific example substances, a further limitation of interpretations of the data stemming from ICD-10 group structure is that, for example, many modern antidepressants, including selective serotonin reuptake inhibitors (SSRIs) citalopram and fluoxetine, fall under 'other and unspecified antidepressants' (ICD-10 code 'T43.2'). Using this ICD-10 group prevents analysis by these substance groups separately, and of trends over time as new substances are introduced. The observed apparent increase over time in ISP through 'narcotics and psychodysleptics [hallucinogens], not elsewhere classified' ('X62+Y12') may reflect the general increase in opioid consumption in many Western countries including New Zealand (International Narcotics Control Board, 2016), but the datasets used in this study do not indicate which opioid may be most problematic. Codeine was the most prevalent opioid in data from Wellington Regional Hospital (Freeman and Quigley, 2015).

Poisoning cases presenting to hospital led to death in only 0.6% of the study sample, similar to evidence from Canada and the United Kingdom (UK; Finkelstein et al., 2016, Gunnell et al., 2004). This number may be an underestimation, as in some cases death may follow after a significant delay, such as after a few days in paracetamol poisoning, and the patient may have been transferred to another ward or facility prior to death, complicating coding. If the case was suicide by poisoning, a subsequent Coroner's investigation would be expected to find and report on the underlying causative poisoning agent accurately. Some ISP and UDP deaths, however, indicated substances that were not reflected by the limited free text toxicology details, indicating that obtaining toxicology data separately from the Institute of Environmental Science and Research (who carry out toxicology testing) would be needed to investigate fatal poisonings in detail. The NMDS data did not offer such a free text field of toxicology findings.

Implications of data limitations

There were no uniformly formatted details available about specific substances in MOH Mortality and NMDS data beyond the ICD-10 groups, which naturally limits interpretations that can be made from them. Obtaining toxicology results separately, as Gallagher and colleagues (2012) have done in their analysis of poisoning deaths requires significant time. While significant time input would also be needed to incorporate this toxicology data into the MOH material, including them would increase the usefulness of these data substantially. Collecting specific substance details in hospitalisation data would be of importance, as a significant proportion of ISP does not lead to death and Coronial investigation, but hospital treatment and/or observation only, and therefore this information should be collected at the point of contact with the patient. As this information may be recorded in the patient file to facilitate treatment decisions, extracting it for MOH data, in addition to the ICD-10 codes, would be justified. Developing a pop-up window for such a purpose when a poisoning case is entered on a hospital computer system such as EDIS, as done routinely in Wellington Hospital ED, for example, could be a way of collecting these data. This will be discussed in Study 1b (Chapter 3). EDIS has also been successfully used to extract specific ISP data in the United Kingdom (Prescott et al., 2009). Improving substance information collection and linking the Mortality and NMDS datasets could perhaps be used to develop automatic or other software 'flags' that could recognise (for example) increasingly lethal drug combinations in big data such as NMDS, and thus alert the treating clinician to (re)evaluate the patient's risk of ISP.

The high prevalence of 'antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' ('X61'), especially in female ISP hospital presentations raises concerns; however, the data here do not tell us which specific drugs may be the most problematic. This study indicated that benzodiazepines and tricyclic and tetracyclic antidepressants were significant substance groups. Recent data from Wellington Hospital ED indicate zopiclone, quetiapine, citalopram, clonazepam, fluoxetine and diazepam from the 'X61' group, and paracetamol from the ICD-10 group 'nonopioid analgesics, antipyretics and antirheumatics' ('X60') as the most commonly misused or

overdosed agents (Freeman and Quigley, 2015). Expanding such poisoning monitoring and analysis to all New Zealand hospitals would give valuable information for designing prevention measures. As there have been differences in coding practices between DHBs that have affected national data quality, such as recording short stays (Ministry of Health – Manatū Hauora, 2015b), arranging uniform nationwide toxicant data collection may be challenging. The findings of this present study support the recommendation by others to establish a national lead agency (Peiris-John et al., 2014) to address these concerns.

2.6.3 Relevance to other studies in this PhD project

To understand these MOH data better, interviews were conducted with ED clinical staff to describe the process of identifying patients presenting to hospital EDs firstly as cases of poisoning, and secondly, whether the poisoning was intentional or accidental. These interviews and the findings are described in Chapter 4 (Study 2). Because a lack of specific substance information in MOH data was identified as a limiting issue for policy-making, this information was collected from three New Zealand public hospital EDs to investigate the feasibility of such data collection, as well as to understand the specific substances encountered in intentional self-poisonings. These prospectively collected, cross-sectional data are described and discussed in Chapter 5 (Study 3). Dedicated collection of more detailed poisoning information at the ED level is investigated in Chapter 3 (Study 1b).

The findings of this present study will be synthesised with the findings of Studies 1b, 2, and 3 in Chapter 6, with emphasis on the implications of data limitations for national policy on poisoning prevention in New Zealand.

2.7 Summary of Chapter 2

In this Study 1 of MOH intentional poisoning death and hospital presentation data I have shown that men are especially at risk of fatal poisoning through ‘other gases and vapours’ (‘X67’; for example carbon monoxide), and that women are at risk of hospital presentations due to intentional poisoning through ‘psychotropic medications’ (‘X61’; for example

antidepressants) and 'non-opioid analgesics' ('X60'; for example paracetamol). People of Māori and 'Other' ethnicities (including NZ European), those aged 15-44, and those living in the most deprived neighbourhoods have the highest rates of death and hospital presentations due to intentional self-poisoning.

Statistics on what specific substance was involved in the poisoning are limited in MOH data due to ICD-10 clinical code structures which describe diagnoses, and identifying individual agents is mostly impossible. Suggesting ways to potentially prevent some of these poisonings is therefore very difficult. We cannot efficiently target a whole substance group, such as 'narcotics' or even opioid analgesics from within that group, but need to understand which substances within any given substance group frequently appearing in cases of intentional self-poisoning are the most problematic. Any proposed restrictions to prevent inappropriate access need to be tailored to address specific problems relating to any high-risk substance as well as overall medication access issues.

[page intentionally blank]

CHAPTER 3 : COMPARISON OF TWO POISONING DATASETS

3.1 Aims of Study 1b

The properties of intentional self-poisoning (ISP) deaths and hospital presentations were explored from national datasets in Chapter 2 (Study 1), and some of the limitations of these data were highlighted as limiting their usefulness for poisoning prevention planning. Subsequently, dedicated poisoning data collection at the point of care, the Emergency Department (ED), was proposed as a means to obtain more informative national data about ISP.

In the present Study 1b this type of specific poisoning data, collected at Wellington Regional Hospital ED, are investigated and described. While Study 1 investigated the demographics of ISP along with the limitations of Ministry of Health (MOH) datasets, Study 1b will focus on data content and the extent of substance and intent information within. I will critically assess the Wellington data limitations, while highlighting the advantages of this system of data collection. This provides more detail than that available in the National Minimum Dataset (NMDS) data which have been described in Study 1 (Chapter 2). The comparison of these two datasets was done to investigate whether specific data collection offered any advantages over the current national hospital presentation dataset, NMDS.

Any large dataset requires auditing or validating efforts to maintain or improve data quality. Understanding and describing the limitations of a dataset are key to correctly interpreting the data extracted from it (Langley et al., 2006). This study therefore attempted to describe the properties of the Wellington dataset, compared to the NMDS data. This could assist in local data collection standardisation efforts in Wellington, which would be expected to improve data quality (Brenner et al., 2002; discussed further in 3.7).

Study 1b will contribute to the discussion about possible changes to national data collection practices, relating to answering the overarching research question I, presented in 1.8, while contributing specific substance information to also address research question III. (1.8):

I. What information about intentional self-poisoning can be obtained from Ministry of Health datasets to plan poisoning prevention initiatives? What are the gaps in these data, and how could these be addressed?

III. Which specific substances do people use in episodes of intentional self-poisoning, and where do they obtain these substances?

Accordingly, the specific aims of Study 1b are to:

1) investigate the extent of information available in specifically collected poisoning data in the context of practical needs for poisoning prevention;
2) compare these specifically collected data to the same data after conversion by clinical coding to NMDS data;
3) inform the discussion and recommendations given in Chapter 6 about developing national poisoning data collection methods to better serve prevention planning.

As noted, this study informs the overall discussion in Chapter 6. Emphasis is on the practical issues, benefits, and challenges of collecting more detailed poisoning data. This study does not present practical means of adopting data collection of this nature in New Zealand hospitals, but discusses the benefits and some of the challenges involved.

3.2 Methods of Study 1b

This section describes the methods used to achieve the aims presented in the previous section, and the two datasets used in the analysis. In this present study, hospital presentation data from NMDS, coded by clinical coders, were compared with specific

locally collected ‘Hazards Data’ extracted from Wellington ED’s Emergency Department Information System (EDIS) patient management software. Clinical coding involves converting patient notes and diagnoses into clinical codes; briefly described in 3.2.1.2, and further in 3.6.

3.2.1 Descriptions of the two datasets

Both datasets used in this study collect information about presentations to hospital. When a patient presents to the ED, clinicians record patient information in EDIS to facilitate treatment and to ensure it is available to other professionals in the chain of care, and for administration purposes. The datasets then extract the information from EDIS for the purpose of describing the presentations in an aggregate manner, to assist service planning, and to fulfil government reporting requirements. ‘Hazards Data’ extracts more detailed poisoning information than NMDS. Both datasets are described in the following sections, and the information extraction flow is summarised in a diagram (Figure 3.1).

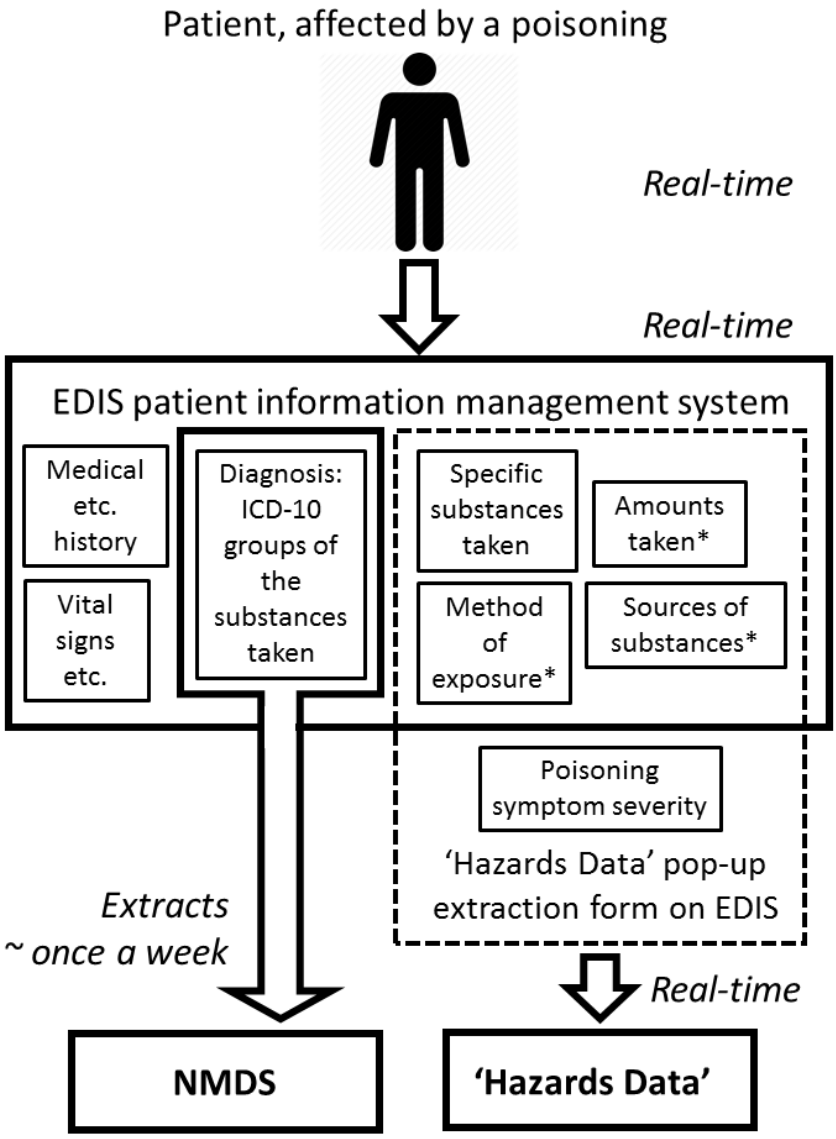

Figure 3.1: Information flow into the National Minimum Dataset and 'Hazards Data'.
*This information is not always collected in EDIS or 'Hazards Data', and is never indicated in NMDS.

3.2.1.1 'Hazards Data'

The New Zealand *Hazardous Substances and New Organisms Act 1996* requires that chemical safety is monitored to prevent adverse effects on the health and safety of both the population and the environment (New Zealand Legislation, 1996). As part of this monitoring, District Health Boards (DHBs) are required to collect data on poisonings with

chemicals and report them to the MOH, which then further reports to the Environmental Protection Authority (EPA). The EPA then engages in safety compliance assurance as necessary.

"The purpose of this Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms."

- Hazardous Substances and New Organisms Act, 1996: Part 2, section 4

Wellington Regional Hospital ED commenced monitoring of poisonings to comply with the Act in 1997, and the first year of full data collected via EDIS was 2004. When an ED clinician enters a poisoning diagnosis code, an automatic data collection window appears on EDIS, and requests the following details in four free text fields:

- **Details** about the toxic substance (substance name, exposure dose)
- **Method** of exposure (ingestion, inhalation, topical, etc.)
- **Intent**: whether the poisoning was intentional self-harm (ISP), accidental, recreational, or caused by medical treatment (iatrogenic)
- **Severity** of poisoning by general significance of symptoms (for example 'clinical poisoning', 'normal drug effect evident', and 'no clinical signs of toxicity')

This information is completed by the clinician treating the patient at the ED, and involves no clinical coders. Any of these fields can also be left blank. As described in Figure 3.1, the data collection window requests additional information to what would normally be recorded about a poisoning case (poisoning severity), and extracts more specific information about the poisoning than NMDS does.

The extent of poisoning data collected at Wellington ED in the 'Hazards Data' exceeds the legal requirements of the *Hazardous Substances and New Organisms Act* of 1996, as data

are collected not only about chemical poisonings but all toxicants. This enables examination of specific substances encountered in poisonings, beyond International Classification of Diseases and Related Health Problems 10th Revision (ICD-10) coding only, which is used in NMDS. Only chemical exposure data from Wellington ED are currently used by MOH and EPA, not the entire 'Hazards Data' dataset. 'Hazards Data' are used internally within Capital & Coast District Health Board (CCDHB) to monitor trends for harmful substances appearing very frequently in a temporally and geographically centred area, thereby 'clustering'. If there is a 'cluster' of, for example, synthetic cannabinoids (recreational drugs), CCDHB may issue a public health announcement in a timely manner.

A sample of the most recent 'Hazards Data' was included in the study to investigate the data properties, and to compare with NMDS data about the same cases. The sample size was designed to be sufficient for a descriptive study, based on Wellington ED ISP rates observed in Study 1 (Chapter 2).

Inclusion criteria

Poisoning cases from 1 January 2015 to 8 August 2017 (31 months) were extracted from the 'Hazards Data' by Quality Systems Performance Analyst Sandra Allmark from the CCDHB Quality Improvement and Patient Safety Directorate. These cases have an 'ED Event Number', which is an automatic number given by the EDIS system, and which cannot be used to identify anyone outside the hospital computer systems. 'ED Event Numbers' were therefore used as a de-identified presentation identifier (not a patient identifier) in the study dataset. Exclusion criteria used in the study are summarised in 3.2.3.

3.2.1.2 Hospitalisation data (National Minimum Dataset)

NMDS hospitalisation data have been described previously in 2.2.1.2. Briefly, they describe presentations to public and private hospitals, of at least three hours' duration. All cases in the NMDS receive full clinical coder attention as the diagnoses and circumstances of the presentation are converted into ICD-10 codes (Careers.co.nz, 2017).

Inclusion criteria

NMDS public hospital presentations for the same time period matching the 'Hazards Data' cases (with the same 'ED Event Numbers'), were extracted from the CCDHB NMDS dataset by Peter Wash, Team Leader Reporting, CCDHB Business Intelligence & Analytics. No further searches were done to identify additional cases not included in the 'Hazards Data'. Exclusion criteria are summarised in 3.2.3.

3.2.2 Data analysis

'Hazards Data' and hospitalisation data were formatted into the same database in the SPSS software (IBM, statistics version 22), and analysed in SPSS and Excel (Microsoft, 2013 version). Graphs depicting the results were created in Excel.

3.2.2.1 Intent descriptors

Intent coding was compared between 'Hazards Data' and NMDS, and described. Of particular interest (due to implications for 'Hazards Data' content) was determining whether there were any differences between poisoning intent coded in the 'Hazards Data', and that in the NMDS data as a result of the clinical coding process.

Intent was investigated based on the ICD-10 code assigned for each case. As an example, if alcohol (ethanol) was coded as 'X65 Intentional self-poisoning by and exposure to alcohol', 'X45 Accidental poisoning by and exposure to alcohol', or 'Y15 Poisoning by and exposure to alcohol, undetermined intent', as well as 'F10.0 Mental and behavioural disorders due to use of alcohol: Acute intoxication', the case intent was coded according to the corresponding 'X' (intentional or accidental) or 'Y' (undetermined intent) code, rather than the 'F code'.

3.2.2.2 Substance descriptors

The cause of presentation, as coded in ICD-10 codes and described by free text fields, was compared. It is important to note that 'Hazards Data' only include one ICD-10 code per

case, the main diagnosis, while the same cases in NMDS may have up to 20 such codes. Changes from 'Hazards Data' to NMDS substance listings/codes were also described. The most commonly encountered medications or groups of medications were determined, and the lists compared between the two data sources.

3.2.3 Exclusion criteria

The Quality Systems Performance Analyst extracted the 'Hazards Data' and excluded any poisoning cases due to bee and wasp stings, general anaphylaxis (a severe allergic reaction), unintentional smoke inhalation from fires, and supra-therapeutic medication events. Supra-therapeutic medication events were described by the CCDHB as unintentional events of 'taking an extra dose', meaning a small quantity, for example, approximately matching the person's normal daily dose, with no significant clinical consequences. Some further cases of these types were identified and excluded during data analysis (see 3.4.2).

3.3 Ethics approvals for Study 1b

As Study 1b involved using de-identified health data previously collected by the CCDHB, the University of Otago Human Research Ethics Committee (Health) 'Minimal Risk Health Research – Audit and audit related studies' pathway was used. This involved peer review of the application by staff at School of Pharmacy, University of Otago, and approval from the Dean of the School of Pharmacy. Peer review involved assessing the relative merit of the research, including its design and methods, and feasibility of the research, data security, and the ethical challenges involved in the study.

This application was approved by the University of Otago Human Research Ethics Committee (Health) on 8 June 2017 (reference number: HD17/023). Locality authorisation to conduct the study was obtained from the Wellington Regional Hospital, and the data were subsequently extracted by CCDHB staff: 'Hazards Data' on 11 August 2017, and NMDS data on 1 September 2017.

These data were de-identified (containing 'ED Event Number' only), and therefore there was no concern of identifying individual persons from either dataset. The de-identified data were stored on a password-protected computer only, on a University of Otago secure server, and only aggregate level results were reported. This research complied with the University's Responsible Practice in Research – Code of Conduct.

3.4 Results of Study 1b

This section describes the findings of the analysis comparing Wellington ED specialised poisoning data ('Hazards Data') with the same cases in NMDS. Both datasets comprise Wellington ED presentations due to poisoning (of any intent) between 1st January 2015 and 8th August 2017.

3.4.1 Numerical descriptors

The 'Hazards Data' contained 1,811 presentations. These data do not permit the identification of repeat presentations by the same person. When the same cases were identified by 'ED Event Number' in NMDS, 1,487 cases (82%) were found. The reason for not finding every case is likely due to length of stay, as presentations lasting fewer than three hours are not included in NMDS. Length of stay is not recorded in 'Hazards Data', and therefore this could not be investigated further.

3.4.2 Case intent descriptors

The intent indications of the 'Hazards Data' cases were investigated to identify additional cases not related to a poisoning, which had been missed in the original data extraction (Table 3.1). Cases involving 'Withdrawal' (symptoms showing withdrawal from a drug, no poisoning indicated in any field), 'Drug-seeking, no poisoning' (coming to the ED specifically to request a prescription), 'Entered in error', and 'Anaphylaxis from drug' (severe allergic reaction) were excluded from the dataset.

Table 3.1: Frequency for reported intent in the 'Hazards Data' cases.

What was the intent according to Hazards Report data?	
	Frequency, n (%)
Intentional supra-therapeutic	8 (0.4%)
Intentional self-harm	1,043 (57.6%)
"Wanted to go to sleep/escape"	10 (0.6%)
Suicide attempt	24 (1.3%)
Recreational	183 (10.1%)
Unintentional	275 (15.2%)
Withdrawal	23 (1.3%)
Unclear from data	16 (0.9%)
Missing intent indication	163 (9.0%)
Unknown intent recorded	25 (1.4%)
Drug-seeking, no poisoning	1 (0.1%)
'Entered in error'*	6 (0.3%)
Anaphylaxis from drug	9 (0.5%)
Iatrogenic poisoning	25 (1.4%)
Total	1,811 (100%)

* 'Entered in error' = e.g. "I clicked the wrong bloody box and can't get out of this screen." etc.

Excluding the aforementioned cases resulted in 1,772 cases remaining in the dataset (Table 3.2). The NMDS contained 1,467 of these cases (83%). For data management purposes to describe specific substances in 3.4.4, cases involving 'Iatrogenic poisoning' (unintentional poisoning caused by medical treatment indicated by a professional, beyond the patient's control) were combined with the group 'Unintentional', while cases which were identified as 'Intentional supra-therapeutic' and 'Wanted to go to sleep/escape' were combined into 'Intentional vague intent'. Cases recorded as 'Suicide attempt' were combined with 'Intentional self-harm'.

Table 3.2: Cases remaining in 'Hazards Data' dataset after an initial screening.

What was the intent according to Hazards Report data?		
		Frequency, n (%)
	Intentional self-harm	1,067 (60.2%)
	Intentional vague intent (escape etc.)	18 (1.0%)
	Recreational	183 (10.3%)
	Unintentional	300 (16.9%)
	Unclear from data	16 (0.9%)
	Missing intent indication*	163 (9.2%)
	Unknown intent recorded	25 (1.4%)
	Total	1,772 (100%)

*Nothing recorded

Comparison of case intent between 'Hazards Data' and NMDS

The recorded intent was compared between 'Hazards Data' and the corresponding cases in the NMDS. Conversion into NMDS data involves clinician coder investigation of the full case material and creation of ICD-10 coding to describe the case, also indicating intent through the codes available in ICD-10 (further described in 4.4.6). The majority of cases deemed ISP (90.3%), unintentional poisonings (77.4%), and many iatrogenic poisonings (61.1%) remained the same after conversion to NMDS data, while many of the recreational drug poisonings (60.2%) were coded into ICD-10 classes other than a drug abuse disorder (Table 3.3). All cases which were of unclear intent in 'Hazards Data' were allocated to an ICD-10 category upon NMDS conversion, even if the new coded category was 'undetermined intent poisoning'. A total of 20 (90.9%) cases of 'unknown intent' in 'Hazards Data' were coded to another category in NMDS by a clinical coder. Of the 133 cases which also appeared in NMDS and where intent was missing in 'Hazards Data', only eight (6% of cases without intent indication; 0.5% of all cases) remained without a poisoning-related ICD-10 code after NMDS coding.

Table 3.3: Comparison of intent indicated in the case: changes from 'Hazard data' to NMDS.

How did the case INTENT change from 'Hazard data' to NMDS?				
		Frequency	% of all cases	% within intent group
Intentional self-poisoning	ISP, remained same (X60-X69)	894	50.5	90.3
	ISP to undetermined intent	33	1.9	3.3
	ISP to abuse disorder	21	1.2	2.1
	ISP to iatrogenic	3	0.2	0.3
	ISP to unintentional	15	0.8	1.5
	ISP to unclear intent	5	0.3	0.5
	ISP to uncoded*	19	1.1	1.9
Unintentional poisoning	Unintentional, remained same (X40-X49)	123	6.9	77.4
	Unintentional to undetermined intent	8	0.5	5.0
	Unintentional to iatrogenic	8	0.5	5.0
	Unintentional to ISP	4	0.2	2.5
	Unintentional to recreational	2	0.1	1.3
	Unintentional to unclear intent	7	0.4	4.4
	Unintentional to uncoded*	7	0.4	4.4
Recreational self-poisoning	Recreational, remained same**	24	1.4	20.3
	Recreational to undetermined intent	17	1.0	14.4
	Recreational to abuse disorder	23	1.3	19.5
	Recreational to unintentional	18	1.0	15.3
	Recreational to ISP	21	1.2	17.8
	Recreational to withdrawal	5	0.3	4.2
	Recreational to uncoded*	10	0.6	8.5
Iatrogenic (unintentional, caused by a clinician)	Iatrogenic, remained same (Y40-Y59)	11	0.6	61.1
	Iatrogenic to undetermined intent	1	0.1	5.6
	Iatrogenic to unintentional	3	0.2	16.7
	Iatrogenic to uncoded*	3	0.2	16.7
Unclear intent (case notes in dataset not sufficient)	Unclear intent, remained same	2	0.1	7.4
	Unclear intent to undetermined intent	2	0.1	7.4
	Unclear intent to abuse disorder	1	0.1	3.7
	Unclear intent to iatrogenic	2	0.1	7.4
	Unclear intent to unintentional	5	0.3	18.5
	Unclear intent to recreational	1	0.1	3.7
	Unclear intent to ISP	14	0.8	51.9

How did the case INTENT change from 'Hazard data' to NMDS?				
Unknown intent (clinician unable to determine)	Unknown to undetermined intent	4	0.2	18.2
	Unknown to unintentional	4	0.2	18.2
	Unknown to recreational	2	0.1	9.0
	Unknown to ISP	10	0.6	45.5
	Unknown to uncoded*	2	0.1	9.0
Missing intent (nothing coded)	Missing intent to undetermined intent	6	0.3	4.5
	Missing intent to abuse disorder	3	0.2	2.3
	Missing intent to iatrogenic	4	0.2	3.0
	Missing intent to unintentional	19	1.1	14.3
	Missing intent to recreational	9	0.5	6.8
	Missing intent to withdrawal	1	0.1	0.8
	Missing intent to ISP	83	4.7	62.4
	Missing intent to uncoded*	8	0.5	6.0
	N/A, case not in NMDS	305	17.2	
	Total	1,772	100.0	

*'uncoded' = no ICD-10 code given in NMDS which indicates intent behind the poisoning, or in some cases that a poisoning even occurred. **'Recreational' indicated in 'Hazards Data', then F10-F19 (substance abuse) in NMDS, but no X or Y codes indicating intentional, unintentional, or undetermined intent poisoning.

3.4.3 ICD-10 substance group descriptors

The substances encountered in the cases were investigated. There are four sources of substance information in the 'Hazards Data': a main diagnosis code (ICD-10); a free text field describing the substances involved; an 'Ingested/inhaled?' field about the substance exposure method which sometimes also contains substance information; and a free text field describing intent which may also contain additional information. These four sources were used to investigate internal consistency within 'Hazards Data'. Again, it is important to remember that 'Hazards Data' only contain one ICD-10 diagnosis code per case, which may describe a non-poisoning condition relevant to the presentation, such as 'depression' or 'observation after suicide attempt'. In these cases the ICD-10 code could not be used to compare. A case was considered consistent if at least one substance listed in the 'Hazards Data' case matched the ICD-10 code which was recorded in it. Just over half (51.4%) of the

cases had a clear match to the ICD-10 coding between the two datasets, while 10.7% had a non-poisoning diagnosis code, and therefore could not be verified (Table 3.4).

Table 3.4: Investigating 'Hazards Data' ICD-10 coding: matching to substances indicated in the case.

Does the 'Hazards Data' ICD-10 coding match the substance(s) indicated?		
		Frequency, n (%)
	No	671 (37.9%)
	Yes	911 (51.4%)
	Coded into a non-poisoning ICD-10 code in 'Hazards Data'*	190 (10.7%)
	Total	1,772 (100%)

*'Depression', 'Gastritis', etc.

'Hazards Data' ICD-10 grouping was also compared to the substances indicated in the case by a broader category. An example of this would be to see if the selective serotonin re-uptake inhibitor (SSRI) antidepressant fluoxetine had been given an incorrect ICD-10 code of 'T43.0 Tricyclic and tetracyclic antidepressants' instead of the correct 'T43.2 Other and unspecified antidepressants'. The incorrect code would indicate that it is an antidepressant (in a broader category). ED clinicians do not have access to a coding aid on EDIS as clinical coders do, and may need to code 'close enough' due to lack of time (discussed in Chapter 4, Study 2). For any cases included in NMDS (length of stay over three hours), the clinical coder will correct the classification later. Substance matching by broader category of drugs such as 'antidepressants' is described in Table 3.5. In a total of 377 cases (21%), the ICD-10 code matched a broader group for at least one substance listed.

A total of 181 cases (10.2%; a total of all rows marked 'No […]' in Table 3.5) were coded into an ICD-10 category which appeared incorrect, not even matching a broader group of similar substances, based on what was listed in the case. A small number of these cases

(seven) appeared to have been incorrectly coded into 'anticholinergic drugs', possibly due to their anticholinergic side-effects observed in overdose. A further 113 cases were coded into ICD-10 code 'T50.9 Other and unspecified drugs, medicaments and biological substances', while there were substances listed which could have been coded into another ICD-10 code. Unlisted, unspecified drugs may also have been involved in some of these cases, however, which would justify coding them with 'T50.9'.

Table 3.5: Investigating 'Hazards Data' ICD-10 coding by broader groups of substances: matching to substances indicated in the case.

Does the 'Hazards Data' ICD-10 coding BROAD GROUP* match the substance(s) indicated in the free text field?	
	Frequency, n (%)
No	144 (8.1%)
Incorrect, but within broader group**	76 (4.3%)
Coded into a non-poisoning ICD-10 code in 'Hazards Data'	190 (10.7%)
Incorrect, but within antidepressant ICD-10 groups	116 (6.5%)
Incorrect, but within opioid ICD-10 groups	88 (5.0%)
Incorrect, but within sedative/hypnotic/antiepileptic ICD-10	5 (0.3%)
Incorrect, but within cardiac dysrhythmic ICD-10 groups	24 (1.4%)
No, opioid coded into non-opioid analgesics	30 (1.7%)
Incorrect, but within non-opioid analgesic ICD-10 groups	31 (1.7%)
Incorrect, but within antihypertensive ICD-10 groups	31 (1.7%)
Incorrect, Ethanol coded as 'Other alcohol'	6 (0.3%)
No, coding for observed anticholinergic effect?	7 (0.4%)
No, coded into 'T50.9 Other drugs' 'dump category'	113 (6.4%)
Correct code	911 (51.4%)
Total	1,772 (100%)

*Such as 'opioids', 'antidepressants', etc. **Matches a general substance group.

In summary, some observed tendencies in incorrect coding done by ED clinicians in the 'Hazards Data' were:

- **Opioids** coded into other opioid subclasses, for example 'natural' to 'synthetic' opioid ICD-10 code
- Any **opioids** coded into 'T40.0 Opium'
- **Morphine** (a natural opioid) coded as 'T48.7 Other and unspecified agents primarily acting on the respiratory system' possibly because it causes respiratory depression in overdose
- **Opioids** coded into non-opioid analgesic subclasses
- **Non-opioid analgesics** coded to other, incorrect non-opioid analgesic subclasses
- **Antidepressants** coded to other, incorrect antidepressant subclasses
- **Sedative/hypnotic/antiepileptic drugs** to other subclasses within the broader classes
- **Dysrhythmic and antihypertensive drugs** to other subclasses within the broader classes, for example beta-blockers coded in generic 'antiarrhythmic drugs' instead of the specific codes available for them
- Using the diagnosis code '**T50.9** Other and unspecified drugs, medicaments and biological substances' just to indicate that it was a medication (drug known but not coded to any specific class), or when there was a list of various drugs, or when coding newer antidepressants and antipsychotics to this category though they belong in another
- **Illicit drugs** difficult to code correctly: many are so new that ICD-10 has no code for them
- Illicit drugs 3,4-Methylenedioxymethamphetamine (**MDMA, ecstasy**) **or Methamphetamine** incorrectly coded under 'T45.8 Other primarily systemic and haematological agents', possibly because their effects are systemic (body-wide)
- Some coding possibly based on **toxidrome** (a combination of typical symptoms of the drug) encountered. Examples of this include the anticholinergic effects of quetiapine, promethazine, amitriptyline, and loratadine in overdose, which may lead to incorrectly coding them as an anticholinergic drug; or incorrectly coding psychoactive drugs which

cause cardiac side-effects in overdose to '46.9 Other and unspecified agents primarily affecting the cardiovascular system'.

Comparison of substance groups between 'Hazards Data' and NMDS

A total of 714 cases (49%) out of the 1,467 which appeared in both 'Hazards Data' and NMDS had the same ICD-10 groups coded in the two datasets (Table 3.6). A further 501 cases (34%) had more ICD-10 groups coded in NMDS, which may be expected, as there are more details and more diagnosis fields available for the clinical coder to enter all relevant toxicants in. There were, however, also 107 cases (7%) where 'Hazards Data' had more substance groups indicated than the NMDS data about the same case. In a total of 145 cases (10%) NMDS coding indicated substance groups which were not indicated in 'Hazards Data' (Table 3.6). Of these 145 cases, 77 (53%) had the same number of substance groups indicated as in 'Hazards Data', while 60 (39%) had more substance groups indicated in NMDS.

Table 3.6: Comparing 'Hazards Data' and NMDS ICD-10 coding of substance groups.

How did the case SUBSTANCES change from 'Hazards Data' to NMDS?	
	Frequency, n (%)
Substance groups remained same in 'Hazards Data' and NMDS	714 (40.4%)
Less substance groups indicated in NMDS than 'Hazards Data'	107 (6.0%)
More substance groups indicated in NMDS than 'Hazards Data'	501 (28.3%)
Different substance groups indicated in NMDS than 'Hazards Data', same number of groups	77 (4.3%)
Different substance groups indicated in NMDS than 'Hazards Data', and less groups in NMDS	8 (0.5%)
Different substance groups indicated in NMDS than 'Hazards Data', and more groups in NMDS	60 (3.4%)
N/A, case not in NMDS	305 (17.2%)
Total	1,772 (100%)

3.4.4 Specific substance descriptors

The 20 most frequently appearing substances in 'Hazards Data' are presented in Table 3.7, by intent indications. The most common substance was paracetamol, with 330 of the total of 426 presentations due to paracetamol (77%) being involved in episodes of intentional self-harm, ISP. The hypnotic zopiclone, antipsychotic quetiapine, opioid analgesic codeine, antidepressants citalopram, venlafaxine, fluoxetine, and sertraline also appeared overwhelmingly frequently in cases of ISP in comparison to other intent categories. MDMA, methamphetamine, and cannabis, which are recreational, illicit drugs, appeared mostly in the 'Recreational' intent category. The opioid analgesic morphine appeared in almost as many unintentional poisonings as intentional ones. The majority of 'Hazards Data' cases, or 1,349 (76%), listed one substance, while 161 cases (9%) had two (Table 3.8). A total of 144 cases had an unknown substance (Table 3.7), and 160 cases (9%) had an unknown number of substances in 'Hazards Data' (Table 3.8).

Table 3.7: The twenty most common individual substances in 'Hazards Data'.

	Intentional self-harm	Intentional vague intent (escape etc.)	Recreational	Unintentional	Unclear from data	Missing intent indication	Unknown intent	Total
Paracetamol	330	0	1	63	0	31	1	**426**
Unknown substance	46	0	16	15	0	57	10	**144**
Zopiclone	94	4	3	8	0	3	3	**115**
Quetiapine	94	3	1	2	1	3	2	**106**
Ethanol	54	2	26	3	1	10	5	**101**
Codeine	54	4	7	6	1	4	0	**76**
Citalopram	41	0	0	5	1	2	1	**50**
Venlafaxine	39	0	0	5	1	0	1	**46**
Ibuprofen	41	0	0	2	0	1	0	**44**
Lorazepam	33	1	0	7	1	1	1	**44**
Tramadol	33	0	2	5	1	1	2	**44**
Fluoxetine	39	0	0	1	0	1	0	**41**
Clonazepam	35	0	1	1	0	1	0	**38**
MDMA (ecstasy)	1	0	32	1	0	1	0	**35**
Cannabis	5	0	23	0	1	4	0	**33**

	Intentional self-harm	Intentional vague intent (escape etc.)	Recreational	Unintentional	Unclear from data	Missing intent indication	Unknown intent	Total
Morphine	12	0	8	10	0	3	0	**33**
Sertraline	25	1	1	3	1	1	0	**32**
Methamphetamine (P, speed)	2	0	25	0	1	2	0	**30**
Diazepam	19	0	2	3	0	1	0	**25**
Prazosin	24	0	0	0	0	0	0	**24**

Data here include the 305 cases which were not in NMDS. MDMA = 3,4-Methylenedioxymethamphetamine.

Table 3.8: The number of substances listed in the 1,772 ‘Hazards Data’ cases.

Number of substances in ‘Hazards Data’?	
	Frequency, n (%)
1	1,350 (76.2%)
2	161 (9.1%)
3	56 (3.2%)
4	28 (1.6%)
5	10 (0.6%)
6	5 (0.3%)
7	2 (0.1%)
Unknown number	160 (9.0%)
Total	1,772* (100%)

*Includes the 305 cases not appearing in NMDS.

The 20 most commonly encountered substances by ICD-10 codes seen in the 1,467 NMDS cases are described in Table 3.9. Similar to ‘Hazards Data’, paracetamol was the most commonly seen substance, as it was identifiable alone due to being the only substance commercially available in New Zealand from its ICD-10 group ‘T39.1’. ‘T43.2 Other and unspecified antidepressants’ and ‘T43.5 Other and unspecified antipsychotics and neuroleptics’ were the second and third most common ICD-10 groups encountered. The specific substances involved could not be determined from these data alone, but of the substances indicated by ‘Hazards Data’, citalopram, venlafaxine, fluoxetine, and sertraline would fall under ‘T43.2’, and quetiapine would fall under ‘T43.5’. A clear majority of poisonings were intentional, whereas the majority of MDMA poisonings were classed as recreational.

[page intentionally blank]

Table 3.9: The twenty most common ICD-10 substance groups in the NMDS data.

Top 20 substance groups in NMDS	Intentional self-harm	Intentional vague intent (escape etc.)	Recreational	Unintentional	Unclear from data	Missing intent indication	Unknown intent	Total
T39.1 4-Aminophenol derivatives (paracetamol)	342	0	1	27	0	44	2	**416**
T43.2 Other and unspecified antidepressants	238	0	1	6	2	22	4	**273**
T43.5 Other and unspecified antipsychotics and neuroleptics	173	2	1	8	0	19	4	**207**
T42.4 Benzodiazepines	156	3	2	14	1	22	2	**200**
T51.0 Ethanol	156	1	13	1	2	16	3	**192**
T42.6 Other antiepileptic and sedative-hypnotic drugs	156	4	2	6	0	16	4	**188**
T39.3 Other nonsteroidal anti-inflammatory drugs [NSAID]	126	0	0	5	0	18	3	**152**
T40.2 Other opioids (Codeine, Morphine, Dihydrocodeine, Oxycodone)	104	4	9	10	1	11	1	**140**
T40.4 Other synthetic narcotics (Fentanyl, Pethidine, Tramadol)	56	0	1	3	1	10	1	**72**
T45.0 Antiallergic and antiemetic drugs	39	1	1	3	0	3	0	**47**
T43.0 Tricyclic and tetracyclic antidepressants	34	0	0	5	0	3	1	**43**
T44.6 Alpha-adrenoreceptor antagonists, NEC	37	0	0	3	0	1	0	**41**
T44.7 Beta-adrenoreceptor antagonists, NEC	22	0	0	5	0	2	0	**29**

Top 20 substance groups in NMDS	Intentional self-harm	Intentional vague intent (escape etc.)	Recreational	Unintentional	Unclear from data	Missing intent indication	Unknown intent	Total
T50.9 Other and unspecified drugs, medicaments and biological substances	14	0	7	4	0	2	2	**29**
T43.3 Phenothiazine antipsychotics and neuroleptics	24	0	0	1	0	2	0	**27**
T43.69 Other psychostimulants with potential for use disorder	13	0	6	3	1	4	0	**27**
T36.0 Penicillins	14	0	0	1	0	2	0	**17**
T43.62 Methylenedioxy methamphetamine (MDMA, ecstasy)	2	0	12	0	1	1	1	**17**
T46.4 ACE inhibitors	13	0	0	4	0	0	0	**17**
T42.0 Hydantoin derivatives	11	0	0	3	0	1	0	**15**

* NEC = 'not elsewhere classified'. *The table contains the extra codes T43.62 'Methylenedioxy methamphetamine' and T43.69 'Other psychostimulants with potential for use disorder', which are being used at Wellington Regional Hospital by special permission from the MOH.*

The majority of NMDS cases, or 625 (43%), had one 'T code' indicating poisoning due to a group of drugs, while the 186 cases (13%) with no 'T codes' only had 'F codes' indicating acute (often illicit) substance abuse (Table 3.10). For descriptions of 'F codes', see Table 2.3. The number of 'T codes' per presentation ranged from 0 to eight, with a median value of one.

Table 3.10: The number of ICD-10 poisoning diagnosis groups ('T codes' and 'F codes') in the NMDS data.

		How many 'T codes'*?	How many 'F codes'**?
		Frequency, n (%)	Frequency, n (%)
Valid	0	186 (12.7%)	1,281 (87.3%)
	1	625 (42.6%)	134 (9.1%)
	2	330 (22.5%)	43 (2.9%)
	3	175 (11.9%)	6 (0.4%)
	4	88 (6.0%)	3 (0.2%)
	5	35 (2.4%)	0
	6	17 (1.2%)	0
	7	10 (0.7%)	0
	8	1 (0.1%)	0
	Total	1,467 (100%)	1,467 (100%)

*'T codes' indicate a poisoning. **'F codes' indicate substance abuse.

3.4.5 Strengths and limitations of the two datasets

This study aimed to investigate a dataset collecting more detailed poisoning information, and how this could serve to offer more usable data for poisoning prevention. As the 'Hazards Data' were assessed and compared to NMDS, the following observations about the strengths and limitations of each dataset were made.

3.4.5.1 Indicating intent behind the poisoning

One of the strengths of NMDS data is that the intent behind the poisoning can be described through multiple ICD-10 codes. Different toxicants may have their own intent codes, and the codes indicate intentional self-poisoning, unintentional poisoning, or poisoning of undetermined intent. While cases may be coded as 'of undetermined intent', a clear majority were coded as either intentional or unintentional.

'Hazards Data' intent coding was not as structured as NMDS. ED clinicians generally used the terms given in the data collection pop-up window prompts (described in 3.2.2.1), which assisted in offering them a set number of choices. Real life does not always follow such categories in a clear-cut manner, however, and therefore other descriptions were observed. The data field collecting this information is in free text format, which enables any values to be entered.

Some free-format intent descriptions in 'Hazards Data' were difficult to analyse and required systematic assumptions to be made. If, for example, intent was described as "recreational but also suicidal/intentional self-harm" in a case, it was interpreted by the researcher as intentional self-poisoning, and for the purposes of this analysis, coded as 'intentional'. If, however, a case indicated uncertainty, for example "recreational, deliberate self-harm?", the case was coded as 'unclear from data'. If a case indicated only "intentional self-harm?", it was coded here as 'unknown', but if it was described to be more likely ISP, for example "likely deliberate self-harm", or "intentional overdose" with multiple substances, it was coded as ISP. Clinical coders would also be required to make such

decisions in NMDS coding based on what the clinician has recorded in the patient file, however, their coding would be dictated by MOH coding guidelines.

Recreational overdoses proved to be difficult to describe uniformly in 'Hazards Data', while NMDS has specific ICD-10 codes for recreational intoxicant use. If a 'Hazards Data' case indicated use of a substance for recreational purposes but indicated that it was intentional, for example "Robitussin [cough syrup] for its EtOH [ethanol] content, intentional", it was coded as 'Recreational', not ISP.

NMDS uses ICD-10 codes to indicate withdrawal syndromes and iatrogenic (treatment-caused) poisoning, and multiple codes can be used to describe the intricacies of the case. In 'Hazards Data', there was no standard means of describing this. If a case indicated both 'withdrawal syndrome' and 'iatrogenic' poisoning, it was interpreted as 'withdrawal syndrome' with no current poisoning occurring. If other codes such as ICD-10 'T codes', however, indicated simultaneous, acute intoxication caused by a poisoning agent, the case was interpreted to be 'iatrogenic'. The level of detail offered in either of the datasets did not enable deeper analysis of this, and therefore some cases may have been incorrectly assigned as either 'withdrawal syndrome' or 'iatrogenic' in the current analysis.

When 'Hazards Data' were analysed, paediatric poisonings in very young children (under five years) were coded as 'unintentional' if intent was not clearly described in the intent field, and 'iatrogenic' was not indicated. If the intent information was completely missing, the case was coded as 'missing intent indication'. This interpretation may have led to underestimation of iatrogenic poisonings in children in the 'Hazards Data', while NMDS data on the other hand can directly indicate iatrogenic poisoning through specific ICD-10 codes.

In summary, the majority of cases in 'Hazards Data' indicated intent without question marks or doubt, but due to clinical coders not assessing and coding the 'Hazards Data', these data were limited by what the clinician had noted down in the original data collection pop-up window. A total of 60.1% of all cases had the same intent classification in NMDS as originally in 'Hazards Data', but in the remainder the classification changed during the

clinical coding process, based on case records available to the coder. NMDS offers clear, systematic ICD-10 codes to indicate intent, but also codes for iatrogenic poisoning, withdrawal syndrome, and recreational intoxication. While cases may be miscoded, NMDS coding is systematic. 'Hazards Data' intent coding was more *ad hoc* and free-formatted, despite the examples of intent categories given to staff in the data collection tool.

3.4.5.2 Indicating poisoning

There is space for twenty ICD-10 diagnosis codes in a NMDS case. This enables describing intent and poisoning, though as shown in Study 1 (Chapter 2), the ICD-10 codes for poisoning do not go to sufficient detail to detect most substances of interest.

There is only space for one ICD-10 code in the 'Hazards Data', and therefore the code entered by the clinician, no matter how relevant to the case, did not always indicate the substance or all of the substances of interest. Sometimes the code described the underlying psychopathology instead. Examples of these included cases coded as 'depression' or 'anxiety' instead of a poisoning-related ICD-10 code. This limited the sources of information about the substances involved, yet may have assisted in the description of intent.

3.4.5.3 Indicating a specific substance

'Hazards Data' ICD-10 coding indicating the substances involved was reviewed for accuracy. There were some instances where it was difficult to unquestionably identify what the toxicant was. If a substance detail field was empty, or if 'unknown/unspecified substances' had been coded under ICD-10 code 'T50.9 Other and unspecified drugs, medicaments and biological substances', coding was presumed to be correct as no further details were available. Further, if an 'unknown substance' was coded into a specific ICD-10 group such as 'T39.0 Salicylates', it was also presumed to be correct, as the clinician was presumed to have known what type of drug it was, if not which one specifically within the ICD-10 group. In addition to this, if multiple drugs were listed in the free text field, but only one of them (or its ICD-10 group) had been coded, thereby not capturing all individual substances, the code given was presumed to be correct, and the most relevant to the case as judged by the

clinician. These assumptions were not able to be checked from the datasets available, and may therefore have led to an overestimation of correct 'Hazards Data' coding.

A similar potential for overestimating correct coding was evident in NMDS, as also noted in Study 1 (Chapter 2). NMDS cases had several ICD-10 codes for poisons, but as they have no free-text field listing the substances involved, checking coding from the dataset alone is not possible. The 'coding assistant' software which clinical coders use in their work when creating NMDS ICD-10 codes, brings up the correct code upon entry of a substance name into the system (4.4.6). The likelihood of having correct ICD-10 codes in NMDS is considered greater than in 'Hazards Data' which is created by clinicians with no such coding assistance programs.

Substances of abuse

In the 'Hazards Data' diagnosis fields, the ICD-10 code 'Z72.0 Tobacco use' was not taken to indicate acute nicotine intoxication (nicotine is the 'active ingredient' in tobacco), as this ICD-10 code indicates lifestyle issues, not necessarily acute use. Similarly, 'F10.1 Mental and behavioural disorders due to use of alcohol; Harmful use', 'F10.2 Mental and behavioural disorders due to use of alcohol; Dependence syndrome' or 'F10.3 Mental and behavioural disorders due to use of alcohol; Withdrawal state' alone were not taken to indicate acute alcohol use. Only 'F10.0 Mental and behavioural disorders due to use of alcohol; Acute intoxication', or the 'F1X.0' code for any other substance of abuse, was used in this study to indicate substance intoxication at the time of the poisoning (see Table 2.3 for descriptions of the codes).

The MOH Clinical Coding Query database instructs that 'F10.0' should be used to indicate that alcohol intoxication occurred as a distinct event from the poisoning event, and that 'T51.0 Toxic effect of ethanol' should be used when the alcohol was taken as part of an overdose (Ministry of Health – Manatū Hauora, 2012a). Further comments include that these two codes should not be used together in the same presentation. Despite this, all 26 cases which had 'F10.0' (distinct event) in the 'Hazards Data' also indicated alcohol use in the free text field and/or the substances listed. The level of detail, however, was not

sufficient to determine timelines of exposure to verify that the alcohol was taken in conjunction with the other substances (if any). As these 26 cases were coded for the study purposes to have alcohol as one of the substances, the rate of cases positive for alcohol may have been overestimated.

As ICD-10 was launched in the late 1980s, new substances may be difficult to code into categories, as they have not yet been officially allocated into one. For the purposes of this study, gamma hydroxybutyrate (GHB), gamma butyrolactone (GBL), and NBOMe (all recreational, illicit drugs) which did not have an ICD-10 category, were included in the 'T43.6 Psychostimulants with abuse potential' class. This class contains both legal and illicit substances.

It should be noted that approximately eight years ago, during an illicit drug crisis, the CCDHB petitioned for special permission from the MOH to create three new ICD-10 subcategories to better monitor substances of abuse ('T43.61 Psychostimulants with potential for use disorder, methylamphetamine (methamphetamine)'; 'T43.62 Methylenedioxy methamphetamine (MDMA)'; 'T43.69 Other psychostimulants with potential for use disorder') which enable more specific monitoring than would be possible with standard ICD-10 categories. These categories were used to describe the number of presentations due to these illicit substances in this study. Describing illicit drug use by separate categories assists analysis of their specific impact. This is currently not possible in NMDS outside of CCDHB. In a future version of ICD these drugs may be allocated in separate categories and be able to be analysed separately.

3.5 Limitations of Study 1b

Presentations were included and investigated in the study if 'Hazards Data' indicated a poisoning. It is therefore possible that there were additional cases in NMDS which were not included because they had not yet been identified as poisonings at the ED treatment stage where the 'Hazards Data' are collected. This, however, seems unlikely, as due to the manifestation of drug effects they would be expected to be identified at the ED. Also, as

the aim of the study was to compare specific poisoning data collection with regular NMDS data collection, additional cases were not searched. This is recognised as a limitation.

A further potential limitation is that the candidate re-interpreted some cases thought to be 'withdrawal', 'drug-seeking, no poisoning', and 'anaphylaxis from drug', and excluded them from this analysis. Some of these cases may have also involved a poisoning which was not evident from the original intent coding. As details about the presentation were very limited, these exclusions could not be verified.

3.6 Discussion: Study 1b

This comparison study showed that collecting more detailed information about poisoning presentations at the ED offers a good opportunity for monitoring the specific substances involved in ISP. EDIS has also previously been successfully used to extract specific ISP data in the United Kingdom (Prescott et al., 2009). While ED clinicians are not clinical coders, they are trained and accustomed to making detailed notes to record the patient presentation in order to facilitate and document their care. After the clinicians had filled in the 'Hazards Data' details, in a large proportion of cases the clinical coders did not change the recorded intent when they converted the data into the NMDS. Only recreational overdoses were mostly allocated into different ICD-10 intent categories in the NMDS conversion, and most cases of unknown or unclear intent were sorted into the appropriate categories during the process.

ED clinicians as 'coders'

The purpose of professional clinical coding is to produce hospital presentation data which assists in planning health funding and services (Careers.co.nz, 2017). Clinical coders are specifically trained and certified, with standardised coding protocols to avoid situations where coders would use different local coding conventions and inadvertently create regional differences in coding practices, negatively affecting the comparability of national and international data (Ministry of Health – Manatū Hauora, 2014b). If ED clinicians, who

have not had this training, were to create health data directly on the various ED computer systems in use in New Zealand, this would be likely to increase variability. Training on filling in the poisoning data collection tool in a uniform way would be needed. Due to the changeability of hospital staff this training would need to be repeated regularly, and 'refresher courses' offered as needed. Initiating data collection at EDs would therefore necessitate some form of validation or audit, and subsequent constructive feedback to those recording the data.

The definition of ISP

The definition of ISP used in this PhD project, presented in 1.3.1, requires that self-harming intent is evident, but beyond that does not exclude recreational overdoses. The intent to harm self and to 'just get high' may be intertwined and difficult to assess and separate (Neale, 2000). Including recreational overdoses in ISP counts may over-inflate numbers, but the significance of this depends on the aim of the specific study, and the types of cases that meet the study inclusion criteria and are described. Recreational overdoses are intentional exposures, even if the motivation may differ from intentional self-harm. This is further discussed in Chapter 4. Separating recreational and intentional (in the self-harm context) poisonings in this present study may have led to allocation of these cases into either category at the expense of the other; however, this was done to better make use of the specific data collection of 'Hazards Data'.

For prevention purposes, all substances that people expose themselves to in quantities that cause adverse effects to their bodies should be targeted. Means of controlling access naturally differ for legal medications being prescribed for legitimate indications and illicit drugs, or legal medications being diverted for illicit purposes. It would therefore be useful to understand specifically whether the purpose of a hospital-treated overdose was for recreational use or intentional self-harm.

Specific substances

Substance coding by clinicians was found to include some imprecision and errors. Only half of the 'Hazards Data' cases had an ICD-10 code that fully matched at least one of the

substances listed for the case. Assigning a code that described a broader group of the correct type of substances such as antipsychotics, instead of the specific antipsychotic type code, appeared to be common. In practice, clinicians were expected to list substances in a free text field on the 'Hazards Data' EDIS collection tool, and then give a 'main' diagnosis code, mostly relating to poisoning in this sample of cases. This was done with no 'coding assistance' software as discussed previously. While substance lists may be reliable and descriptive, 'Hazards Data' ICD-10 grouping needs to be interpreted with caution, and should not be used as a sole source of substance information.

A notable trend observed in this study was to code substances into 'not quite correct' ICD-10 categories, for example, coding any kind of antidepressant into ICD-10 code 'T43.0 Tricyclic and tetracyclic antidepressants'. As SSRIs, another type of antidepressant, are commonly seen in overdoses (see Chapter 2, Study 1), incorrectly adding them to 'T43.0' may lead to overestimation of Tricyclic Antidepressant (TCA) poisoning rates if only ICD-10 codes are analysed.

A significant improvement for coding done by clinicians would be a 'coding assistant' or a separate program for quickly checking the correct code for a drug at the ED while filling in the case details. An audit study from Queensland showed that only two thirds of 'T code' discharge diagnoses of 'T36-T50' (poisoning by 'chiefly medicinal' substances), and one third of 'T51-T65' ('chiefly non-medicinal substances') on EDIS matched their comparison dataset principal diagnoses (Queensland Hospital Admitted Patient Data Collection; similar to the NMDS in New Zealand; Howell et al. (2014). This finding is similar to that observed in the present study. At Australian EDs, several staff members involved in the care of a patient documented their notes on EDIS (Marson et al., 2005), and this is often the case in New Zealand EDs as well. Marson and colleagues (2005) found that EDIS data quality was significantly affected by perceived lack of time for documentation, as well as a lack of formal training for consistent data entry. Clinical staff in this Australian study also felt that the diagnosis codes which were available to them were too limited (Marson et al., 2005), as did those staff surveyed in another Australian injury surveillance-related study (Hockey et al., 2000). This may also be reflected in the present study, where clinicians were perhaps

forced to give 'close enough' poisoning diagnosis codes when they could not identify the correct one quickly (for further discussion, see Chapter 4, Study 2), and also in the incorrect or 'within broader group of medicines' ICD-10 coding observed in the present study.

In Chapter 2 (Study 1) I argued that we should collect more specific poisoning data nationally in New Zealand to genuinely understand which substances people are using, and which drugs should be targeted in prevention efforts. Collecting specific poisoning data at the point of care, the emergency department, also has the added value that poisoning trends can be followed in real-time at the locality. This could assist in sending out public health alerts, for example, about 'clusters' of problematic medicine overdoses, or 'bad batches' of drugs on the street such as synthetic cannabis. In this way, community services and the public could be aware of the danger – effectiveness of response would naturally depend on how well individual people follow advice or guidance.

Evidence from Sydney (Nepean Hospital ED) shows that introducing new electronic data collection systems may negatively affect patient flow target times while staff are learning to use the new system (Mohan et al., 2013). EDIS has, however, also been successfully used for automated, real-time monitoring of injuries during the 2003 Rugby World Cup in 12 public hospital EDs in Sydney, with virtually no impact on ED staff time (Muscatello et al., 2005). To introduce additional surveillance such as specific poisoning substance monitoring successfully, automated report-generation should be considered, and staff satisfaction with performing any extra tasks in relation to collecting poisoning data should be monitored. A Queensland-based study of three EDs, validating specialised injury surveillance data collection, also surveyed staff satisfaction and found that 85% of self-selecting staff participants felt that EDIS was easy to use for recording data (Hockey et al., 2000). While self-selection may have introduced bias to this survey, job satisfaction is key to optimal performance, and to maximise the quality of any data collected, staff would need to be at least amenable to be doing it. This could be attempted by offering ongoing education about the data collection system and procedures.

3.7 Summary of Chapter 3

Wellington ED 'Hazards Data' were shown to offer more specific substance information, while NMDS offered more structured, uniform information about the poisoning. For the purposes of poisoning monitoring, data collection on specific substances through electronic patient management systems was shown to be able to produce useful information in this study. There were, however, limitations observed with some data variables in 'Hazards Data' such as recording intent behind the poisoning, and in the recording of all involved substances. These need to be addressed in any data collection initiatives, at least through auditing and understanding the limitations so that data are interpreted appropriately and accordingly.

This study did not attempt to investigate the practicalities of data collection through EDIS, nor does it offer suggestions on how such data collection should be started. It simply compared data obtained through specialised data collection to professionally coded health information to describe some of the challenges. The findings of this study contribute to the overall PhD project discussion in Chapter 6. They also supplement the findings of Study 1 (Chapter 2), as that study recommended collecting such specific poisoning data, and help us understand the findings of Study 3 (Chapter 5) which prospectively collected cross-sectional data on ISP patients who presented to three New Zealand EDs. The following Chapter 4 describes the process of identifying cases as poisonings at the ED, and investigating the intent behind them, to inform the interpretation of the results of the other studies in this PhD project.

CHAPTER 4 : COLLECTING AND CREATING NATIONAL HOSPITALISATION DATA

4.1 Aims of Study 2

National Minimum Dataset (NMDS) data from an earlier time period were investigated in Study 1 (Chapter 2). In order to understand these data better, in this chapter I will describe the process of creating and collecting Ministry of Health (MOH) data on intentional self-poisoning (ISP), specifically for the NMDS. This present study investigates how Emergency Department (ED) clinicians identify whether patients presenting to an ED have been affected by a poisoning, and how they assess intent in poisoning cases, namely whether it was unintentional or intentional. Conversion to NMDS data, performed by clinical coders, is also investigated. I will discuss how these processes impact on MOH data properties, and what the implications are for using these data for planning poisoning prevention initiatives.

This study addresses the overarching research question II, presented in 1.8:

> ***II. How do emergency medicine professionals identify poisonings and investigate intent behind them, and how does that information become national hospital presentation data?***

To answer this research question, and to facilitate analysis of other study findings within this thesis, the specific aims of Study 2 are to:

1) investigate the process of gathering data about what has happened to and is affecting a patient who is brought into the ED;
2) map the process of identifying that someone is affected by a poisoning;
3) map the process of investigating intent behind the poisoning in the clinical setting of the ED;
4) map the process of coding presentations due to poisoning into national data;
5) inform the analysis and understanding of MOH data investigated in Study 1 (Chapter 2), and the cross-sectional data collected in Study 3 (Chapter 5), especially regarding investigation of intent in poisoning cases.

This chapter describes how ED clinicians and paramedics assess patients who may have self-poisoned. Identification of patients who have intentionally overdosed can be challenging (Rockett et al., 2014). Some patients may freely admit this, while others go to great lengths to avoid disclosure. The present study therefore consists of interviews of ED clinicians in three hospital locations, and investigates what cues they use in their clinical decision-making when determining if someone has overdosed intentionally.

Findings are discussed in the context of understanding the properties and limitations of national data on poisonings, and the challenges of measuring and understanding intent. This study therefore assists understanding the findings of Study 1 - 'Epidemiology of intentional self-poisoning in Ministry of Health Mortality and Hospitalisation data' (Chapter 2), and supports conclusions made from Study 1b – 'Comparison of two poisoning datasets at Wellington Emergency Department' (Chapter 3), and Study 3 - 'Prospective data on

substances used in intentional self-poisoning and the sources for obtaining them' (Chapter 5). This present study will not suggest specific poisoning prevention initiatives, although some study participants' views on this will be presented and discussed.

Methods are described initially, followed by the ethics approvals needed to conduct the study. The participant information sheets and consent forms used when conducting this study are presented in Appendix 2. The results of these ED staff interviews are presented by themes, and then discussed in the context of understanding MOH data on poisonings. An overarching discussion of the whole PhD project findings, including those from this present study, with implications for public health, is presented in Chapter 6.

4.2 Methods of Study 2

The aims of Study 2 were presented in the previous section. Developing the semi-structured interview schedule is described here, as well as analysis of the interviews. Key considerations relating to this analysis are highlighted, including some limitations of the data available.

4.2.1 Regarding the mixed methods used in the study

This study aimed to investigate a complex, multi-faceted process of identifying a poisoning and determining intent behind it. There are no quantitative scales or other measurement methods to describe this process, and therefore a mixed study, combining qualitative and quantitative methods, was designed to triangulate with both means to address the challenges of the complexity of the ED study environment (Creswell et al., 2004, O'Cathain et al., 2007). The qualitative and quantitative data were collected concurrently, and the results were only considered together in the interpretation stage. This type of mixed study can be called a 'data integration at interpretation phase only' study (Doyle et al., 2009). The interviews contained a greater proportion of qualitative questions, and qualitative data were emphasised in the interpretation stage (qualitative data dominated). Leech and

Onwuegbuzie (2009) have presented a typology for classifying and describing mixed methods studies, and this current study could be classified as an F2 study, fully mixed concurrent dominant status design, according to their typology.

The strengths of mixed methods lie in their flexibility, as interview schedules, for example, can be adjusted as the research project progresses, and based on what is uncovered in previous interviews. A weakness of mixed methods research is that research can be very labour-intensive, due to its flexible character and therefore 'unending' opportunities for further analysis. Yet a further benefit is synergism from the opportunities for characterising phenomena which neither qualitative nor quantitative methods can describe alone, but where together they can complement each other and enable a much richer, deeper analysis (Creswell et al., 2004). The findings of this mixed methods study could then be integrated into the findings of the qualitative studies in this thesis, for a more comprehensive picture of data about ISP in New Zealand (Chapter 6).

4.2.2 Study locations

Study 2 involved semi-structured interviews with ED clinical staff at Dunedin Hospital, Wellington Regional Hospital, and Timaru Hospital, and paramedics from St John Ambulance Services in these three cities. These hospitals were not chosen to give a statistically representative sample of all New Zealand hospitals. They were purposefully selected, based on the findings of Study 1 (Chapter 2), to include a hospital that sees many ISP patients and has poisoning specialist staff (Clinical Toxicologists) on site (Wellington), an 'average ISP load' hospital (Dunedin), and a smaller regional hospital which sees fewer ISP patients by absolute numbers (Timaru). As a first step, the PhD candidate observed patient flow through each ED under the supervision of a clinician (Principal Investigator (PI) on site) to understand the local practices better, in order to prepare for the interviews. The current number of all matching staff that could have been recruited for the study was obtained from all locations so that we could describe which proportion of all eligible ED staff was interviewed.

4.2.3 Developing the semi-structured interview schedule

The initial interview schedule was developed by the PhD candidate based on the aims of the study. After receiving feedback and input from the project supervisors, feedback was also sought from Dr Bruce Lambie, the PI at Dunedin Hospital ED. The interview schedule was first tested on four participants, and from those interviews further insights arose that were incorporated into the schedule. Dr Lambie also contributed a new question for the interviews (participants' views on possible ISP prevention methods). The final interview schedule was then used in the subsequent interviews. The interview schedule for ED clinicians, including paramedics, is presented in Appendix 2.3.

The clinician interviews finally consisted of quantitative questions about the years of experience of the interviewee, the size of the hospital and number of patients seen, and the usual work hours and time of day on shift, to describe the participants. Qualitative, mostly open-ended questions about identifying that someone is affected by a poisoning, and the cues and decision-making in determining intent were discussed with each participant. The main objective was to understand how a poisoning case is identified, and how it is then identified as 'intentional' or 'of undetermined intent', as opposed to 'unintentional' (accidental).

As the PhD project investigates 'intentional self-poisoning', participant understanding of the term was investigated. This was done to inform the PhD candidate of the clarity of the study material wording of Study 3 (Chapter 5), and to contribute to the discussion about the implications of some of the ambiguities of the term in Chapter 6. Finally, the views of the participants on how some of these intentional self-poisonings could be prevented were explored. The interviews were designed to be semi-structured, so that possible emerging new themes could be explored, and to last around 15-20 minutes to not take up too much of the participant's time from work.

During the interviews, clinical coders were identified as an important professional group involved in the process of collecting hospital presentation data for the MOH. Clinical coders

are individuals who have been specifically trained to convert patient discharge summaries and supportive material such as test results into ICD-10 or other clinical coding systems (Careers.co.nz, 2017). This process creates, for example, health data which is then transferred to national data collections such as the NMDS. This clinical code conversion is an important step in the pathway to final datasets, and therefore clinical coders were later added into the list of participants to interview.

"The main aim of coding is: To translate medical statements into code. Clinical coders have to ensure the clinical record content justifies the assignment of diagnoses and procedures." - Tracy Thompson, Senior Analyst (2010)

The interview schedule for clinical coder participants is presented in Appendix 2.4, and consisted of similar questions to the ED clinician schedule, with some questions that were not applicable to them omitted (discussing patient contact items), and some specific to clinical coding added (describing the process of coding).

4.2.4 Study participants

Participants were recruited from among ED staff present at the department by directly asking about their willingness to participate. To facilitate this, in Wellington the PhD candidate was present at the ED at all hours (day and night shifts) during a period of one week to reach more people, and presented the study to staff at handover meetings between staff shift changes, separately for doctors and nurses. There was also an advertisement about the study in the staff tea room notice board. Wellington St John Ambulance Services paramedics were recruited by waiting for paramedics to arrive, and then approaching them directly when they were doing their notes before leaving the ED again. Clinical coders were recruited by the Clinical Coding Team Leader, who indicated more experienced coders present on the day of the interviews for approach.

To facilitate the study in Dunedin, the PhD candidate attended medical and nursing handover meetings to present the study and invite participation. The ED Nurse Educator also advertised the study to nursing staff in emails, and was on hand to cover for nursing staff who wanted to take part. St John Ambulance Service paramedics in Dunedin were recruited through their manager.

As Timaru has a smaller total number of staff, the Charge Nurse Manager (CNM; a leading nurse who allocates nursing personnel resources to specific tasks or areas of ED) initially recruited staff for the interviews based on availability on the day of the interview, and the opportunity for the CNM to relieve the clinician for the duration of the interview. St John Ambulance Services paramedics in Timaru were recruited by both waiting for paramedics to arrive, and through their manager.

Due to the differences in local circumstances and the need to avoid disturbing normal ED operations, recruitment was not completely identical in every study location. At every study site, the PhD candidate attempted to recruit approximately equal numbers of doctors and nurses, until data saturation occurred in the interviews (no new items or themes identified). The number of paramedics was limited to one or two per study site by practical constraints, as these professionals work outside the ED, rarely having time to stay at the ED for long periods.

Clinical coders were interviewed only at one site, Wellington Regional Hospital, due to the time constraints of these professionals. Clinical coders only work as coders during business hours on weekdays, and often work as nurses or other health professionals as well. They have requirements to deliver their finished coding by specified timelines. Practical constraints therefore limited the sample of clinical coders to one site.

The sample of participants was not aimed to be statistically representative of all clinicians on site, across regions, or nationally. Recruiting a purposeful sample of different professional backgrounds was attempted, and the participants were a sample of people

present, willing, and able to do the interview at a time that the PhD candidate was present or could arrange beforehand.

4.2.5 Collecting interview data

At all locations and in all interviews, a quiet place was found for the interview at the ED or clinical coding facilities. All participants were first given permission by their supervisors to take time off their work duties to participate. The PhD candidate then explained the study purpose and how the data were to be used, and the participant had the opportunity to read through the information sheet (Appendix 2.1) and ask questions. Once this was done, the researcher verbally confirmed the participant was happy to be recorded, and gave them a running number for the interview, for example 'ED Clinician 12', to protect their confidentiality. This running number was used in the recordings to refer to the participant.

Written informed consent (Appendix 2.2) to participate was obtained from every participant, and these forms are kept in a locked filing cabinet, separate from the other study material to maintain confidentiality. There was no reward for participation, but at all locations the PhD candidate made sweets available to all staff as a token of appreciation.

These one-on-one interviews were audio-taped, and transcribed by the PhD candidate. The de-identified transcripts were then again compared to the original audio files for accuracy by the PhD candidate, and a number by the PhD supervisors.

4.2.6 Data analysis of clinician interviews

The quantitative elements in the interview schedule were used to describe the participants, including their level of experience in emergency medicine. Additionally, the participant's estimate number of patient 'openness' to discuss the intentional overdose with them ("how many patients are 'open' out of ten"), and their estimate of the average number of poisoning patients they may see during any given shift, were described by numerical

median numbers. These descriptives did not follow normal distribution, and therefore medians were presented.

For rigour and to assist the qualitative analysis, another researcher from the School of Pharmacy (Lea Doughty) listened to some parts of the interviews that were difficult to make out, succeeding in resolving some of the words which were unclear. The PhD project supervisors, Professor Norris and Dr Nada-Raja both listened to a stratified random sample of five interviews each (Norris: 3, 7, 14, 18, 22; Nada-Raja: 5, 8, 11, 15, 20) to become acquainted with the study material content. The randomisation was done from pools of professional groups of participants (doctors, nurses, etc.) to include all types of professionals among these interviews.

The interview transcripts were imported into NVivo Pro software (version 11.3.1.777, QSR International, Melbourne, Australia) for analysis. The interview schedule questions were used to code the interviews to enable quotes to be extracted relating to the questions. The PhD candidate used these quotes to map participant responses into network displays to visualise and process data (Miles et al., 2014). Mind maps were used to map the concepts which were identified in the interviews. Further analysis was performed by creating sequential network displays (Figure 4.1), mind maps with simple hierarchy (Figure 4.2, Figure 4.3, Figure 4.5), and a more free-formatted mind map (Figure 4.4). While creating these figures, observations were refined, and simple relationships between the concepts were mapped. These graphs describe the complex relationships discovered, in a visual format which assists in analysing and understanding the whole and its component parts (Miles et al., 1994, Davies, 2011). While a mind map describes non-linear associations between concepts, where any concept can be linked to any other (Davies, 2011), a sequential network display can demonstrate, for example, temporal progression from one concept to another (Miles et al., 2014). While causal, or hierarchical concept maps highlighting relationship directions (Davies, 2011) were not attempted, the network displays which were created share some characteristics with them as they group items by broader themes. For rigour, the supervisors listened to another stratified, random sample

of interviews (Norris: 8, 12, 19, 24, Nada-Raja: 10, 16, 22, 26) to determine whether there were items relating to the mind maps that had been missed and were not included.

Participant responses were analysed in NVivo Pro by the interview questions. All responses were considered when creating a flow chart of their content, and some quotes from participants were also collected in section 4.4 which describes the study findings.

4.3 Ethics approvals for Study 2

As the study involved human participants, an information sheet (Appendix 2.1) was developed, according to the University of Otago guidelines and template. This information sheet outlined what participation would entail, and that participation was voluntary. It also described what the results would be used for, and how the participant confidentiality would be maintained. All participants were required to have the opportunity to be informed about the study, decide whether to take part, and then sign a consent form (Appendix 2.2) that again outlined what they were consenting to.

The clinician interviews and observing at the emergency department were both considered to be low-risk activities, as no direct patient contact was made by the student researcher. Being present at the hospital might have resulted in the candidate inadvertently hearing confidential information, and therefore a confidentiality agreement was required and signed at each study site. University of Otago Human Ethics Committee (UOHEC) Category B ethics were applied for. This approval involves peer review of the study protocol by an established academic in the School, and a departmental review (Dean's sign-off), followed by final approval by UOHEC. This approval was granted provisionally on 20th January 2016 with the condition that the final ED clinician interview schedule (Appendix 2.3) be sent to UOHEC once it had been piloted and the finished format of the questions decided upon.

The semi-structured interview schedule was piloted in the first four interviews, and as a result some questions were added or clarified. The final version was sent to UOHEC and final approval was obtained on 2nd March 2016 (reference number: D16-010).

When the clinical coders were added to the list of professionals interviewed, an amendment to the existing ethics approval to include them was granted by UOHEC on 11th April 2017. UOHEC also checked and approved the clinical coder interview schedule (Appendix 2.4) at this stage.

As the interviews took place at hospitals, locality authorisations were obtained from each of the three study sites as per applicable District Health Board (DHB) procedures, before commencing research at any given location. All locality authorisation and confidentiality agreement materials were sent to UOHEC for their records. The study had the identifier 01199 at Southern DHB (SDHB, Dunedin Hospital); 'intentional self-poisoning study: interviews' at Capital & Coast DHB (CCDHB, Wellington Regional Hospital); and 201606 at South Canterbury DHB (SCDHB, Timaru Hospital).

In summary, this research was approved by the appropriate ethics committee and conducted in accordance with the University's Responsible Practice in Research – Code of Conduct.

4.4 Results of Study 2

The clinician interview results are described in this section, and the findings are presented by the main themes. The impact on reliability and validity of MOH hospitalisation data that were used to investigate the poisoning agents in Study 1 can be explored through the findings of these interviews, and will be discussed in 4.6 and further in Chapter 6.

4.4.1 Study 2 coverage

The ED clinician interviews were conducted at Dunedin Hospital from 15th February to 9th March 2016, at Wellington Regional Hospital from 19th to 24th February 2016, and at Timaru Hospital from 4th to 5th October 2016. The clinical coder interviews were conducted on 24th May 2017. A total of 26 clinicians were interviewed: 11 of these were nurses, 10 were doctors, and five were paramedics. Interviews with ED clinicians were conducted until researcher-perceived data saturation was achieved at each site. A total of three clinical coders were also interviewed for the study. The participation rate was approximately 7% of all eligible ED staff (excluding paramedics) on the payroll at the time at Dunedin ED, 6% at Wellington ED, and 25% at Timaru ED.

4.4.2 Quantitative descriptors of participants

The median number of years in the participant's current ED or St John Ambulance Services job was five (range 0.3 to 28 years), and the median number of years working in emergency medicine was 10 (range 0.3 to 50 years). Clinical coder participants had 8.5 years (median; range three to 19) of experience in coding.

A total of 12 ED doctor and nurse participants (57% of the participating 19 doctors and nurses) reported that they worked all shifts (morning, day, evening, night, other), while five (24%) worked everything but night shifts, and four (19%) worked only day or night shifts. Paramedic shifts were 12 hours long, and would include both day and night shifts. Clinical coders only worked during flexible office hours during weekdays.

The ED-affiliated interview participants estimated that their ED saw an average of 115-155 patients per day in Dunedin, 160-190 in Wellington, and 45-60 in Timaru. They estimated that on average they would see patients afflicted by a poisoning (unintentional or intentional) one time per a shift that they would be working (median; range 0.1-3 times), although six participants (23%) were not able to give a numerical estimate for this. The clinical coder participants estimated that they coded approximately 30-70 patient cases per

day (all causes) depending on case content and complexity, but commented that the number of poisoning cases out of these varied greatly. They were unable to give a numerical estimate for this.

4.4.3 Describing the process of gathering case information

While ED clinician participants described the flow of information to them about a poisoning case at the ED setting, paramedic participants were able to describe observations at the scene of the poisoning (for example, a patient's home), and how they gathered information before bringing the patient to the ED. The ED-based participants (nurses and doctors) were also able to comment on this pre-hospital information-gathering from their point of view, and many commented that paramedics made work at the ED more streamlined by already investigating the case before bringing the patient in. The flow of information before ED staff commence their work is described through quotes from participants, and then summarised in Figure 4.1.

Information gathering at the scene of the poisoning, outside of the hospital

Paramedic participants described how the background information they received about a patient before arriving at the scene varied based on how much a caller to 111 (general emergency line) knew about the case. Ambulance dispatch would pass on relevant items to the paramedics:

> *Someone's actually called us […] So the… yes, so there's GENERALLY a, a reason to why we're going to the scene and generally someone might have sussed it out a bit.* – **EDClinician15**

> *So… the… We… get whatever background information is available to the call taker… and the dispatcher. That they feel is relevant to pass onto us. So whatever information is given… at the time… umm by the… caller to the call taker.* – **EDClinician19**

They also commented that sometimes police were able to assist in passing on information about the case:

And the police are really good too: they're really helpful. So they will come and… with their, you know, evidence bag full of drugs and such. – **EDClinician7**

All participants highlighted the importance of direct questions to the patient and possible other people or bystanders present at the scene of the pickup. They described the clues they obtained by talking to other people present ('collateral history'):

People, you know, they go from point A to point B, but they also might be at a friend's house, and I'll say: 'What medications are there in the house? Not, not necessarily for them, but what about Dad's medications, Mum's medications? Go have a look – are they where they're meant to be? – **EDClinician19**

Gathering background information about what had happened was seen by the paramedic participants as making a series of different observations and requests for information from various sources:

… Umm then we can, obviously with their consent, search the house. So we look in things like rubbish bins, umm cupboards, umm looking for pill packets, umm alcohol that's been recently drunk. Umm we can also talk to family members, ring family members, ask them what medications they are on. We can talk to the police, police will help us in that as well. Umm we can also ring CATT [emergency psychiatric service], umm and ask them whether they've presented recently. – **EDClinician7**

Paramedics also described observing the surroundings such as the look and smell of a dwelling. Through experience they would start to notice that, for example, untidiness and mouldiness could be possible indicators of social problems, possibly suggesting mental health issues:

And a lot of the times it actually starts with the state of the property. And generally if it's in poor condition, umm… you might start thinking on the lines of: 'Is someone coping?' – **EDClinician15**

They also described how with modern technology they could now take photos of the scene, with the patient's permission, to assist information transfer at the ED:

And they asked a permission to take a photograph of the area, well the house and stuff. And… they got the permission from the patient. Just to try and describe to the hospital how bad they are and how dysfunctional they are. – **EDClinician15**

Paramedic participants also commented that they needed to have an initial, working diagnosis about the case to start necessary, life-saving or otherwise time-dependent treatment. These treatments might include, for example, administration of opioid intoxication-reversing drugs such as naloxone, or sedatives in the case of severely aggressive patients who are a threat to their own safety or that of others. Such drugs cannot be administered by paramedics unless there is a clear indication for the need to use them, i.e. an initial diagnosis matching what these drugs are indicated for. The aim of the paramedic stage of the treatment chain is to stabilise the patient for transport to the hospital, and to initiate appropriate treatment when clinically indicated:

We have got to come up with a provisional diagnosis, so we know how we're going to treat the person. Umm… uhh… I understand of course that the, the nurses can't… uhh diagnose. That's what the doctors are doing. But we have got to come up with a provisional diagnosis. – **EDClinician26**

We can give drugs such as Narcaine [naloxone], just to potentially rule out heroin, opiates... Umm and you can get a fairly good idea of what's going on from the people around them, so… a working diagnosis helps, because it helps our treatment, umm and what treatment the patient's going to receive. – **EDClinician7**

Information gathering from self-presenting patients

When a patient is not brought in by an ambulance but self-presents, or is brought into ED by another person, they are seen by a triage nurse first, who scopes the patient's condition and decides on acuity for being seen by medical staff:

So the triage nurse will be the first point of contact. Umm the patient will either self-present to… triage and give their clerical details and obviously their… sort of complaint or condition, umm or alternatively they will be brought in via ambulance. […] And obviously the triage nurse can then talk to the patient to then clarify, or... – **EDClinician14**

So uhh when a patient arrives, they all present themselves to the triage desk, which is manned by one of our, uhh, trained triage nurses. Umm and they'll ask them what the problem is. And… they'll tell the triage nurse something, whether or not it's the truth, that's, who knows. Umm and the triage nurse will try and decide if they need to be seen… immediately, umm or within 10 minutes, or I think it was within half an hour, or within two hours, or… – **EDClinician17**

After the patient has been triaged into a category, they either wait to be seen or not, depending on how urgent their treatment is. After this the care path is essentially the same for self-presenting and ambulance-referred patients.

Information gathering at the handover stage at the ED

Once the paramedics bring a patient to the ED, they are seen by a triage nurse who takes over the care of the patient in a 'handover'. The triage nurse makes the decision about how quickly a patient needs to be seen by a doctor at the ED, based on the Australasian Triage Scale (ATS; Ministry of Health – Manatū Hauora, 2015a). At this stage paramedics would verbally give a description of the items they consider relevant to the case, including comments on background items such as social problems. They would also describe any treatments they have given, and any vital signs or other observations they have made:

So we give them… umm basically this [form] here, so the mechanism of injury, signs, symptoms, treatment, allergies, medication, background, and then other information. So the first thing I'd say is: 'this is such-and-such, umm I believe they've taken an overdose of this amount of tablets, umm we've rung the Poisons Line, this is what we've been told to watch out for, umm they've presented with this, ra-de-ra.' Yeah. – **EDClinician7**

Uhh just, they'll give a general background. Usually… umm… the presenting problem, and some detail about what the vital signs, and what medical interventions they've sort of gone... undertaken at this stage. Yep. […] It's usually quite comprehensive, what they have. Depends on which time the ambulance have spent with them, and how alert and how much information, but it's often, it's often a fairly comprehensive assessment the ambulance guys have done. – **EDClinician10**

This information is recorded by the triage nurse in paper format, or by another 'scribe' present, depending of the severity of the case. If a poisoning is very severe (ATS category 1), the handover from paramedics to the ED is done to the whole resuscitation team of doctors and nurses as they perform life-saving treatment on the patient:

> *So we get a verbal handover but there's also a… so the ambos carry an iPad, and they do all of their documentation on it. And it's printed out when it gets here, yeah.* – **EDClinician18**

ED clinician participants highlighted the fact that the triage stage of the process did not lead to a diagnosis, and in fact diagnosing at this stage was discouraged. According to the participants, the triage assessment is to be a precise yet quick process to determine acuity, in the form of the ATS score given to the patient. A presenting complaint, the 'main reason' for being at the ED is recorded to facilitate further assessment and treatment at the ED:

> *We are not trying to establish a diagnosis, we are just trying to establish risk, umm and stratify their risk by giving them a number. So it is meant to be quite quick.* – **EDClinician12**

Clinician participants based at the ED commented that in addition to information coming from the scene through paramedics, police, other informants, and the patient, they could access notes from previous presentations and mental health contacts, if the patient had previously presented within the same DHB. Clinicians could also sometimes question informants to elicit information they specifically need, to assist in factoring in risks in their further treatment and diagnosis process:

> *Umm… Obviously [police officer] skills… their, their focus is different. So umm… they will be able to tell you information that they have obviously taken in at a scene, but it is normally what you are trying to elicit from them. So it might be more in the line that YOU'RE questioning them. Won't be necessarily that they will know… because what they are looking for and what we are looking for are two different things.* – **EDClinician12**

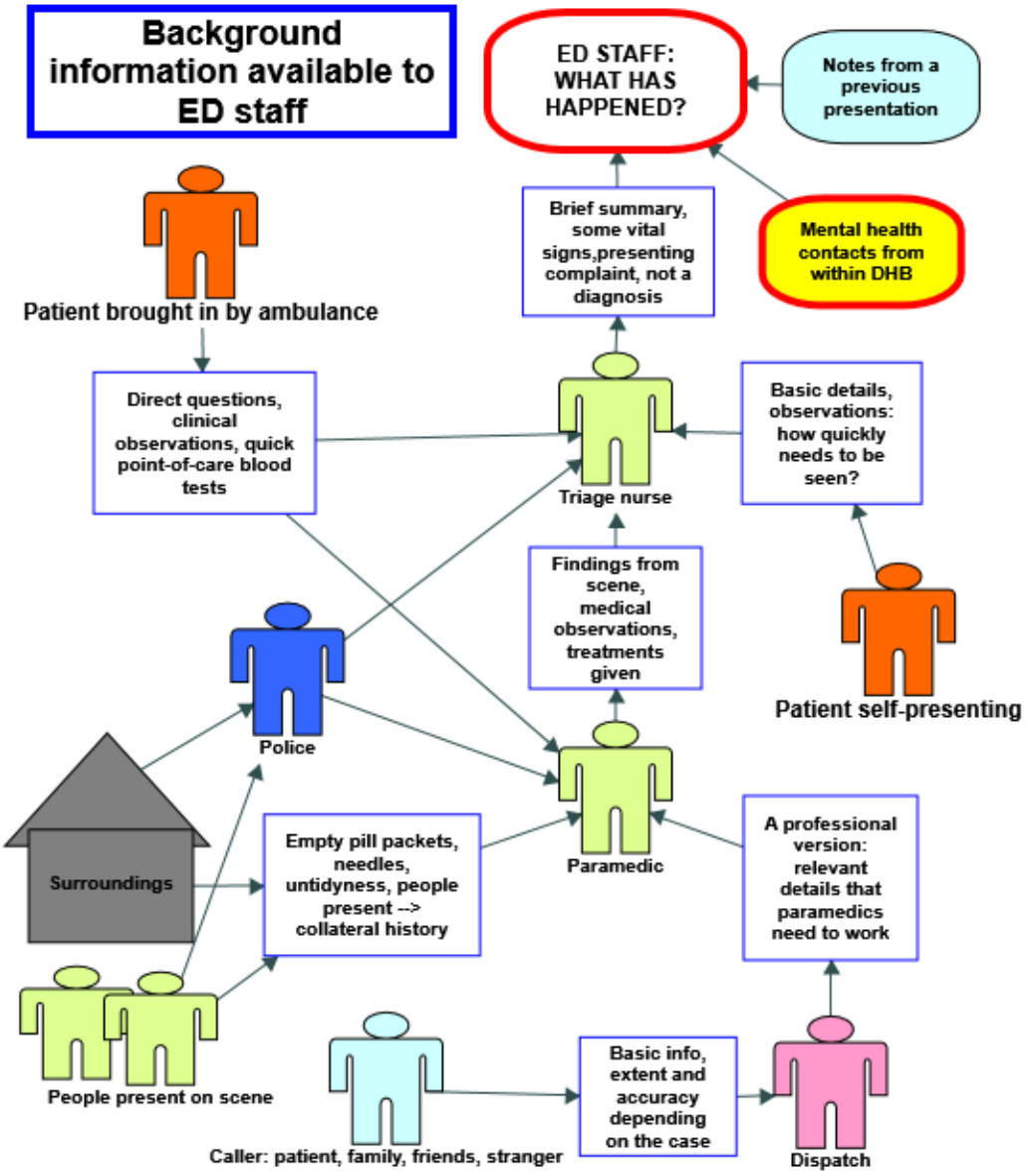

Figure 4.1: The flow of information prior to treatment at hospital.

Further information gathering at the ED

The ED-based participants described how the triage process is intended to be a quick survey of the situation, to either start immediate treatment or to delay it until a medically indicated and appropriate time in the near future, depending on the acuity of the patient

and others at the ED. Once treatment commenced, further assessment of the patient was done with the specific aim to ascertain what is causing the presenting complaint and condition, and to also see if the situation or what the patient had told to previous carers in the chain of care had altered over time:

> *So it's just a quick 2-minute conversation, initial with the triage nurse. Umm then they move through to the CTA [accredited nurse doing a full clinical assessment], so from there, conversations probably become more in-depth about things.* – **EDClinician2**

> *Umm so I guess you would take a history from the patient if they are able to talk to you. Umm… often with overdoses and intentional self-harm there's quite a lot… The way in which they came to be here is quite important. So… umm if that patient has overdosed or hurt themselves or done something, and then called emergency services themselves, then they are often… reasonably… umm compliant with following through in treatment, because at some point some sort of remorse has kicked in and they want help.* – **EDClinician12**

Developing a diagnosis

Some of the aims of the diagnostic process are to increase the certainty the clinician has of absence or presence of a disease in a person, and to guide clinical management of that person (Knottnerus et al., 2002). As discussed previously, paramedics explained that they may need a 'working diagnosis' to be able to treat the patient accordingly before bringing them to the hospital. This 'working diagnosis' further develops as the triage nurse takes a handover from the paramedics, and becomes a 'presenting complaint', to briefly describe why the patient is presenting at that particular time, and to indicate how quickly the patient needs to be seen by a doctor:

> *Diagnosis? At triage, you'd be thinking what they've taken, and there is a possibility, that it could be this, umm… but it will be confirmed once they've been seen by a doctor. […] Yes, so you have a chat with them and then you give them a code on how quickly they should be seen, depending on the overdose or how they look. And how they are emotionally.* – **EDClinician2**

Umm so with the triage nurse, it is umm… essential that THEY don't diagnose. They're not allowed to write a diagnosis on their triage screen. They have to write a presenting complaint. – **EDClinician14**

In some instances, such as a broken leg, this presenting complaint may be so clear that it will end up being the final diagnosis. In other cases, such as poisonings, depending on how much the patient is willing to disclose, the presenting complaint may be very vague, such as 'abdominal pain'. As the nurses and doctors further interact with and assess the patient, making observations and receiving laboratory results, the presenting complaint again becomes a 'working diagnosis', guiding treatment:

It can, it can be as simple as just… a, a diagnosis, which isn't a true diagnosis, where it may just be a symptom. So you maybe say 'headache' as your diagnosis. And then as you go along, you sort of refine that process. But yeah, every, every step we sort of, yeah take in information, try to include and exclude sort of things which are going to… clarify the diagnosis by then. So you get, at least you get a working diagnosis which then… provides the outline of the plan that sort of follows that. – **EDClinician10**

Then you get all the way down [to] the opposite end of the scale: a patient comes in and they're confused, they don't give a full history, they're intoxicated, they're uhh… victim of either drugs or assault, or anything along those lines, and it takes a while. So you gain a kind of preliminary field that you narrow down, your diagnostic criteria, umm till you find to an area where you have to make a certain test. So you say: 'I can take this further if I do this test. It goes this way if I do that test, goes that way', and then go from there. – **EDClinician9**

This 'working diagnosis' develops during the care-giving event, possibly having other differential diagnoses being considered in parallel:

I mean which ever doctor is… seeing the patient, you know, as you're interviewing them, you're establishing a differential diagnosis, and what you think are the most likely things. And… then determining what investigations, if any, are necessary to either confirm or exclude a particular diagnosis. And then once you get your data back… umm and some of that data might be getting information from family or friends, or… you know, that kind of thing. It might not be investigations that we do on blood or imaging. – **EDClinician22**

Participants described that in the case of poisonings, patients are quite often open about what they took, assisting diagnosis, but in some instances the discharge diagnosis may still be somewhat unspecific if the patient does not cooperate and the symptoms are not obvious:

> *There will always be a provisional diagnosis of 'Query:', let's say… 'atorvastatin overdose', for instance. And then as we collect more information, we revise it until the final… uhh information. Again, sometimes people with intentional poisoning, like an overdose, may not be forthcoming with what they actually do, and so sometimes we have to do toxin screens and umm levels of other medication[s] that we suspect may be… may be going on. And then yeah, revising it to actually reach a final diagnosis.* – **EDClinician24**

At the discharge stage the doctor records the final diagnosis. In some instances this may also be done by the nurse if the doctor has not done so, but it is based on the doctor's notes and decision. The patient information management system, Emergency Department Information System (EDIS), was noted to sometimes make entering a specific final diagnosis difficult (also previously noted in Study 1b, section 3.4.3):

> *Umm, so the final diagnosis will either be doctors or nurses, being honest. Umm… the EDIS system that we use, it's actually very difficult sometimes to find the diagnosis that you actually WANT to put down. So you kind of end up using something a bit more broader. But… or you just kind of, like me sometimes, I just go for straights, and put something that's roughly related, but isn't actually… exactly what it is.* – **EDClinician24**

4.4.4 Identifying cases as poisonings

Participants described the process of identifying a case as a poisoning as firstly depending heavily on how much the patient is willing to disclose. The 'history' given by the patient, meaning the patient's past medical history combined with the circumstances that led to the presentation, is generally taken at 'face value' unless there are circumstances to suggest otherwise:

We just, we usually take the history, just take the history, and… Normally what the patient tells you is true. You know… so if they say they've taken something, they just always have. You just take their word for it, to be quite honest. Umm but we sometimes double-check, I would do, if they've taken an, an overdose, we usually do a paracetamol level. – **EDClinician1**

How sleepy they are, how unwell they look. Their vital signs. Things like that. You always [have to] take what they say, on the basis of what they say, if they say they've taken 100 paracetamol, even though you don't THINK they've taken 100 paracetamol, you've got to go with that: they took 100 paracetamol. – **EDClinician2**

'Collateral history' from people present at the scene, the police and the paramedics may significantly affect the credibility of the history given by the patient, or simply add to it:

I think you're relying a lot on… what they've taken, what they disclose. […] A lot of, a lot of them present quite low in mood… umm usually complaining about abdo[minal] pain… or feeling nauseated, or sick, or… vomiting from that aspect. Drowsy. Depending on what they've taken, really. So they're the, the clinical signs that you tend… to observe the most. – **EDClinician21**

I would certainly, I would certainly be looking at their eyes. Sometimes their pupils might be… uhh, yeah, larger than… umm normal. Umm I would be talking to the people that they were with… umm and, and asking the person directly. You know, people are quite… By the time, if they've got to the emergency department, if they've come here, they're usually coming here for help. – **EDClinician13**

4.4.4.1 Clinical signs of a poisoning

ED clinician participants described examining the vital signs of the patient, from previous vitals taken by paramedics or triage nurses to new vitals taken at clinically appropriate intervals during the care process. Participants mentioned an altered consciousness state, as assessed by the Glasgow Coma Scale (GCS) which describes how mentally alert a person is, as an important indicator that they use to assess a patient to determine whether it might be a poisoning. Also changes in electrocardiogram (ECG; imaging the electrical signalling in the heart) readings, seizures, abdominal pain, nausea, and vomiting may suggest a poisoning:

Umm so look for things like monitoring their GCS [Glasgow Coma Scale], if they're fluctuating. Umm… just their behaviour in general. – **EDClinician25**

Oh, you can usually tell by looking at the vital signs, yeah, most of… whether they're tachycardic [abnormally rapid heartbeat] in particular, whether they've got a normal ECG or not. It's quite useful. And umm… and basic things like blood tests are quite useful. […] We always, we get the basic workup, and the blood tests [are] useful, because if they're, if they're normal, it's more likely to be a poisoning, whereas if we find, if the blood tests are really high, it's more likely to be something differential, so something else. – **EDClinician1**

A lack of any visible physical trauma that might explain the condition that the patient is in can also be a clue to suggest a substance-induced state:

Umm but essentially too it is a lot about your… back… about the background of the patient. So umm… if there is no sort of history of trauma, no signs of trauma to the patient, and they are in an altered conscious state, then you are going to be thinking of sort of either a cerebral event or some sort of medication… umm that has caused that altered conscious state. – **EDClinician12**

You know, it's… you know, oftentimes the 'diagnosis of exclusion'. You know the kid is acting goofy, you can't find anything, and then you find out that… you know, Mum is missing a lorazepam tablet or something. So… it's either by history or physical examination, but most of the time the patient tells you. – **EDClinician22**

Participants mentioned using known 'toxidromes' as guides. They mentioned frequently using the TOXINZ online database as a source of toxicology and toxidrome information. A toxidrome refers to a combination of clinical symptoms typically associated with a type of medication or medication group in overdose. If a presentation matches a known toxidrome, this can aid management as it suggests poisoning with a similar agent:

You look for a toxidrome. So you look for sympathomimetic, or anticholinergic, or… umm… […] Umm, you know, look for track marks for the opiates, for the methadone ones, we look for pinpoint pupils. […] So you look for clinical signs. – **EDClinician11**

Umm if they have a… if you can get a medication list, you can see whether their clinical features are consistent with an overdose with one of those medications. – **EDClinician10**

Umm… so the things I would look for: 'Is there a clearly definable toxidrome?' So you know, 'Is this obviously an anticholinergic toxidrome?', or 'Is this, say, a serotonergic, or sympathomimetic toxidrome?', or there's all sorts of overlap between them. Umm… that would be the first thing I do, you know, just an overall, sort of end-of-the-bed 'Oh yeah, does this patient look like they've got a toxidrome?' – **EDClinician18**

Some specific symptoms and signs that participants used to identify toxidromes and poisonings included hyperthermia (elevated body temperature); sweating; fever; pinpoint or dilated pupils; an abnormal respiratory rate; needle marks ('track marks'); agitation; seizures; clonus (convulsive spasms); pain; headache; visual disturbances; nystagmus (rapid involuntary eye movements); abnormal reflexes; arrhythmias; and responses to voice and pain:

Umm… but your treatment regime may change depending on what you find, so if they're hot, umm if they're burning up, as in hyperthermic, then you got to look at something like speed, or umm… like an MDMA type drug. If they're sweaty, then you're going to look at meth[amphetamine]. Umm so you see we do have quite a good working understanding of what the drugs are. I'm looking at pupils: are they pinpoint or are they dilated? What's the respi[ratory] rate? Have they got pock marks, have they got 'tracks'? – **EDClinician7**

You look along the lines of clonus, you look along the lines of febrile, so if they've got a raised temperature, uhh… nystagmus, if they've got visual disturbance. Umm so you'd look for a variety of signs. If they're talking, you'd ask them symptoms, whys, what they would get, whether they were agitated, in any pain, is there any headache, whether they're describing any visual disturbances and the like. And then we'd progress onto, umm…. obviously as I said you'd examine them and see if there's any – some drugs cause neurological… issues, so hyper reflexes, or reduced reflexes. – **EDClinician9**

Are there other things, that's how they present, so unconscious, how unconscious are they, are they responding to voice, pain, or not responding at all. Umm… pupils, are they pinpoint pupils, uhh we, we look at that. Uhh respi[ration] rate, saturations, umm

ECG, we want to look and see what rhythm they've got: is an arrhythmia happening or is it a normal sinus rhythm. – **EDClinician6**

Diagnostic tests that may be used to assess a patient include measuring blood paracetamol levels in suspected paracetamol poisonings. Many participants mentioned this test as one of the most common toxicology tests done at the ED. Results of the test are available in about one hour, which makes them useful for guiding further management of the presentation. If toxicology results take too long to obtain, they will not be helpful for resolving the immediate situation. Breath or blood alcohol and blood paracetamol level testing were mentioned as useful aids:

Our investigations that we can get back at a timely fashion for these patients are quite limited. Umm… urinary tox screens take a while. Umm blood tox screens – I don't even know how long we go about that! Umm the only things that we routinely screen for are paracetamol and ethanol. – **EDClinician18**

In heavy intoxication the smell of alcohol may be obvious, and depending on the presentation, blood alcohol levels may not need to be measured. Blood glucose levels and venous blood gases were described as other diagnostic tests used in treatment guidance:

I do blood glucose on them as well, because I want to know, you know, what have I, what have I got? Umm sometimes you do get a smell of alcohol. You do get a smell of cannabis on the clothes itself, umm however that's not something that you always want to go on, because it might just be an environment as well. – **EDClinician5**

4.4.4.2 Other means of identifying a poisoning

Participants mentioned that clinical experience helped them identify poisonings through simply having seen similar presentations many times before. Demographic factors could be used to assess risk factors, and to add to the evidence obtained in the case:

Umm… much of it is from 'field experience' of... well you know, 'stereotypical presentations'. So… young people with agitated delirium… for example. I mean there's a high likelihood that is… related to… substance ingestion, deliberate, accidental,

whatever. Umm… compared with say an elderly patient who comes in with the same. So… it's a really intricate question between history, exam, demographics… experience… For example I might… pick up on something that one of the juniors [doctors] might not. – **EDClinician18**

The final step that the ED clinician participants described was to combine all of the evidence gathered: using clinical experience, matching symptoms to known toxidromes, looking at the toxicology results and the patient history, and to use the process of eliminating other causes, until there is only poisoning left. Many participants underlined the history obtained from the patient as a key piece of information that could streamline the process greatly. This process has been summarised as a flow chart in Figure 4.2.

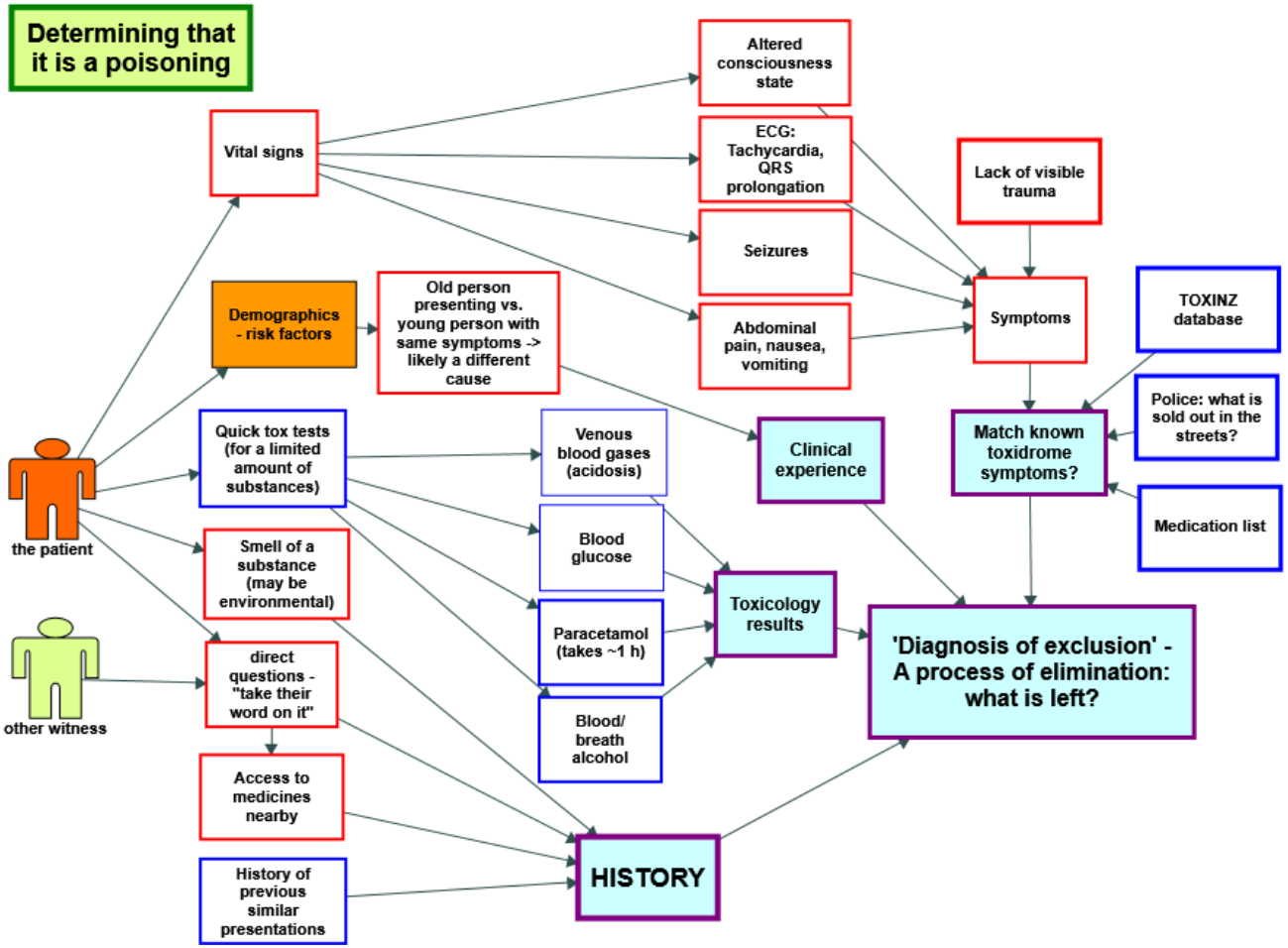

Figure 4.2: Information flow in the process of identifying a poisoning.

4.4.5 Investigating the intent behind a self-poisoning

The ED clinician participants reported that their best approach to determining intent behind a poisoning were direct questions to the patient. From their experience the majority of patients would tell them:

> *And you usually get a direct answer, 'oh no, I didn't want to die', or 'yes, I'm sick of life, I want… I want to die, I'm disappointed that I, that I didn't die', so yeah it's a direct question, it's quite useful.* – **EDClinician1**

> *Umm… often… we, it's, it's actually rare for people who have intentionally overdosed to… deny it. […] They often… they've got enough insight that they want some help as well.* – **EDClinician10**

> *I do ask people… if they had the intent to kill themselves. Because it gives you, it's a very blunt enough front question, and people will generally tell you 'yes' or 'no'. Or 'Do you still feel that way?' And it gives me an idea as to what frame of mind that they're in, what they're likely to do from there. And also, it gives me an indication of how… actual… is their intent.* – **EDClinician19**

Building rapport was seen as a good way of establishing a good care relationship and obtaining information from the patient:

> *'I'm here to help you. Umm… You've taken something that's interacting with you and you are… for whatever reason, sometimes it's good to talk about it – if I'm not the person you want to talk to, okay'. […] And sometimes it's offering a cup of tea. And sometimes it's just the ability to have someone actually cry. […] So it's, it's… it's hard for me to put my finger on it, because I will assess it on the patient and what, which is weird to say, what I will 'sense' from them.* – **EDClinician5**

Participants felt that the majority of poisoning patients presenting at EDs would statistically be intentional self-poisonings, but that they would keep an open mind and take each presentation as it comes, even if there are previous presentations for intentional overdoses in the past:

'Were you intending to hurt yourself?' And once I've got that, that knowledge behind me, then… it's just all in the back of my mind, I'm still going to treat based on what I see… – **EDClinician19**

But yeah, clear risk elements, I mean young male population, umm… basically they're your poor support groups, IV [intravenous] drug use, alcoholism, umm previous suicide attempt – as I said, the severe ones that ended up in ICU. – **EDClinician9**

Participants took their duty of care seriously. Duty of care in the medico-legal context in New Zealand means that once a clinician accepts the care of a patient, they have a duty to prevent harm from happening to the patient (New Zealand Nurses Organisation, 2016). This harm may be through the actions or lack of action by the clinician. An acceptable level of care, not in breach of duty of care, is defined as the reasonable actions of other similar, fully registered clinicians in the same situation. In cases of ISP, complying with duty of care is, for example, that the clinician would not leave a patient at risk of suicide unsupervised. Clinicians described that they would try their utmost to build rapport, and keep their patients safe and assess their competency to make informed decisions about their own care:

I think as part of our umm… care for the patient, and duty of care, we need to establish ongoing risk to self. So in… any nurse really should be asking the patient if they have had any, in that context, any thoughts of ongoing self-harm. – **EDClinician12**

But risk assessment of suicidality is famously… poor. It's very hard to get a good 'reading'. Umm so everyone we see that we suspect may have taken an intentional overdose, goes to the emergency psychiatric services. – **EDClinician17**

Yeah, and if they don't want to tell you, then that's their choice, that's their right. But we, we gain really good trust with our patients, umm and give them a lot of information. Umm and they do tell us a lot of stuff, so… yeah… but it's up to the patient. – **EDClinician7**

Participants also mentioned that mental state assessments and investigation of intent may need to wait until the patient is no longer intoxicated:

We're often looking after their acute sort of medical problem and then… umm… often if they're intoxicated, we'll reassess that when they're in a non-intoxicated state, and then just try to get a clear picture of what's happened. So it's often where we go through intent. And then we work in conjunction with mental health services and they're often the people that go into more detail. – **EDClinician10**

Participants discussed a changing story as an indicator of an intentional event. If the patient was willing to talk but the story they gave about the events changed from clinician to clinician over time, that indicated a possible impulsive intentional self-poisoning event and subsequent 'change of heart' and willingness to deny that the event had occurred:

And sometimes what you… what I find even with paramedics is that the patient will ring the ambulance, and tell them one thing. And then when you get them to the triage they'll tell you a different story. – **EDClinician3**

Sometimes denial of umm… events, even though… you can clearly see… things we're piecing together. So umm… it can be a wee bit of detective work. Umm and sometimes people will make sort of innocuous comments that you pick up on… umm… that you'll realise that there was quite an intent behind it. – **EDClinician12**

Yeah, so inconsistencies, or blood results will sharpen, you know, say 'Clearly you have been drinking because your ethanol result is X, and you said you haven't'. So once inconsistencies start to come, you probably… start to be a little bit more suspicious… umm, of things. – **EDClinician11**

So… if the patient… is denying that it was a deliberate overdose or an attempt to commit suicide, I mean what you can look for is changing history. […] So they keep changing it, or literally you're suspicious [that] they're making it up […]. If their history is not in keeping with your clinical findings, so for example 'I haven't taken any paracetamol' but the paracetamol level is through the roof, so LYING would be part of it, umm or then just not admitting to the truth. – **EDClinician9**

A particularly alarming sign of intentionality in a poisoning that the participants mentioned was definite planning of the event:

Or if they planned it, stockpiled some medications, waited 'till everyone was away, and then tried to… a serious attempt to… kill themselves. –**EDClinician17**

Umm clear plans… umm and… there's also some preparations to things, so if they've written a note, if they've made sure they're far away from other people, and if they're found – that's really important. If they've texted someone, 'I'm feeling suicidal', they've already put their hand in the air, it's a, it's a sign for help. They may have taken a really serious overdose, don't get me wrong, but it is a sign of their, they want a degree of help from it. – **EDClinician9**

Expectations of what would occur as a result of exposing themselves to the poisoning agent were also used as cues suggesting an intentional overdose, and in addition to a clear wish to die, referring to a wish to escape or 'just go to sleep' were also considered cues for the interviewees that made them suspect an intentional event:

I'll just turn around and say: 'So, what, what were you intending to do by doing this?' You know: 'What did you think the pills would do for you? What do you think this could do to you? Did you understand that this would be harmful?' And… umm… yeah, go from there. Yeah. – **EDClinician14**

Why they took the pills, if they, what they thought was going to happen. Umm if they're happy or sad that they're not, they weren't successful, if it was a suicide attempt. – **EDClinician17**

Circumstantial evidence such as the type of poisoning agent taken being a not-normally ingested substance or with no clear rational reason for taking it, or an unusually large quantity being taken, sometimes stockpiled over a period of time, could indicate planning of an intentional overdose:

Uhh… I mean sometimes it's fairly obvious, I mean I'm thinking of the last guy I had: […] You don't normally drink antifreeze. – **EDClinician14**

If they've taken a lot of tablets, it's usually not… you know it's not accidental. So… It's quite difficult to swallow tablets. I find that people that have taken maybe more than… five or six or they haven't got a clear syndrome that they're treating… […] And then often the medication they've taken often gives us an idea about the intent. And often the… just the sheer volume of the tablets or medications taken gives us a rough idea of intent. – **EDClinician10**

> *The thing is, if it's accidental, they just don't come here [to ED]. You know they might have taken one or two extra pills, it's so rare for them to come because they don't make… any pharmacological effect… or physiological effect, so they don't come saying 'ooh, I accidentally took two cilazapril'. You know, instead of one. […] It'll be asymptomatic, therefore they won't come. The ones that take the whole bottle, that's not an accident. And they will usually tell you.* – **EDClinician11**

Circumstantial evidence could also assist the clinicians interviewed in assessing patients who did not wish to talk at all. 'Closed', rigid body language, angry demeanour, especially lack of eye contact, were mentioned as cues that suggested an intentional event:

> *If they clam up and DON'T tell me, that probably puts me more on alert that they ARE… a higher risk.* – **EDClinician14**

> *Uhh… often their body language. They're a, a bit more closed… […], you usually have to probe a little harder. If they've, umm… if they've intentionally overdosed and they don't want to have been helped, so umm… they're reluctant to give you that information.* – **EDClinician23**

> *Umm… eye contact's usually a big… one with me. Usually if… they're sort of not wanting to be… are sort of hiding from you, that kind of behaviour… umm tells me that there's something… not quite right and something's happened in that way.* –**EDClinician25**

'Collateral history', especially about recent life stressors and noted changes in behaviour by family, friends, or carers could also suggest an intentional overdose:

> *The partner. And you get a slight history from them as well, so their suspicions that they might give a previous history. They might tell you 'Actually she's been actively, he or she's been actively suicidal for a while, they've been planning things, we've been worried'.* – **EDClinician9**

Gathering information that may lead to a suspicion of a poisoning being intentional is summarised in Figure 4.3.

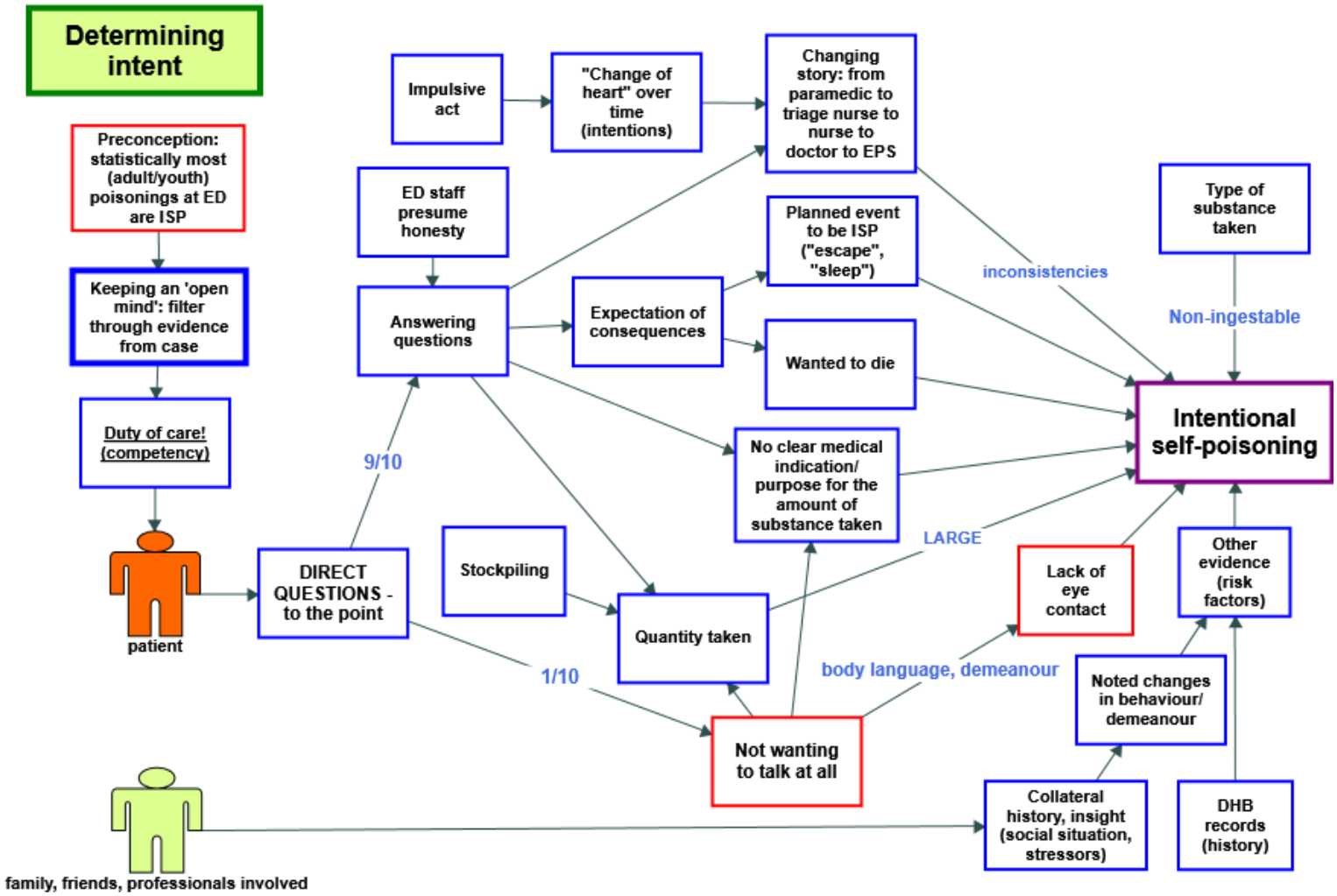

Figure 4.3: Identifying intent behind a poisoning.

4.4.5.1 Patient willingness to disclose intent

ED clinician participants estimated that only one out of ten intentional self-poisoning patients they see would not be open about the intent behind the poisoning when questioned about it (median 1; range 0.5-5). A total of 22 clinicians gave their views on this, while four participants (15%) did not give an estimate. They also commented that most people were very open about what they had done and why, and usually would collaborate and assist treatment. According to the interviewees, this was often due to a 'change of heart', that the ISP had been an impulsive event that the patient later regretted:

> *So a lot of these people do actually, are actually coming… to… get… mental health assessment, and help from that point of view. And they're also worried. They will also, some have had a change of heart in the meantime. And they don't, they no longer want to… harm themselves. […] We, we see people… who… have either… I mean… most, a lot of these people are actually self-presenting. They're actually, or, or calling the ambulance themselves. […] But people who have actually made that sort of first step to ask for… you know, some sort of medical assessment, then they're often, they're quite open about it.* – **EDClinician10**

> *And you KNOW they've told someone that they've taken, because you – because the ambulance doesn't just turn up for no reason. We don't just turn up at people's house and say: 'Have you taken an overdose? – Let's go to the hospital!' We go there because they've told SOMEONE – whether they've rang… themselves, or whether they've texted their counsellor, or their social worker, or their support worker, or their friend to say they've taken, they've done this thing.* – **EDClinician19**

Participants also described circumstances where patients may try to hide the intent behind a poisoning, and some of their solutions to figuring out what was happening in such cases. A reason a patient may not wish to talk could be that they are upset that they were intercepted, and want to try intentionally injuring themselves again. Another reason could be that they feel frustrated or disillusioned, feeling that the clinician cannot really help them resolve the issues that precipitated the ISP event:

If they're not going to, they're not going to tell you, because they either want to try again… or 'It's actually none of your business, you're just a nurse'. Umm… Or there's nothing you can do to get them out of the situation that they feel that they're currently in. You can't make things better. You can make better something, for now, but… you can't give them… that lifeline that they expect. That they feel that they need at that time. – **EDClinician5**

Being vague or not saying anything were some means of hiding intent from the clinician, or making up excuses for the overdose, trying to explain it away as accidental:

Obviously just giving poor history. Or… making up other reasons for it, like having pain that was uncontrollable. […] Sometimes people would say 'Oh, I just could not get on top of my pain, and so I took…' even though they have been taking 'X' medication for a long time and you know that they… clearly have been managing it, in the past. – **EDClinician12**

But yeah they certainly try and avoid the question. You can tell, because they'll… they typically… just won't give you really any answer. But they may answer other questions, but they may… pretend to be really sleepy or… just not giving an answer. Just glance at you, or something like that. Or tell you: 'Go away!'. – **EDClinician16**

And 'Did you take them to kill yourself? So what did you want to happen when you took them?' – 'I don't know.' 'Or did you want to die?' – 'No, not really, I sort of just, I don't really know, you know, just sort of had enough, I just had enough'. Or 'I just wanted to sleep'. Or 'I don't really know why I took them'. – **EDClinician3**

Clinician participants explained that they would try to get an understanding of the intent in these cases by looking at what other clinical evidence and the patient's state were indicating:

Umm… if they're trying to hide it… […] Or they just won't mention some of the pills they've taken, but will have empty bottles of everything they might have taken, or potentially have access to uhh… and was no longer there. Umm… but a lot of the time it's… well, we do it based on symptoms. So if they have lots of symptoms, then… it's usually more serious. Or they've had a bit of a go at it. – **EDClinician17**

Participants felt that the amount taken could be a clue in investigating intent. They felt that people may not always be truthful about the amounts they had taken, but through questioning and comparing evidence they could establish the circumstances of a suspected overdose better:

> *Umm… I think a lot of people don't give… exact amounts of… whether they've taken a large amount, or a small amount. Sometimes they might say they've taken a lot, and then all their bloods come back and obviously they haven't taken any at all. And then it can go the other way, 'Oh I haven't taken that many at all', and then they come back with a Panadol… level sky high. So obviously they haven't been too truthful. So you get to see both sides of the fence, and it's… and it is hard, to distinguish… you know… you just have got to be reliant upon them being open.* – **EDClinician21**

> *People are either… have that intent, or they don't. And the quantities… you know, they, they don't tend to vary much. You don't sort of see six or seven paracetamol. It's… normally a couple of extra because you're in pain, OR, it's the… the whole foil that they had available to them because that's all they had.* – **EDClinician19**

4.4.5.2 Exploring the uncertainties of determining intent in poisoning cases

When ED clinician participants were asked about poisoning cases that sometimes end up being coded as 'of undetermined intent', many felt that sometimes the patient themselves did not know, or the patient was adamant that it had been unintentional even though other evidence pointed to an intentional event:

> *If they're adamant that it was totally accidental and things, but there's something else just saying that it's not, to you. Then you'd make it 'undifferentiated'.* – **EDClinician2**

> *There's circumstances [where] the clinicians believe one thing and the patient is adamant, another. And we can't prove that they're lying. And I assume that's what's the case. Because you either… they admit to it, and we believe them. They don't, they say it wasn't intentional, and we believe them. Or we disbelieve them. And… yeah, it, it, that's a difficult question. That essentially means is that the clinician is either uncertain, or disbelieving of which direction it is.* – **EDClinician9**

Consuming alcohol with other substances, or overdosing on recreational drugs also sometimes made it difficult to determine what the intention of the overdose was:

> *Well… to me, it's tied up with alcohol. […] they lose their… reasoning ability, after alcohol. And… then they get a bit depressed, in some cases. 'Let's do it!' So to me it started off… not with that intent, but unfortunately whatever, either marijuana or booze normally… umm has altered their intent later on.* – **EDClinician26**

Many clinicians relied on their patients being honest about what they had done, and if they could not question the patient due to for example the patient being unconscious or not willing to talk, determining intent may not be possible. If an overdose could be explained as pure ignorance, especially if the patient had access to more drugs but did not take them all, a case could be of undetermined intent:

> *And I guess overdoses that are, some are on the line of, on the cusp of being… […] of a level that might be harmful, sometimes I guess you sort of think that if somebody had a, a real intent or… and had availability of medication, often you find people might overdose and there is still half a packet of five drugs there. And you sort of think if you were doing this, you would… have taken everything you had. […] Umm so I guess sometimes… umm… behaviours that you could somewhat explain as maybe… ignorance.* – **EDClinician12**

> *Because I think sometimes people are thicker than we think they are. As in… you think that the knowledge is out there that paracetamol… more than, you know, recommended dose is not good for you. And I think sometimes people… uhh… sort of want to hurt themselves, sort of don't want to hurt themselves. Might have that little voice in their head saying 'Oh, maybe you've taken two?' – 'Naah, naah, naah, it should be right!' type of thing. So that's a really, really hard one to determine.* – **EDClinician3**

The patient's clinical condition, such as chronic, severe pain or dementia were described as factors that could make determining intent more difficult:

> *Umm… […] whether it's an accident, let's say an older person, who… umm may be in a lot of pain and have taken eight tramadol as opposed to four. But they've also got an element of dementia. Very difficult to determine if that's a suicide attempt umm or a… an accident.* – **EDClinician7**

> *Umm I guess… probably those patients we have been talking about that might say that they have got a pain that is uncontrolled, 'So I just took', you know, 'I just thought it would not hurt if I took an four extra tablets a day or… six', and I guess that coupled with potentially… a history of harm… or depression or something might make you think that that is borderline. But if they are steadfastly refusing…* – **EDClinician12**

Some interviewees also stressed the importance of asking direct, clear questions: "Did you want to die?" and "Did you want to hurt yourself?", and making a clear distinction between the two, not omitting one or the other. If this distinction was not made to the patient, answers could be vague and non-contributory, and lead to a case of undetermined intent:

> *Hmm. I think there's a very grey area between… we– like questions 'Were you trying to hurt yourself?' and 'Were you trying to kill yourself?'. And I guess unless you make a really clear distinction to the PERSON… then… you may NOT actually ever know whether or not it was… because they wanted to do it. You know, they wanted to just… end up in hospital, or they wanted to… hurt themselves, with a… you know, a fatal amount…* – **EDClinician16**

Participants also felt that some people who have presented due to ISP previously may wish to hide their true intent to avoid being referred to the Emergency Psychiatric Service (EPS), as they have already been referred previously and wish to avoid it this time. This could then cause an undetermined intent coding:

> *Yeah, well I think… I wonder if it has something to do with the fact that they may have been 'in the system' before? And umm they know that if they say… something, that they are stuck 'in the system' that's really hard to get out of. […] So those are the ones*

that I think that are more experienced campaigners that… know that if they say stuff… they're 'stuck'. That's what I think. – **EDClinician15**

Three participants also felt that cases could get coded as 'of undetermined intent' if there was insufficient data available to the coders due to mental health contacts not being updated in the discharge summary, or due to simply not determining intent clearly at the ED while the patient is present:

Yeah. And they will have access to psychiatric notes which we don't have access to [at the ED]. Umm someone thought it would be a good idea to keep the two separate… but it's pretty stupid. – **EDClinician17**

I think the difficulty is often the coding, the intention's often not… The intention's often not sorted out within ED. […] You know, without us knowing that, and I don't know for example how our data from EDIS actually reflects… a patient who was discharged to the care of EPS, who was THEN admitted. I don't know if we would be able to catch that data with ours, with our ED statistics. […] Uhh I think that's just because it's difficult to determine intent. At the time of coding. It depends on WHEN you were just talking about these diagnoses being coded. If it's a DISCHARGE diagnosis, from HOSPITAL, then you're capturing a much more serious group. If it's an ED group… umm that's probably a defect in the information gathering. – **EDClinician18**

These factors contributing to findings of 'poisoning of undetermined intent' are summarised in Figure 4.4.

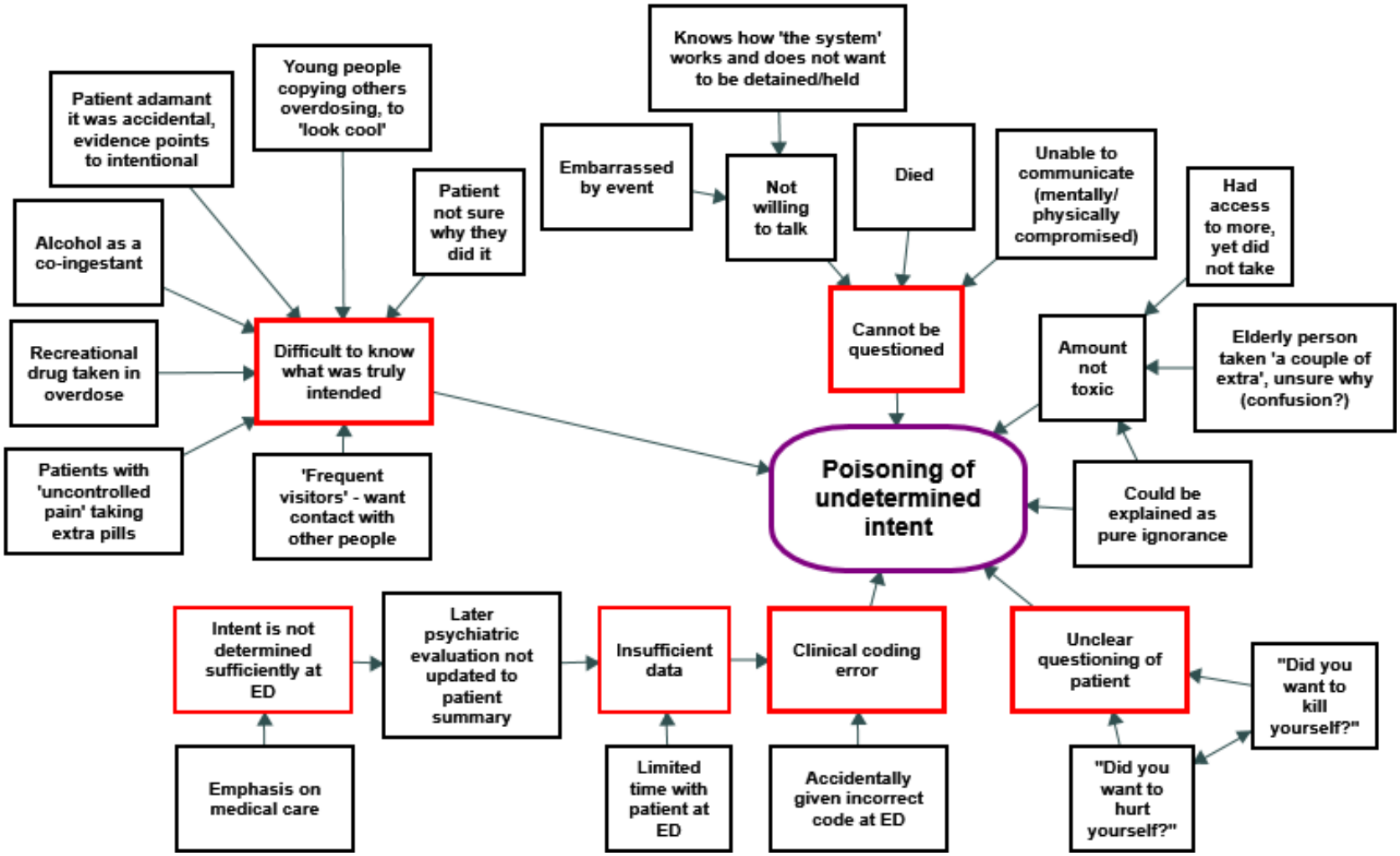

Figure 4.4: Reasons for poisoning cases remaining as ‘of undetermined intent’.

4.4.6 Converting patient information to Ministry of Health data

Patient cases are allocated to clinical coders based on the patient's National Health Index (NHI) number (national identifier). Each coder in Wellington has a range of numbers that allocate cases to them, and if the last two digits of a patient's NHI number in a presentation match these numbers, the coder will code that particular presentation.

Clinical coder participants described that their source material included patient files both in electronic and paper format, including ambulance, triage, laboratory, imaging, and mental health service notes, depending on the way the case is managed:

> *We'll get their charts. So have their discharge summary… […] we'll have notes… labs… Everything on the notes, operational reports… radiology. Umm if it's ED, or mental health, we usually just code straight from online, so discharge summaries online. […] We want to know what they came in with, you know, why they presented to hospital, and then what they actually got ADMITTED with... because it could be… different. Umm yeah, so to us, the more information we have, the more accurate our coding is going to be.* – **EDClinician29**

All patient files have a discharge summary briefly detailing what has happened, what the treatment has been, and what the end result was. The three clinical coders interviewed indicated that the summaries were used in combination with all the other relevant material in the patient file:

> *Ah, we go through – if we have the file we go, not ALL the file, but we go through the… umm, the notes that… is current to that event. Umm… also the mental health umm notes as well.* – **EDClinician28**

If something was unclear, coders had the opportunity to contact the clinicians who had treated the patient. Mostly, however, issues were able to be resolved among the coding team where most have a medical or nursing degree. All coders stressed that their job is not to interpret the case file, but to convert what the clinical staff have recorded, into ICD-10 codes:

Though we're NOT meant to interpret, we're meant with no clinical knowledge – we just code what is documented. […] Yeah, you go by what the doctor noted. – **EDClinician27**

We have to convert it into… Like this one here, they have got 'appendicitis'. Well but we have got several codes for appendicitis. So we would have to go looking: Is it acute? Is it chronic? Is it gangrenous? Is it suppurative? Is it ruptured? There's all those sort of things that… we don't get… just from that. So we have to go and we have got… sort of flow charts and things… that we go through. – **EDClinician27**

A diagnosis of a poisoning is usually indicated in the discharge summary, and further described in the main file notes. Intent behind the poisoning is usually already indicated in the discharge summary, especially when a poisoning has been intentional, but the coder will still read the case notes to confirm intent:

It will say like 'paracetamol overdose'. Or 'multi-drugs overdose'. You know. So... it's, that's why it's easier to recognise if it's an overdose or not. If it's in the journal it is easy. And if it's… just uhh an accident, they will also say it there. 'Accidental overdose'. – **EDClinician28**

The hospital presentation event is to be described through ICD-10 codes, and diagnoses and relevant events are converted into these codes. In the case of a poisoning, the coder includes an ICD-10 poisoning code which corresponds to the specific substance which was involved (T code - does not indicate intent; see Table A.1.2) or several such codes, and one or more external injury codes (X40-X49 unintentional, X60-X69 intentional, Y10-Y19 undetermined intent poisoning, see Table A1.1 for examples). Coders were also required to manually enter the specific drug name into the code name:

We used to… ah well, we have to now over-type everything. You know... put the specifics down. [refers to changing the code text, for example 'quetiapine poisoning' → coding software automatically gives the ICD-10 code 'T43.5 Other and unspecified antipsychotics and neuroleptics' → this code is manually changed to 'T43.5 Other and unspecified antipsychotics and neuroleptics QUETIAPINE'] – **EDClinician27**

Yeah. So we won't always put the exact amount of those drugs [that were taken], but we should have the actual drug name… because they ARE required by the Ministry of

Health, to be edited. […] it's a national requirement, to edit these texts. – **EDClinician29**

Once the patient presentation has been coded, it will go through quality control checks. If there are any corrections to be made, the coder will get the case returned back to them, and adjust it accordingly:

Weekly, we have a report, it will come back, and our manager checks that, and, and if she can see that the drugs have actually been stated on the discharge summary, she'll get it back to the coder and say: 'You need to put that in'. – **EDClinician29**

Clinical coders are offered training on changes in coding practices, Ministry of Health guidelines on coding, and new or current versions of ICD-10 as necessary. Patient cases which involve unusual codes or otherwise difficult coding are discussed among the team to educate all coders about the issue. The coding team also arranges training for their peers:

I think we've done a lot as coders. We've done a lot of education with the medical staff. […] In terms of what's needed. […] … vigorous accuracy, is what WE want. For accurate data. – **EDClinician27**

4.4.7 Other insights from participants

In addition to the pathways of collecting information about the case, participants were asked about their views on the impact that knowing a poisoning is intentional may have on treatment given, and on how they might approach preventing intentional self-poisoning. This section also describes the interviewees' first impressions about the term 'intentional self-poisoning'.

4.4.7.1 Effects of knowing intent on the subsequent care path

Clinician participants felt that knowing whether a poisoning was intentional or unintentional would not affect the acute care given. Medical treatment of many poisonings was described as simply supportive, and intent would not matter while keeping the patient

under observation at the ED or in a ward. Participants did feel, however, that intent would be investigated and taken into account when keeping the patient safe at the ED:

> *It wouldn't affect their treatment so much when they came… through the department, you'd be more mindful of the fact that… whether they'd do it again. Or what watches are needed in place? Whether they are still actively feeling like they want to harm themselves.* – **EDClinician2**

> *So which treatment strategies, whether it be umm pharmacological, psychological such as counselling, umm so that may change. But the immediate, resuscitation of the patient is the same.* – **EDClinician9**

Keeping the patient safe could involve restraining and holding them against their will if so legally indicated under duty of care, and when planning their discharge and possible referrals for follow-up care:

> *Umm not the medical treatment. It would be more around… managing that person. So if they were non-compliant with care, umm it would be more around potentially needing to physically or chemically restrain them. To give the treatment. So more around duty of care, and then plus or minus needing to section someone under Mental Health Act to keep them safe.* – **EDClinician12**

> *Quite often get people who'll say 'I've taken uhh 500 pills of Panadol', and you know, 'I want to die', and then they get quite agitated and they want to leave. […] And… you know, as part of our duty of care to call security and… and that can be… really traumatic for them and for us. Because you're TRYING to help them and they're fighting it all the way. […] So what we have to do is call security, and then state it's under the duty of care, which is the Crimes Act. And so if we… if they said: 'You restrained me against my will' and took us to court, then the duty of care is our defence.* – **EDClinician14**

> *I think if I was genuinely concerned that somebody was… umm… very suicidal, that was why they had taken, or poisoned themselves, I would be more likely to… engage security. And I would be more likely… to… restrain them… and consider… umm… a… consider, essentially, re- just… detain them in the ED, under a Common Law duty of care, until such time as they could be assessed by a psychiatrist. OR even evoke the*

Mental Health Act. If I had to. I would do that only if I was STRONGLY suspicious that there was intent behind it. – **EDClinician18**

All ED-based participants indicated that in cases of ISP the patient would always be seen by emergency psychiatric services before being discharged from the hospital:

If it's a, if they've taken it intentionally, we would always get psych services involved. Yeah except sometimes if they're medically unwell, they get admitted under the medical team, and then the medical team mobilises the psych call-out. Basically, any self-poisoning, intentional self-poisoning, gets seen by the psych, psych services. – **EDClinician1**

In the sort of care that they get would be the same. I just… The end outcome is to whether they're allowed to… leave when they want to. Whether we get TACT [emergency psychiatric service] involved would be different. So the sort of the 'end'. – **EDClinician20**

Medical practitioner participants specified that knowing an overdose was intentional would affect their prescribing to the patient. It is standard ED policy to only prescribe medications for immediate, short-term need, and to refer the patient to seek further prescriptions from their usual doctor such as a general practitioner (GP):

The treatment's no different. The only – we're actually going to do, we make sure they saw EPS, the emergency psych services, before they go. Umm… But we generally don't give people large scripts from the emergency room anyway, because… it's better that they see their GP for close monitoring. – **EDClinician17**

Umm if… kind of like controlled drugs, or drugs that I know can be used for abuse, umm… in general, in my prior, in my own practice I will… try and avoid it, and I will refer back to the GP. […] So kind of like things such as like benzos [benzodiazepines], if someone asks that they want a benzo, I'll say it's not really my job to prescribe it, unless there's a very clear… uhh… reason for it, at which point I will give kind of like maybe two, three pills ONLY. And that's very much in general. Uhh… if, if I know that someone's taken a… if someone's taken an overdose with intent, then, yeah then the way that I will prescribe… will change very drastically. – **EDClinician4**

No, you only, you only prescribe them what you NEED to. For example if it's a tricyclic overdose, and they've got wide QRS [complex; describing a distinctive pattern in an electrocardiogram image], you might give them bicarb [bicarbonate], but you don't, we don't give them drugs to go home with. They go to EPS [Emergency Psychiatric Service]. We, we would NEVER write somebody who's overdosed a prescription and more drugs to go home with. – **EDClinician11**

4.4.7.2 Clinician views on preventing intentional self-poisonings

Participants were asked about ways that they thought might work in preventing some of these intentional overdoses. Interviewees could suggest interventions at either an individual patient or policy level, or both, depending on their preference. All participants felt that preventing ISP was not a simple task, as there were many factors involved. Social problems in the patient's life were seen as something that would be very difficult to solve, and therefore risk factors would be difficult to control:

And that's the thing I think umm if we could provide more supports… for the communities… and for those areas that those sort of families and individuals and stuff, hopefully that would… bring down… overdoses... and… the numbers… that present, really. Because they come here… it's a shout, you know, for help, and obviously we just treat them from the fact: 'Have you done damage or have you not?' We're not treating them from our perspective… 'What can we do to get to the ROOT of the cause?', and… and sometimes… Just like sticking a Band-Aid on! It's not really solving them, it's something or other. Yeah. – **EDClinician21**

You know… self-poisoning is a symptom… of other stuff that's going on. It's not a… it's not a disease in itself. – **EDClinician18**

Well, the thing is, even if you have all the power, like even if you're the head of the DHB, ED, and all that – at the end of the day… people will do what they want to actually do. And unfortunately… uhh the intention, […] behind […] unintentional or intentional overdose is so myriad, like there's so many factors that, that [play] a role. – **EDClinician24**

Support through increased funding for mental health services and improved access was seen as one way to help the situation:

So I think a lot more support for those with mental illness. As to what that support should be… I'm not quite sure. […] So yeah, I don't know whether it's acute stuff or community, but I think mental health need… more money. [laughter] – **EDClinician14**

Either increase publicity of the current… […] mental health… uhh… teams and… that there are currently in place. Umm so they'd know where to go to seek help should that happen. So with either bringing it up into our schools would be a good place, because of course umm we do have overdoses in children, umm deliberate, and both accidental. Umm… and potentially further funding for those mental health services as well. So more bed space on the wards, more CATT nurses to facilitate evaluations. Umm… access to a safe place, in order to be evaluated, when they're going. – **EDClinician9**

But umm I guess it's all about an increase in community mental health support, really. […] There is a lot of advertising, sort of trying to get… you know, 'Come on and seek help if you need it', that sort of stuff… It seems to be pretty good. But you're dealing with a pretty desperate sort of group of people, really. So they often don't see that, umm see that as a viable option when they're feeling, feeling like they do. – **EDClinician10**

Participants also felt that screening and early intervention before problems spiralled out of control could help reduce ISP:

But getting more focused on WHY they have got these thoughts and WHY they're feeling the need… for that intentional… overdose. Umm and what can be done to prevent it from getting to that stage. Umm… I think a lot more education in high schools as well... on the damage it can do, and ways to get out of it. – **EDClinician25**

You know, it would be, the perfect world there would have some sort of… I don't know… primary care… mental health screening… umm which people… you know, would use and try to get help prior to feeling like they could overdose. – **EDClinician10**

Restricting access to substances that can be used in overdose was seen as an important means of keeping high-risk individuals safe, but measures such as daily dosing could be expensive and difficult to arrange:

I think it's… limiting access to their medications. […] Those that are wanting to, to do this will… hoard medications. And umm… and they just, they get their medications, their scripts every… week or two weeks, umm but they'll hoard it. So it's just I suppose having… uhh better control over those medications, for those that are known to... do this… Yeah, I don't know how that will ever happen! – **EDClinician6**

Uhh… well every single person who is at risk would have to have daily… one tablet at a time when they were meant to. So restricted access, and that's just not going to happen with the limited resources, and you are NOT going to cure mental illness and depression just like that. […] But… you know, it's slightly annoying when some GPs will prescribe a new patient with depression a whole month of pills. And then they take them all… the next day. – **EDClinician11**

Umm… any drugs given out by a GP, by a pharmacy would have to be on daily dispensing, umm observed taking. Umm… and even then people still manage to stockpile medications, on observed daily taking. Umm… so unless you manage to 'fix' everyone everywhere, you would be, it's an absolutely impossible task! – **EDClinician17**

Education was also seen as useful, both on the dangers of certain easily available drugs such as paracetamol and on keeping medications out of reach of vulnerable people:

Umm… and I guess… it's again, it is kind of two-pronged argument with education on that, […] if you highlight to the public, that there is such danger, then people with intent will then… have that information. But I think if you do, you can source it anyway, so... – **EDClinician12**

And umm… and like, you know, they don't realise the dangers of paracetamol. So if it's a 'cry for help', and I take 50 paracetamol [tablets], they don't realise that umm further down the track you may harm your liver! […] You know, a better education around… the risks involved. […] 'Your liver's, you're going to be dead in three days because your liver's kaput' – there, there needs to be a better education to the young ones. – **EDClinician15**

Yeah, and safe, safe, you know, more education for parents about keeping medications and you know, household cleaners and things like that safe. – **EDClinician11**

Some participants mentioned home medication reviews and removing unused or expired medications so that they would no longer be unnecessarily available to the patient:

> *If we go to a patient… who has a polypharmacy, […] their cupboard is full of medication bottles… They can do a referral, and it goes through to the DHB, and they're referred to their pharmacist […] and if the patient agrees, the pharmacist then goes out to the patient, goes: 'You don't need those pills, this is what you need to take, this is how you take them', coaches them how to take them, talks to them about blister packs, ensures they have an up-to-date medication card. So you… reduce that risk of having those medications available for the overdose or the accidental…* – **EDClinician19**

Education about the dangers of alcohol and other substances were mentioned as ways to prevent intentional overdoses, as well as teaching 'life skills' so that especially young people could deal with problems in their lives by other means than ISP:

> *My first, my first thing would be… to remove alcohol, but then we'd go back to the old days where everyone would make moonshine. […] I can tell you now that the meth and 'P' [methamphetamine] would go up! […] The trafficking would be huge! Umm… society, government would have to change things. Yeah. Umm I suppose it's just a level of awareness, and for people to be engaged, and what life's actually about, and it's not being bored in life, have to sort of see… other stuff.* – **EDClinician7**

> *Yeah, you could decrease, you could make alcohol harder to get at, because that seems to be a factor in quite a few, both deliberate and kind of… half-arsed attempts. So ones that they instantaneously regret, because their inhibitions have been lowered. And we certainly have a lot of people who come in, actively suicidal and drunk, and perfectly fine when not drunk.* – **EDClinician9**

> *I guess campaigns against alcohol, because I would say a good 80% of the ODs that I see would be in the context of somebody getting intoxicated, having impaired judgement, and doing something impulsively. So it's not always that the intent is there, it is just that in that moment of intoxication, when their judgement is impaired, they'll do something stupid.* – **EDClinician12**

These views of the participants on how ISP might be prevented are summarised in Figure 4.5.

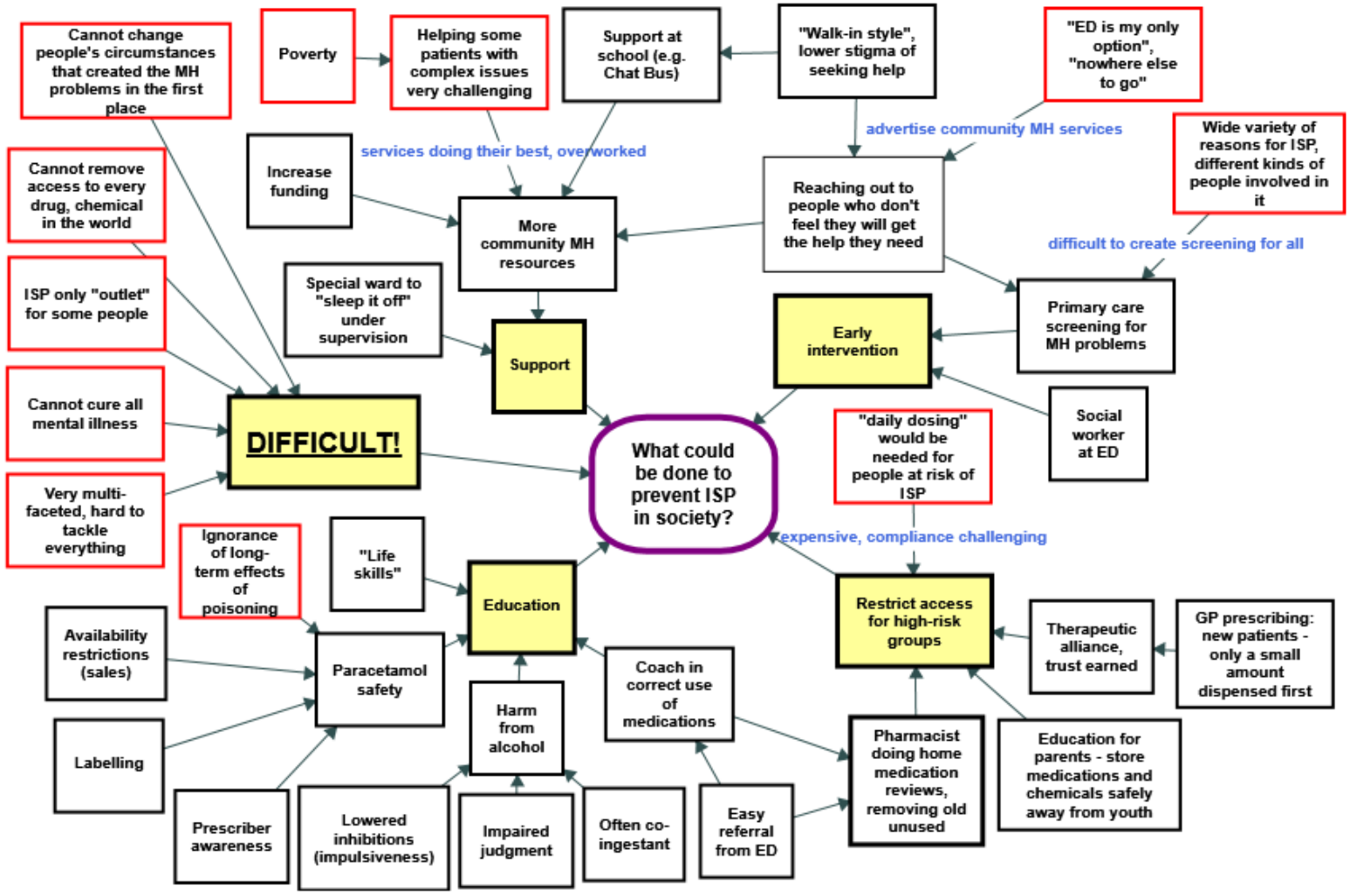

Figure 4.5: Interviewee views on preventing intentional self-poisoning.

4.4.7.3 Clinician understanding of the term 'intentional self-poisoning'

Interview participants were asked to give their first-impression definition of the term 'intentional self-poisoning'. The participant information sheet did not give a definition that the participants might have seen previously. Participants could therefore be considered an educated audience as they were healthcare professionals, perhaps more knowledgeable about poisonings than lay persons, but possibly hearing the term for the first time.

Twenty-three clinician participants mentioned intentionally deciding to take/self-administer something, and 13 mentioned deciding on a specific amount of something that was believed to cause a desired outcome, be it harmful, detrimental, dangerous, or something else (Figure 4.6). Eleven participants mentioned taking 'anything', not limiting their definition to just medications, while nine mentioned 'drugs' or medications only.

Twelve clinician participants recognised and included in their definitions various reasons for overdosing on purpose, ranging from a true wish to die to harming self, 'stopping the pain', getting a 'desired effect' or a reaction out of someone else, expressing that they are mentally unwell, or seeking help through the overdose (Figure 4.6). Ten participants only mentioned harm to self or death and no other objectives, and out of these one person mentioned only death (suicide). One participant specifically mentioned that recreational substance overdoses would also be included in the definition. One participant commented that the term 'intentional self-poisoning' was so generic, that it was almost useless in defining anything.

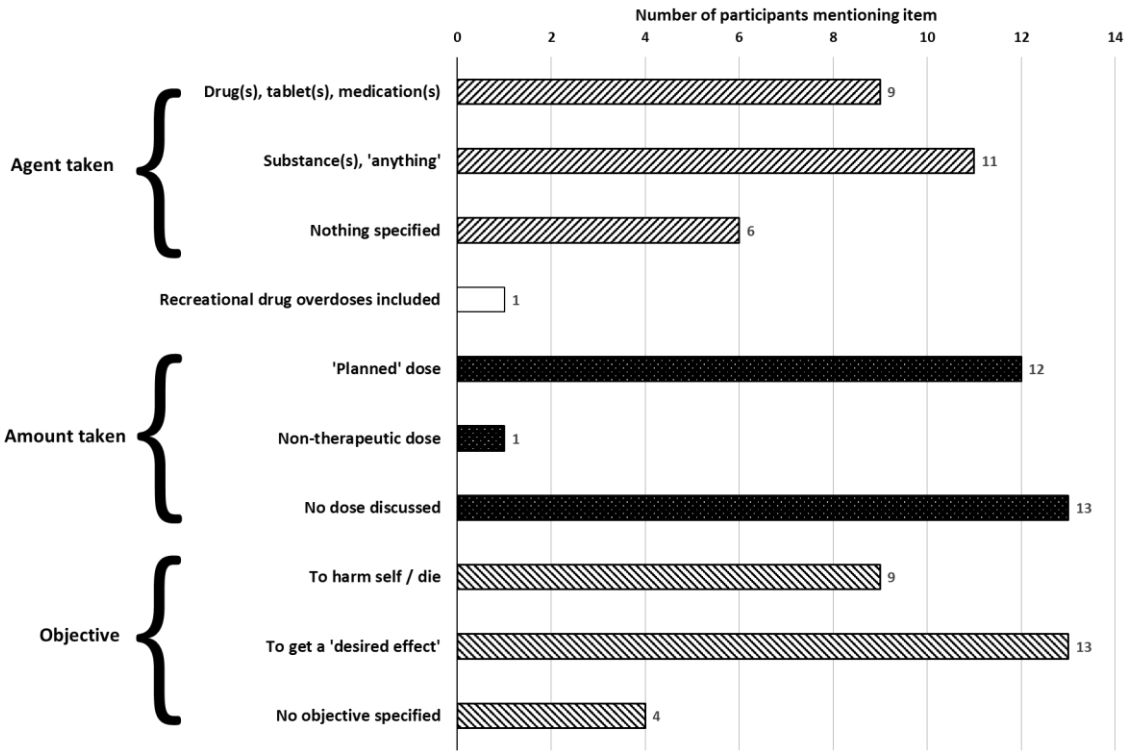

Figure 4.6: Themes and concepts that interview participants used in their first impression definitions of the term 'intentional self-poisoning'.

4.5 Limitations of Study 2

This study sample consisted of a purposeful sample of clinicians from three New Zealand hospitals who were willing to take part in the study. While the interview results may not therefore describe the individual decision-making of all New Zealand clinicians and clinical coders, they will give insight into the process of identifying and coding poisoning cases as intentional or of undetermined intent.

Recruitment of participants

The total number of ED staff eligible to be interviewed at any given department is an estimate only, as there are frequent changes occurring in ED staffing, including having

temporary workers on the roster. As a result, department administration staff could only give their best estimate of numbers of doctors and nurses currently working in their ED at the time of the interviews.

Staff volunteered to be interviewed, but sometimes specific people were asked by supervisors to consider participation. As the interviewer was only present on a few specific days, this automatically excluded all of those staff who were on holidays or otherwise not on shift at that particular time, or who were too busy or unwilling to participate. This study therefore best describes the opinions and practice of those staff who were interviewed in the three study locations. Three different centres were chosen, however, to improve the chances of sampling different settings and people.

It was not possible to investigate whether the participants of this study differed in any way from other eligible clinicians who did not take part. Also, some participants were asked about their willingness by their supervisors on the spot, so their selection may have been random - unless the supervisor had a preconception about their 'suitability' to be interviewed, and therefore introduced a selection bias. These selection biases cannot be excluded, but on the other hand, as discussed previously, we did not aim for a fully statistically representative sample covering all of New Zealand.

Participant characteristics

Previous experience and length of service may affect participants' ability and confidence to discuss intent with patients, and for example their willingness to directly ask the patient whether they intended to die through the poisoning, as mentioned by some participants during the interviews. Interviewees with differing service times, as in this present study, would be expected to give differing opinions and views to interview questions. This would correspond with the 'real world', where ISP patients will be cared for by clinicians of differing levels of experience, confidence, and willingness to ask 'sensitive questions', and could also be considered a strength of the study.

Data interpretation

Data interpretation and analysis were done by the PhD candidate, and the supervisors listened to some interviews to see if they would find themes not explored by the candidate in creating the flow charts of interview findings. Project collaborators, Drs Lambie, Quigley, and Smith-Hamel also commented on the flow charts from their clinician viewpoint and experience. These reviews were done to ensure rigour. It is possible that the candidate misunderstood what a participant truly meant, or an interviewee misunderstood a question, and as a result the visual interpretations (flow charts) may have inaccuracies. The PhD candidate is not an ED clinician but a pharmacist, and has spent significant time at the participating EDs as a result of collecting data for this and other related projects. This experience, together with the assistance of ED clinicians and PhD supervisors in interpretation of the results should offer additional rigour.

4.6 Discussion: Study 2

This study aimed to explore the process of gathering NMDS data on poisonings, with an emphasis on investigating intent. Understanding this process is key to understanding the properties of these national data. This process has not been described in detail previously, and the present study therefore fills a gap in knowledge. This section summarises the findings and discusses the implications for currently available national data.

Most participants in the study were experienced emergency medicine professionals, who described the process of identifying that a patient was affected by a poisoning. They also described how they investigate intent behind the poisoning, to the extent that was necessary for their practice at the ED. The main goal of the ED care pathway according to the participants is to stabilise the patient, to give immediate necessary medical care, and then refer the patient to further care in other units as necessary. This is important to recognise when interpreting the results. Also, for future studies, a clear definition of what 'intentional self-poisoning' means in any particular study is needed, as differing views were

obvious from the first impression descriptions that the clinician participants gave for the term here.

Impact of paramedics on NMDS data properties

Paramedics, potentially engaging with the patient at their home, and definitely outside the ED physical settings, were identified as important sources of information about the poisoning and the intent by all interview participants. Paramedic participants themselves described that through experience they became more alert to picking up unspoken clues about what has happened by observing things beyond the patient at the scene of the call-out, including their surroundings, items in it, and their living arrangements. These clues, in addition to obvious ones such as empty pill packets, were vital for understanding the patient's social circumstances, which may affect or reflect their mental state, and thereby indicate intent.

ED clinicians were very appreciative of paramedic handovers where the patient background is relayed to them, and key observations from outside the ED are summarised. This is in line with findings from a study done in Melbourne, where ED clinicians rated paramedic handover content regarding substance intoxication to be either 'relevant' or 'very relevant' in 86% of the cases (Yong et al., 2008). In contrast to findings in this present study, the clinicians in the Melbourne study only passed on information about the patient pickup surroundings in 23% of the cases, and about the sources of information about the medicines the patient was using in 13.3% of cases. This Melbourne study looked at all presentations to ED, not specifically poisonings, and therefore it may have systematically underestimated these rates, as they may not apply to other types of injuries. If, however, a paramedic was concerned about a possible or evidenced poisoning, they may well specifically choose to convey any relevant information about the pickup location and medications used by the patient. This was clearly indicated in the interviews in this present study which specifically investigated poisonings.

The extent of experience of the paramedic has implications on the handover information transfer, as paramedics commented that they were able to identify and choose items of importance to convey to ED clinicians. Clinicians were then able to use these as a detailed history of the patient, in addition to their own investigations and possible previous DHB-level patient records. A standardised handover tool for clinicians to use in routine practice has been suggested, but current evidence of efficacy was found to be very limited in a recent review of the literature (Dawson et al., 2013). In a small-scale study done in South Africa, handover efficacy and retention of information were not improved by use of a standardised information transfer tool in verbal handovers, but the authors suggested that electronic transfer of ambulance notes to the ED patient management system could assist in this (Talbot and Bleetman, 2007). This approach is currently in use at Dunedin and Wellington EDs, and Timaru ED uses a system where paramedics can print their electronic notes for handover to ED staff.

A recent review by Dawson and colleagues (2013) suggested that barriers to communication, lack of a structured handover tool, having to repeat handover to several different ED clinicians, the need for education and training about the handover process, problems in handing over vital signs taken prior to arriving at the ED, and lack of a proper documenting tool in the field were items of concern in performing the handover. The participants of the present study mentioned the ability to transfer ambulance notes directly or by printing them out to ED staff as a tool to improve the information flow, but perhaps due to the poisoning and intent-specific focus of the interviews, the other themes described by Dawson and colleagues were not encountered in this study.

In summary, paramedics are taught and further learn through practice to specifically highlight items that will be important for patient care at the ED. Paramedics can therefore improve NMDS data quality early on in the process of gathering information by providing insight from the patient pickup location and about the presentation prior to treatment at the hospital is commenced. As specialised professionals they may be able to make and convey more relevant, objective observations than lay persons such as family members.

Impact of ED clinicians on NMDS data properties

ED clinician interviewees described their assessment of a patient. They explained that depending on what they found in the vital signs, they would be guided further in the assessment until they finally reached a discharge diagnosis. Several participants highlighted the fact that they relied on the patient to be honest, if the patient was willing to talk to them. Their opinion was that most ISP patients were willing to give a history of what they had taken and why, and that this assisted the process of identifying poisonings and intent greatly. If a patient was unwilling to talk, that in itself was seen as a warning sign about their current mental state and possible ongoing intent to harm self, warranting more monitoring.

Suicidal intent can be measured by using scales such as the Beck Scale for Suicide Ideation, which gives points when a patient being assessed gives positive answers to questions relating to risk factors of suicide, and to protective factors (Beck et al., 1979). The sum of these points can be used to indicate level of risk of suicide. Accurately assessing suicidal intent, especially long-term risk of suicide, is challenging, and increasing scores in suicidal intent scales do not necessarily clearly depict increasing long-term risk (Brown et al., 2004, Harriss et al., 2005, Cooper et al., 2006). Clinician participants based at the ED, doctors and nurses, mentioned this challenge in their descriptions of assessing intent in poisoning cases, and many mentioned that they would involve mental health professionals to manage further risk of suicide and self-harm. They felt that they would investigate intent to the extent that was necessary to keep the patient safe while under their care, and to decide whether to engage the appropriate mental health services. It is therefore likely that their discharge summary and diagnosis would mention intent specifically to justify further referrals.

As patients were commonly described as being very open about what they took and why, this further implies that the clinician may be likely to record poisoning details and intent accurately. Participants did stress, however, that they rarely did any toxicology analysis to

confirm patient claims about the substances and amounts they may have taken, with the notable exceptions of alcohol in blood or breath, and paracetamol levels in blood, which are quick to perform and can guide treatment significantly (Daly et al., 2008). Some ED-based participants also commented that they rarely did formal suicide risk assessment themselves, and were unaware of further treatment outside of the ED. These issues together would imply that unless suicidal or self-harm intent is clearly vocalised by the patient or indicated by circumstantial evidence at time of treatment at the ED, they may not be reflected in the discharge diagnosis and subsequently NMDS data.

In summary, ED doctors and nurses aim to treat the immediate medical crisis in a poisoning, and investigate intent to an extent that enables management of immediate risk and appropriate referrals for further care where necessary. The implications for NMDS data are that intent is likely to be investigated and recorded in discharge diagnoses.

Intent cannot be treated as a simple yes/no variable, but may involve significant ambiguity, even for the person who overdosed (Buykx et al., 2012). This may mean that the discharge diagnosis and the intent recorded in it describes the clinician interpretation of the patient's mental state and resolution at a specific point of time, which may have changed subsequently. Defining a specific point in time during the treatment pathway – a 'cut-off' for determining intent – is not feasible, as piecing together the story of what happened may take time as the clinician builds rapport with the patient and gets them talking about it. As time passes, the patient may also change their mind about the intent (Buykx et al., 2012), complicating intent assessment. Intent coded in NMDS may therefore be descriptive of what the patient intended, or it may describe the clinician's best estimate (not necessarily correct) at the time of discharge. Some patients simply do not wish to disclose intent accurately, as they may for example wish to avoid further intervention or being involved with mental health services (Buykx et al., 2012). NMDS and other similar datasets will always be affected by this potential limitation in interpreting intent, which is impossible to control for.

Impact of clinical coders on NMDS data properties

The three clinical coders who were interviewed were very experienced in their field. They emphasised that coding could only be done based on what was recorded in the patient notes and discharge summary. Clinical coders are not allowed to 'interpret' or expand on clinician notes. This is to maintain uniformity of coding and integrity of the trail of evidence documented in the patient notes (Ministry of Health – Manatū Hauora, 2014b).

If clinicians do not record items relating to the patient or presentation in the notes, clinical coders are unable to enter those in the case coding, even if they suspect there could be indications for a code to be given. Coding of NMDS data is only done based on the clinician's judgment as recorded in the notes. In the case of poisonings, clinical coder participants noted that these patients often get discharged from the ED directly, or from an ED-adjunct short-stay unit, and therefore coding is often based on the ED clinician's diagnosis and notes. The key implication from these findings is that ED clinician thoroughness and specific documenting of events and diagnoses are vital for producing accurate, descriptive NMDS data. This has been previously noted by Davie and colleagues (2008) for New Zealand datasets.

Clinical coders also mentioned that they routinely manually change the ICD-10 poisoning code name to also include the specific drug name (if known). Data on specific substances do therefore get sent to the MOH in NMDS. This is of importance, as access to these data would significantly assist in understanding which substances specifically are involved in ISP on a national level. At present these data are not being published, but could assist poisoning prevention planning efforts.

Other factors contributing to uncertainties in cases of poisoning

Despite the best efforts of clinicians, intent may be left undetermined: 11% of hospital presentations due to poisoning which were not unintentional were 'of undetermined intent' rather than deemed intentional in Study 1 (Chapter 2). Participants in this present

study felt that cases could be left undetermined when there was insufficient objective evidence, when the poisoning could be due to ignorance, or when alcohol or other substance intoxication made the presentation more complex. Patients themselves sometimes did not know what they had tried to achieve, or had changed their minds, as described above. This uncertainty affects all datasets, and is difficult to address. Clinician participants stressed the importance of building rapport with their patients, in order to encourage them to talk and be truthful, and this appears to be a useful avenue to pursue, not only to improve data quality but for overall patient benefit.

Summary of study implications for NMDS data

This study of clinician experiences of intentional self-poisoning in the ED setting found that significant clues about what the patient did and intended to happen in a poisoning are collected from the start of the care pathway, at the pickup scene in the community. Paramedic experience assists in picking up clues, which then assist ED clinicians in further developing the story of what happened, until they form a discharge diagnosis for the patient, which clinical coders then convert to a formal ICD-10 code that gets recorded in NMDS. Determining intent is always limited by what the patient is willing to disclose, and any NMDS code indicating intent is an interpretation of the patient's state of mind at a specific point of time, attempting to describe a very complex concept. Clinician participants in the chain of care for the ISP patient contribute directly to the data collection, and would likely benefit from regular updating of knowledge about the process, and from improved communication between the departments involved (Davie et al., 2008). Together these efforts are expected to improve NMDS data quality (intent coding).

Clinician views on preventing intentional self-poisonings

While this thesis focuses on collecting more useful data on poisonings to assist our understanding of which substances are being used, the views of participants on poisoning prevention were of special interest. Participants took a comprehensive stance, indicating improvements in social circumstances, access to mental health care, and teaching life skills

for young people for coping as important avenues for tackling ISP. Early screening of depression, lowering the threshold for seeking help, and education about the harms from alcohol and also from some common drugs such as paracetamol were seen as potentially helpful. Better control of access to medications through prescriptions and other means was seen as a way of reducing ISP. Active approaches such as pharmacist-performed medication reviews were also perceived to be useful, for example, through home visits by pharmacists where unnecessary, accumulated medications are removed from the home. Prevention planning should involve feedback from ISP patients and clinicians to better inform policy-makers of end-user needs and feasibility of initiatives.

4.7 Summary of Chapter 4

Collecting and creating NMDS poisoning data were described in this study from the point of view of the clinicians involved in the process. The main finding was that several carers feed information into the patient file along the care pathways of transport to hospital (if applicable), triage, nursing assessment, medical assessment, and acute medical treatment. These are all synthesised by the treating doctor in a discharge summary and discharge diagnosis. Information about and from possible follow-up care is not updated into the patient file which is available to the clinical coders who then convert the doctor's notes into NMDS codes describing the case. The importance of facilitating patient openness to have a productive dialogue with the carers about what had happened, together with diligent documentation and transfer of patient information from one carer to the next were recognised as key to ensuring accurate, descriptive data.

CHAPTER 5 : SPECIFIC SUBSTANCES USED IN INTENTIONAL SELF-POISONING AND THE SOURCES FOR OBTAINING THEM

5.1 Aims of Study 3

This study investigates the specific substances and from where they are sourced in episodes of intentional self-poisoning (ISP). The study design is cross-sectional. As described in Study 1 (Chapter 2), specific substance information is not available in the National Minimum Dataset (NMDS), but could be collected specifically through Emergency Department (ED) electronic patient management systems (Chapter 3). The sources of poisoning agents are not (officially) recorded in NMDS data, though ED clinicians often ask for these details during the care encounter with an ISP patient when they are determining the history and assessing risk of further self-harm (see Study 2, Chapter 4). These data need to be collected separately in this project. The aim of collecting this information is to inform ISP prevention efforts, through better understanding of how people obtain the substances they used for intentional self-poisoning.

The specific substances seen in a sample of ISP patients, as well as the sources of these substances as reported by the patients to the ED clinicians who were treating them, are described in this study. Based on these findings, implications for medication safety and availability are discussed, particularly in the context of limiting inappropriate access. The effectiveness of reducing access to means of ISP is not discussed here, aside from discussing some specific examples described in the literature.

This study addresses research question III, presented in 1.8:

> ***III. Which specific substances do people use in episodes of intentional self-poisoning, and where do they obtain these substances?***

To address this research question, the specific aims of Study 3 are to:

1) collect data prospectively from three New Zealand EDs about the specific substances people have taken in hospital-treated episodes of intentional self-poisoning;
2) collect data from these patients about where they obtained the substances used in the poisoning;
3) describe these de-identified data in terms of informing ways of possibly preventing some of these intentional self-poisonings.

The study findings assist in supporting the need for national, specific data on poisonings, presented in Chapter 6 (Discussion). This recommendation is based on the combined findings of Study 1 (Chapter 2) which investigated currently and routinely collected national hospital presentation data, Study 1b (Chapter 3) which described specific substance monitoring at one New Zealand site, and the present study in this chapter. The previous chapter (Study 2) described how current national poisoning presentation data are collected at EDs, and contributes to the overall discussion about the importance of more specific data collection for ISP. Findings from Study 2 also helped plan the practical aspects of data collection in the present study.

5.2 Methods of Study 3

The ED is a fast-paced, busy environment, and the main focus is always delivering the best possible care to patients in a timely manner. The starting point for planning the study was to minimise any impact on ED routines by implementing advice from our clinician collaborators, Drs Bruce Lambie (Emergency Medicine Specialist, Senior Medical Officer (SMO); Dunedin ED) and Paul Quigley (Emergency Medicine Specialist, SMO; Wellington ED).

The sources of substances in ISP were investigated in consenting patients through a short questionnaire administered by ED doctors and nurses. Many of the questions were expected to be asked by the clinicians as part of their routine assessment of the patients, and therefore not to delay the care process significantly. The following sections describe this rationale in full, and describe the study methods in more detail.

5.2.1 Study locations

This study involved three locations where data were collected prospectively: Dunedin Hospital ED, Wellington Regional Hospital ED, and Southland Hospital ED (Invercargill). These locations were chosen not only due to having a relatively high rate of public hospital presentations due to ISP in the local population (as determined in Study 1, Chapter 2), but also for practical considerations. They were a purposeful sample of public hospital ED locations within New Zealand, with a more metropolitan locality with frequent ISP presentations and specialist toxicologist staff present (Wellington City: population 190,959), a mid-sized regional centre locality (Dunedin City: population 120,246), and a smaller regional locality (Invercargill City: population 51,696; Figure 5.1).

The map in Figure 5.1 and population numbers were obtained from the latest 2013 Census, from the Statistics New Zealand website map generator (Statistics New Zealand, 2018). Populations given above are by the city boundaries only, with significant additional numbers of people residing in the surrounding areas, who may also be presenting to the

city hospital. The Wellington region population is 471,315; the Otago region surrounding Dunedin consists of 202,467 people; and the Southland region surrounding Invercargill consists of a total of 93,339 people (Statistics New Zealand, 2018). It should be noted that severe cases in the Southland region may be referred to Dunedin Hospital.

Dunedin Hospital ED, within Southern District Health Board (SDHB), is located in the immediate vicinity of the School of Pharmacy, which assisted the PhD candidate to be on site to regularly remind staff about the study. Also, Dr Lambie contributed to the development of the data collection tool, and facilitated data collection.

Wellington Hospital ED was chosen as Capital & Coast District Health Board (CCDHB) had a high rate of hospital presentations due to ISP, and also has the same hospital computer system as SDHB (Emergency Department Information System (EDIS), a software developed by MEDHOST Inc., TN, USA). Furthermore, Dr Quigley contributed to the development of the data collection tool, and facilitated data collection at that location. Wellington ED is also possibly the only ED in New Zealand to systematically collect specific data about substances used in poisonings, as described in Study 1b (Chapter 3). Briefly, a pop-up window appears there on EDIS any time a doctor enters a diagnosis code involving a poisoning, and specific details are entered on the system in a way that enables easy analysis.

The third study location, Southland Hospital ED, was chosen as the Southland area has a high rate of ISP, and as a registrar (junior doctor), Dr Carissa Herbert, was willing to be the local ‘champion’ for the study. Also, being part of SDHB, Invercargill ED has EDIS as their patient data management system, similar to Dunedin and Wellington, enabling reasonably uniform instructions to all EDs on data collection procedures (see 5.2.4).

Figure 5.1: Study 3 localities Dunedin, Invercargill, and Wellington.
Created on the Statistics New Zealand – Tatauranga Aotearoa website (Statistics New Zealand, 2018).

5.2.2 Developing the data collection form

The data collection form included questions on basic demographic data (age, sex, self-determined ethnicity), which substance(s) the person had taken, how much of the substance(s) they had taken and when, and from where they had obtained the substances (see Appendix 3.3). Most questions had multiple choices with an 'Other: please specify' option with a free text field available. The mainly multiple-choice format was chosen as this

helped doctors/nurses fill in the form more quickly, improving their satisfaction with the data collection process, and therefore the chances of them approaching patients for inclusion in the study.

The language of the data collection form was 'proofread' by the clinician principal investigator (PI) at Dunedin Hospital, Dr Lambie, to make sure that all terms used matched those that clinicians frequently use, and that are used in the EDIS patient management computer system. An example of this is the term used for where the patient goes after discharge from the ED, 'depart destination', as named on EDIS. This was to ensure that the forms would be as clear and easy to use for the clinicians as possible, to further encourage and facilitate data collection, and to maximise data accuracy and uniformity within and between the study locations.

5.2.3 Participant recruitment

A study flow chart was developed and tailored for each of the three study locations to assist staff in understanding what needed to be done to recruit participants and record their data. An example from Dunedin is shown in Figure 5.2, and the other locations only differed by the names of key local contacts and the places where forms were located. The study forms for a single patient case, including the patient information leaflet (Appendix 3.1), participant consent form (Appendix 3.2), and the data collection sheet (Appendix 3.3) were contained in a large envelope. This also contained a smaller envelope for staff to place the consent form and seal. Placement of these study envelopes within the ED facilities was tailored to the location specifically, to remind staff of data collection, and to make it easier to obtain an envelope when an eligible patient was present at the department.

Study participants were people aged 16 or older, therefore legally able to give informed consent to participate, who had presented to the ED after an ISP event. No data were collected from those who declined to take part in the study except that they declined, or from those who were missed due to, for example, staff busyness. A patient was asked about participation only if the clinician deemed them physically and mentally well enough to

consider such a request. This meant that they were no longer so intoxicated that it would impair their judgment, and that they were no longer in an acute medical or mental health crisis. There was no direct contact between the researcher and the participants. It was not possible to track patients who were very unwell and sent to the intensive care unit (ICU), or after discharge from therein, once they were clinically stable.

Due to the de-identified nature of data collection, participants were not prevented from appearing in the study sample more than once. The possibility of a person being recruited more than once cannot therefore be excluded. As this study investigated sources of ISP substances, possible other presentations due to ISP by the same person were of interest as well. This could have introduced a bias of 'overly similar' results into the study material, however, if one person had been included more than once and used the same substances and sources every time. It was impossible to investigate the impact (if any) of this, and this limitation is further discussed in 5.5.1.

A total eligible patient pool during the study period applicable to the site was determined by PIs in Dunedin and Wellington through EDIS searches (diagnosis of a poisoning and ISP indicated). Southland ED was unable to provide this number, and therefore Dr Alesha Smith (School of Pharmacy) extracted this number for that locality from the NMDS on 23rd March 2018. The parameters used for this NMDS extraction included: facility code = 4511 (Southland Hospital); time of admission 9th March to 23rd September 2017; age at admission 16 and over; Ecodes (indicating external cause) in the case include at least one of X60-X69 (indicating ISP). It should be noted that this Invercargill number may be an underestimate, as NMDS only includes presentations where length of stay at the hospital was at least three hours.

Definition of Intentional self-poisoning

For inclusion in the study, a patient needed to be presenting due to ISP. The definition of ISP, presented in 1.3.1, was given both in the written clinician instructions, and also verbally at staff briefings and reminders. As discussed previously in sections 3.6 and 4.4.7.3, recreational overdoses challenge this definition to some extent. This was also evident here,

as clinicians often asked whether cases of purely recreational overdose should be included or not. The instructions given to them were that purely recreational overdoses, where there was no indication of any intent to harm self, should not be included. This was done to focus the data collection on events of intentional self-harm.

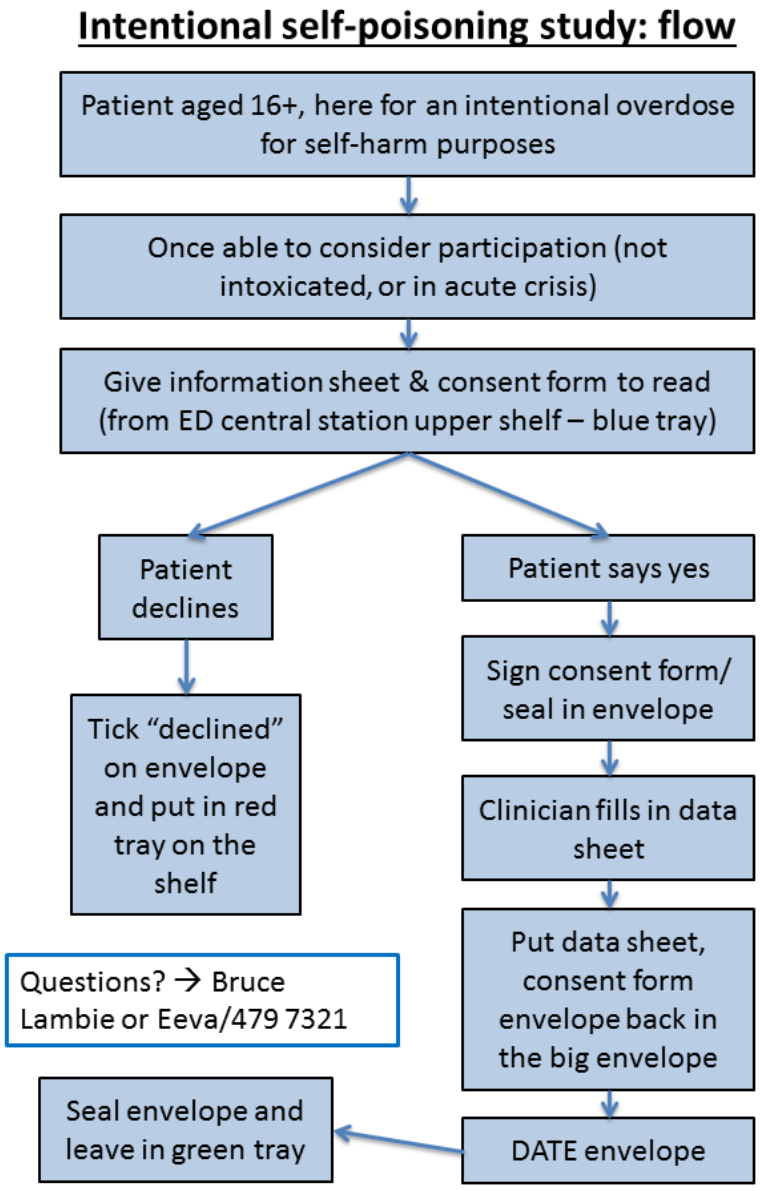

Figure 5.2: The study flow chart instructions given to staff at Dunedin ED.

5.2.4 Data collection

After a patient had given written informed consent, the clinician filled in the data collection form. Demographic items could be copied across from EDIS, and details about the substances taken would have already been determined previously to guide treatment at the ED. The sources of substances, and the timeline of taking them (meaning how long before presentation) may also have been determined previously, but if not, the clinician would ask the patient at this stage. The clinician PIs on site, Drs Lambie, Quigley, and Herbert, later checked the data sheets for completeness against EDIS records, and added in items which may have been missed upon first entry.

5.2.5 Data analysis

The case information collected on the data sheets was entered in an SPSS database (IBM, statistics version 22) created for the study. This enabled the description of quantitative study items such as age, gender, and ethnicity through SPSS and Excel (Microsoft, 2013 version). Graphs were created in Excel.

5.2.5.1 Describing the demographics

'Prioritised ethnicity' was used to describe participant ethnicities. Briefly, as described in 2.2.2 previously, prioritised ethnicity lists one ethnicity only per person, and prioritises multiple ethnicities according to a standard Ministry of Health (MOH) list (Ministry of Health – Manatū Hauora, 2004).

When employment status was described, if both 'Student/home maker etc.' and 'Employed' were ticked, 'Student/home maker etc.' was considered to be more significant to the person's employment circumstances, and the case was coded as such. New Zealand students work in paid employment only 13 hours per week on average (New Zealand Union of Students' Associations, 2017), and it was not feasible to examine the extent of every participant's employment. The validity of these assumptions could not be determined from the study material. All such cases in this study had 'student' specified, however, and

therefore did not contain home makers and others who may have different employment circumstances.

5.2.5.2 Describing the exposure dose

Defined daily dose (DDD) was used to describe amounts of substances taken, where a DDD value for adults was available from the World Health Organization (WHO) website (World Health Organization, 2016a). The WHO definition for DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults (World Health Organization, 2016b). If a patient were to take 10 tablets of 500mg paracetamol, for example, for a total of 5000mg, this equals to 1.7 DDD, as the DDD of paracetamol is 3000mg (5000mg/3000mg = 1.7). If DDDs for multiple administration routes were available, the correct one was chosen depending on the method of exposure. If, for example, the substance was ingested, the oral dosing DDD was chosen.

It is important to keep in mind that the same load of DDDs of two different substances does not mean similar clinical effect, but the 'seriousness' could vary significantly between them (World Health Organization, 2016b, World Health Organization, 2018b, Reith et al., 2003). The same dose given to two people of different weights and possible differences in pharmacokinetic variables such as renal excretion rates may also lead to very different clinical outcomes. DDDs were therefore chosen to describe overall dose load, not to describe clinical symptoms or severity of poisoning (World Health Organization, 2018b, Reith et al., 2005, Reith et al., 2003).

In instances where a substance was ingested, but there were different DDDs for multiple clinical indications of oral dosing, the highest DDD was chosen to give a conservative estimate of the exposure dose in DDDs (larger denominator). This was done as the specific indication that the participant used it for was not recorded in the data collection sheet. Overall, when calculating DDDs consumed by a participant, a conservative estimate was used: if a participant was unsure of how many tablets they had taken, and for example gave

an estimate of 10-12, the more conservative value 10 was used for tablet number and DDD calculations.

Alcohol amounts consumed by the participants were converted into New Zealand Standard Drinks (Health Promotion Agency, 2016). The New Zealand Standard Drink is equal to 10g of pure alcohol, which is equal to the Australian Standard Drink (Department of Health, 2012), less than the American Standard Drink of 14g (National Institute on Alcohol Abuse and Alcoholism, 2005), and more than the United Kingdom (UK) Standard Drink of 8g (United Kingdom Department of Health, 2015).

Dunedin and Invercargill EDs record blood alcohol concentration (BAC) values in International System of Units (SI) unit mmol/l, whereas Wellington ED records them in mg% or mg/100ml of blood. For simplicity, all study locations recorded their results in the units which they regularly use, and the PhD candidate converted them to obtain values in both units with the assistance of an online converter (Unitslab.com, 2018). This converter was first tested with three known converted values to ensure it was accurate.

5.3 Ethics approvals for Study 3

As this study involved human participants whose data were collected by ED clinicians and not by the researchers, the study was submitted for full ethical review by the University of Otago Human Ethics Committee (UOHEC; (Health)). This involved a peer-review of the study protocol, a review by the Dean, as well as evidence of support from the participating hospitals.

The acting Dean of the School of Pharmacy, University of Otago, provided valuable assistance in preparing the application. The practical comments and constructive critique of the proposed study protocol, and the ethical issues which were highlighted were addressed before submitting the application to the UOHEC (Health). Of particular concern was the assessment done by the treating clinician that a patient would be 'well enough' to be approached to ask about and consider participation. This was addressed in briefings and

instructions to staff, specifying the importance of approaching patients only towards the discharge end of the presentation. Clinicians mostly voiced opinions that they would not have it any other way. This was stressed in reminders done at clinical handovers, to also cover junior clinical staff new to the field, possibly eager to do research and therefore less careful. It was also considered vital that patients should not feel that participating or not would affect their care at the ED in any way. This was highlighted in the patient information leaflet, and also to the clinicians in briefings.

As this study used patient information, and of a sensitive nature, maintaining participant confidentiality was of high priority. The only identifying item collected with the data was the patient name on the consent form. The consent form did not contain any other identifying items such as date of birth or home address. The data collection form did not contain any names or patient ID numbers. Once a participant signed the consent form, it was sealed in a small envelope by the clinician, which the PhD candidate separated from the data before analysis. These consent forms were stored, sealed in their envelopes, in a locked filing cabinet at the School of Pharmacy.

On 22nd March 2016 the UOHEC requested minor changes/explanations (such as including those aged 16 and 17 in the study sample) which were addressed to the committee's satisfaction, and full ethical approval was obtained on 19th April 2016 (reference number: H16/043).

Locality authorisation was obtained at all three study locations before commencing the study at any given site. This involved approvals from the Clinical Leader of the ED as well as the ED Service Manager, and in SDHB also support from leaders of the Dunedin School of Medicine. Health Research South (HRS) processed the application in SDHB.

As the student researcher visited the study locations on several occasions during the study period to facilitate data collection with the potential for accidentally overhearing patient information, a confidentiality agreement was signed at both DHBs involved (SDHB and CCDHB). All locality authorisation and confidentiality agreement material was sent to UOHEC (Health) for their records. The study had the identifier 01206 at HRS/SDHB (Dunedin

and Southland Hospitals), and 'Intentional self-poisoning study' at CCDHB (Wellington Regional Hospital).

It should also be noted that for data collection at Wellington Regional Hospital ED, a data collection fee of $1,000 was paid to CCDHB from the Dean's Fund grant awarded to the project. Wellington ED staff other than local PI Dr Quigley were not aware of this, so it would not have affected their behaviour in data collection in any way.

5.4 Results of Study 3

This section presents the process of recruiting patients, and the findings from their de-identified data. As patient recruitment was beyond the control of the PhD candidate, facilitating data collection through reminders and presentations to staff is described in detail in the following section 5.4.1 before the study findings. Some of the limitations of the study arising from patient recruitment methods are touched upon in 5.4.1, while 5.5 describes study limitations in more detail.

5.4.1 Study 3 coverage

Data collection at Dunedin Hospital commenced on 9th May 2016 and finished on 25th October 2017 (a total of 535 days); at Wellington Regional Hospital from 5th September 2016 to 25th October 2017 (a total of 416 days); and Invercargill ED from 9th March 2017 to 23rd September 2017 (a total of 199 days). During these periods of time a total of 102 patients presenting due to ISP were recruited, with 73 cases from Dunedin, 24 from Wellington, and five from Invercargill ED.

5.4.1.1 Facilitating data collection at Dunedin Hospital

During the 76-week data collection period the PhD candidate visited Dunedin Hospital ED medical staff handover meetings (between two shifts changing) 44 times, and brought sweets for all ED staff as a reminder of the study 74 times. Sweets were often taken on busy Monday and Friday afternoons, and on Friday or Saturday nights for the night shift, as

these were shifts where patients matching the study inclusion criteria were thought to present.

On the reminder visits, the PhD candidate also took some sweets to the triage nurses' desk, and specifically requested that they place bright yellow study reminder sheets in folders of people meeting the inclusion criteria. This was done so that the treating clinician would find the reminder in the folder towards the end of the patient presentation. These yellow sheets did appear in some study folders later along with the filled-in data collection forms.

Due to frequent staff changes repeated reminders were crucial. The PhD candidate presented the study at a registrar (junior doctor) teaching session. Also, the presence of certain 'champions' of the study, most importantly Dr Lambie, Nurse Educator Shona Willers, and Registered Nurse Stephen Ryan, had a positive effect on data collection being done.

5.4.1.2 Facilitating data collection at Wellington Regional Hospital

During the 59-week data collection period, the PhD candidate visited the Wellington ED and its Short-Stay Unit (SSU) seven times to facilitate data collection. The SSU is a unit adjacent to the main ED facilities, specifically for monitoring patients who are well enough to be waiting to be either transferred to another ward or unit, or to be discharged home. This was deemed as a good location for study recruitment by Dr Quigley. 'Advertisement' posters and study flow charts were also placed at locations in the SSU where they were thought to be easily seen by staff.

The PhD candidate did two presentations for SSU nurses during the study period. During the presentations and discussion after them staff were of the opinion that "Psych[iatric] nurses should just do it", meaning that the Crisis Assessment and Treatment Team (CATT) which has a mental health nurse present at the SSU should do the patient recruitment. The CATT nurses see all patients who are in a psychiatric crisis. Perhaps due to this reluctance of 'regular staff' to collect data, the presence of three key 'champions', Dr Quigley, Dr Alex Stewart (registrar, junior doctor), and Lorraine Arnold, CATT nurse, was crucial for data

collection. Dr Stewart was recruited by Dr Quigley to assist in data collection and advocacy in June 2017. Data collection was much slower in Wellington than at Dunedin ED, and this was thought to be simply due to these key personnel not being consistently present.

5.4.1.3 Facilitating data collection at Southland Hospital

To increase the number of cases collected for the study in a reasonable time frame, Dr Quigley recruited Dr Carissa Herbert (registrar) to be the 'study champion' at Southland Hospital ED. As Dr Herbert was present at the ED during her regular shifts, she was able to facilitate data collection, reminding other staff about the study. Dr Herbert was also given sweets with a study poster to give out to staff weekly as a small reminder of the study. During the study period (28 weeks), the PhD candidate visited the study site once to facilitate data collection through discussions with Dr Herbert and to replenish their stock of sweets.

5.4.1.4 Study sample

The PIs/advocate clinicians determined the number of eligible ISP cases at their sites during the study periods applicable to them in Dunedin and Wellington. Southland ED was unable to provide this number, and therefore an eligible total for Invercargill was extracted from NMDS. This means that the Invercargill eligible sample may be missing some patients who stayed for less than three hours. A total of 1,137 ISP patients would have been eligible to take part, however, only 131 (12%) were approached about participation. The proportions of ISP patients consenting and declining to take part are presented in Table 5.1.

During the study period, a total of 131 patients were known to have been approached to take part in the study, and while 102 of them consented, 29 declined (Table 5.1). The number of people who declined to take part is thought to be an underestimate, as staff appeared to be somewhat forgetful in reporting these.

Participants were given the option to withdraw from the study for one month after participation, but only one person chose to do so. This was immediately after participation,

through informing the Emergency Psychiatric Service (EPS) nurse, who notified the ED in question. This person's data were destroyed, and they are counted in the 'declined' cases.

Table 5.1: Study catchment rates at the three study locations.

			Of all eligible, n (%)	Of all approached, n (%)	
Study site	**Study/weeks**	**Eligible**	**Approached**	**Consented**	**Declined**
Dunedin Hospital ED	76	603	93 (15%)	73 (78%)	20 (22%)
Wellington Regional Hospital ED/SSU	59	475	29 (6%)	24 (83%)	5 (17%)
Southland Hospital ED	28	*59**	9 (15%)	5 (56%)	4 (44%)
	Total patients	1,137	131 (12%)	102 (78 %)	29 (22%)

ED = Emergency Department; SSU = Short-Stay Unit. *The Southland ED number only includes cases from the National Minimum Dataset (length of stay over three hours), therefore potentially missing eligible cases from this number, and subsequently from the total eligible study sample.

In summary, the study sample cannot be considered a random or statistically representative sample of all ISP patients at these study sites during the study period, but due to practical necessity it is a self-selective sample. Anyone too unwell and taken to the ICU, too aggressive, in a prolonged crisis or agitated state, or self-discharging early, would have been automatically excluded from this study. Also, those who were not approached about participation due to staff simply not asking them about it would have been excluded. These limitations are discussed further in 5.5.

5.4.2 Demographic descriptors

The median age of the 102 participants was 21.5 years (range: 16 to 68), and they are described further in Table 5.2, which lists the proportions of participants by different descriptive variables. Most participants were female (68%), aged younger than 25 years (65%), of NZ European ethnicity (88%), never married (62%), and lived in an urban setting (92%).

Table 5.2: Demographic descriptors of the 102 participants of the study.

Descriptive variable	Number of cases; n (%)
Biological sex	
Female	69 (68%)
Male	33 (32%)
Age groups	
16-24	66 (65%)
25-34	14 (14%)
35-44	9 (9%)
45-54	9 (9%)
55-64	0 (0%)
65+	4 (4%)
Location of domicile	
Urban	94 (92%)
Rural	7 (7%)
Value missing	1 (1%)
Self-identified ethnicity	
Māori*	5 (5%)
Pasifika	1 (1%)
Asian	3 (3%)
NZ European	90 (88%)
Other**	3 (3%)
Marital status	
Married	10 (10%)
Never married	63 (62%)
Living with partner	13 (13%)
Widowed/separated/divorced	9 (9%)
Single	2 (2%)
Refused to say	4 (4%)
Value missing	1 (1%)
Employment status	
Employed	30 (30%)
Student/home-maker etc.***	43 (42%)
Unemployed	22 (22%)
Retired/pensioner	4 (4%)
Refused to say	1 (1%)
Value missing	2 (2%)

*One person also listed ‘Pasifika’ in addition to ‘Māori’ as their ethnicity (not counted in the ‘Pasifika’ total). **‘Other’ included one of each: 'Not specified', ‘American’, ‘Australian’. ***Seven people included here also listed ‘Employed’ in addition to ‘Student’ as their occupation (not counted in the ‘Employed’ total).

5.4.3 Pre-existing conditions

ED clinicians collecting data had noted 'None' under 'comorbidities' in 40 cases (39%). A further nine cases (9%) had an empty field, not listing any pre-existing conditions, but not noting down 'None'. It is not possible to determine from the study material whether these cases indicated missing data or that there were no conditions to list. These two categories are therefore listed separately in Table 5.3. The participants of the study had a median of one pre-existing condition listed (range: 0 to 3).

A total of 30 cases listed at least one psychiatric condition, while 30 listed at least one non-psychiatric one. The conditions are listed in detail in Table 5.3. As a person could have multiple pre-existing conditions, the totals from individual ailments in this table do not match the totals for cases with psychiatric and non-psychiatric conditions.

A total of 23 cases listed only psychiatric conditions, while 23 cases listed only non-psychiatric ones. Seven cases had both psychiatric and non-psychiatric conditions. Depression was the most frequently noted psychiatric condition listed (23 cases), while asthma was the most frequent non-psychiatric condition (eight cases; Table 5.3).

Table 5.3: Pre-existing conditions encountered in the 102 participants of the study.

Condition listed	Cases	% of all 102 cases
None	**40**	**39%**
None listed*	**9**	**9%**
Psychiatric conditions	**30****	**29%**
Depression	23	
Anxiety	6	
Attention Deficit Hyperactivity Disorder	4	
Obsessive Compulsive Disorder	1	
Post-traumatic Stress Disorder	2	
Bipolar disorder	2	
Schizophrenia	2	
Alcohol dependency	1	
None listed, 'extensive mental health history'	1	
Non-psychiatric conditions	**30****	**29%**
Cardiovascular conditions:	**7**	**7%**
Arrhythmias	3	
Coronary artery disease	1	
Hypertension	3	
Pulmonary conditions:	**10**	**10%**
Asthma	8	
Chronic Obstructive Pulmonary Disease	1	
Obstructive sleep apnoea	1	
Conditions relating to the nervous system:	**7**	**7%**
Cerebellar/cerebral atrophy	1	
Chronic pain	4	
Migraine	1	
Traumatic brain injury	1	
Other conditions:	**14**	**14%**
Autoimmune diseases	3	
Cancer	1	
'Dental problem'	1	
Diabetes mellitus	3	
Eczema	2	
'Flu-like symptoms'	1	
Haemophilia	1	
'Low iron'	1	
Renal calculi	1	

* Nothing recorded, i.e. clinician has not recorded 'None'.

**At least one matching pre-existing condition listed per case.

5.4.4 Presentation descriptors

The majority of participants (62%) self-referred themselves to the ED (Table 5.4). About half of the participants arrived at the ED by ambulance, while another half either walked in or arrived by a private vehicle. Almost two thirds of the participants presented to the ED between 6PM and 6AM, while discharges occurred fairly evenly throughout the day (Figure 5.3). There were no great differences observed in the day of the week of the presentations (Figure 5.4), however, given the sample characteristics (see 5.4.1.4 and 5.5), this may reflect shift patterns of ED clinician advocates of the study rather than true ISP presentation patterns at the study locations.

Table 5.4: Referral method and mode of arrival to the Emergency Department.

Referred to ED	**Cases, n (%)**
Self-referral	63 (62%)
After Hours Service	1 (1%)
General Practitioner	1 (1%)
Mental Health Services	6 (6%)
Other	29 (28%)
Friend	9
Partner	4
Health Line/Poisons Line	3
Parent	3
Police	3
Ambulance	2
‘Family’	1
Neighbour	1
'Other agencies'	1
Rural Hospital	1
School dean + counsellor	1
Unknown, not recorded	2 (2%)
Mode of arrival to ED	
Ambulance*	54 (53%)
Private vehicle	25 (25%)
Police	2 (2%)
Walk-in	21 (21%)

*Includes one instance of an ambulance helicopter

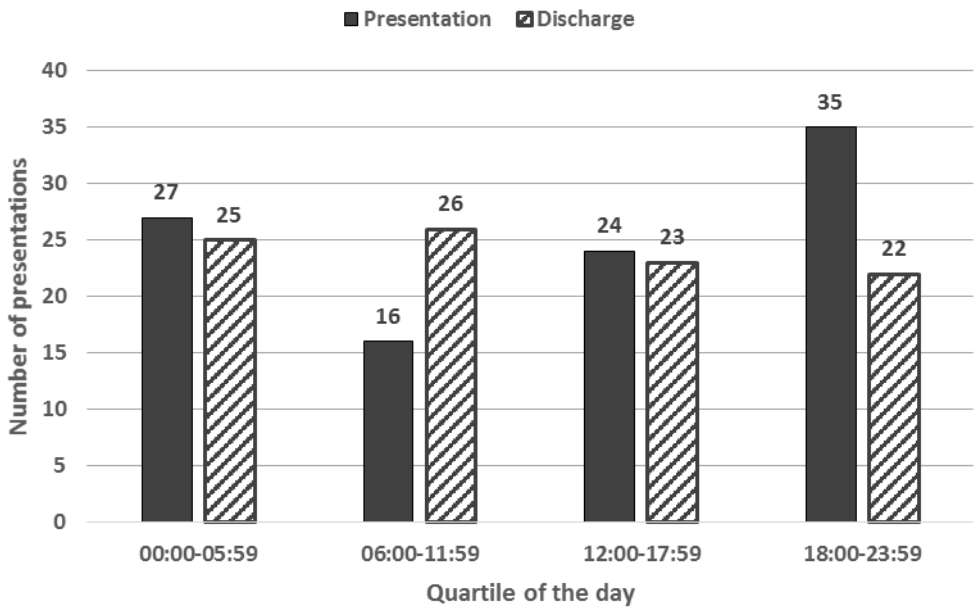

Figure 5.3: Study participants presenting and being discharged by quartile of day.

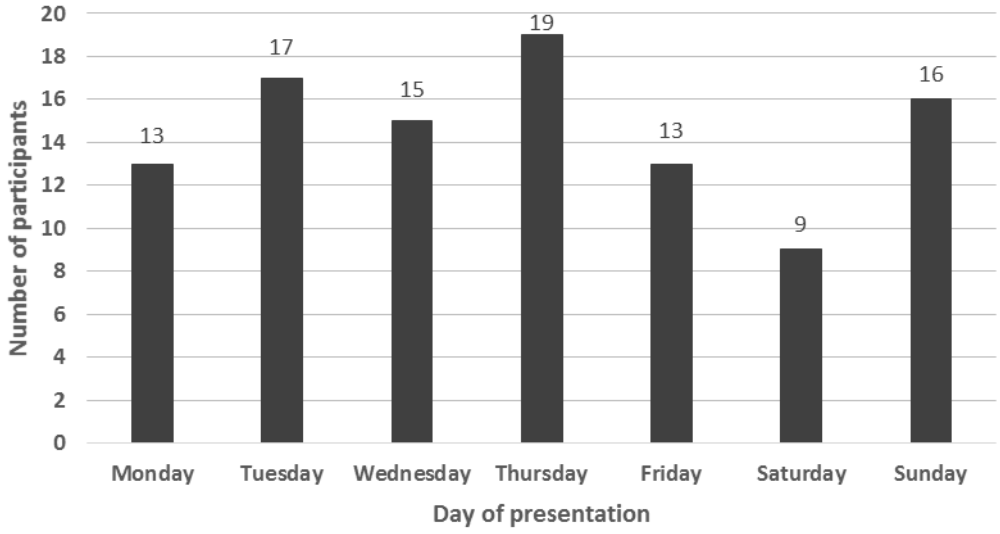

Figure 5.4: Day of the week of study participant ED presentations.

Study participants were triaged upon arrival at the ED to their appropriate Australasian Triage Scale (ATS) acuity categories, which guide how quickly they need to be seen by medical staff (Ministry of Health – Manatū Hauora, 2015a). Two-thirds of participants fell into ATS category 3, where a patient needs to be seen within 30 minutes of being triaged (Table 5.5). The participants stayed at the ED or the ED and SSU for a median length of 6.0 hours (range: 1.0 to 35.3 hours; six participants' values were missing). A total of 15 participants (15%) stayed for under three hours, and would not therefore be included in NMDS.

Table 5.5: Australasian Triage Scale categories of the study participants.

ATS category	Cases, n (%)	Description of ATS category; to be seen within
1	1 (1%)	Immediately
2	22 (22%)	10 min
3	67 (66%)	30 min
4	11 (11%)	1 h
5	0 (0%)	2 h
Unknown	1 (1%)	N/A

ATS = Australasian Triage Scale

The depart destination, indicating where the patient was sent after discharge from the ED or ED SSU, was the local EPS in two-thirds of the cases (Table 5.6). A total of 94 participants (92%) had a psychiatric referral made at the ED as a result of their ISP presentation, while for four patients no such referral was made as the patients went to another ward for further medical treatment, and the referral would have been made from the ward after the patient was medically stable. There were no details available about psychiatric referral in the case of four participants (4%).

Table 5.6: Depart destinations of the study participants.

Depart destination	Cases, n (%)
Emergency Psychiatric Service	66 (65%)
Home	12 (12%)
Ward	11 (11%)
Community mental health	3 (3%)
Other*	2 (2%)
Unknown (not recorded)	8 (8%)

*Respite Care

5.4.5 Cause of presentation

The data collection sheet listed information on the specific substances that the participant had taken in the ISP event that led to the presentation at the ED. These were self-reported by the patient, or determined through third party evidence such as paramedics reporting empty pill packets at the patient's home, or for example family members reporting an amount of tablets missing from a bottle at home (further discussed in 5.5.3). The source of substance information was not recorded on the data collection form.

Toxicological testing was only done for 39 participants (38%), while for 44 (43%) no testing was done, and for 19 (19%) it was unknown if testing had taken place (Table 5.7). Toxicological testing of ED patients is mostly done only in the case of suspected paracetamol poisoning, as the paracetamol level in blood guides treatment of the poisoning (Daly et al., 2008). Other toxicological tests used in the ED include blood or breath alcohol levels, but otherwise toxicology test results take too long to be useful to guide acute treatment (discussed further in 5.5.4.1 and previously in 4.6). In this study, 29% of participants had their BAC levels tested. Alcohol as part of the presentation is discussed in more detail in 5.4.6.

Table 5.7: Proportions of cases where blood alcohol levels or other toxicological tests were performed.

Was testing done?	Blood alcohol level	Toxicology testing*
No	67 (66%)	44 (43%)
Yes	30 (29%)	39 (38%)
Unknown	5 (5%)	19 (19%)

*Including measuring the concentration of paracetamol in venous blood.

When the substances were described by International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) groups, 61 cases (60%) involved at least one substance from the ICD-10 group 'X61 Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified' (Table 5.8). A total of 48 cases (47%) involved at least one substance from the ICD-10 group 'X60 Intentional self-poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics'. These ICD-10 groups are described in more detail in Table A1.1 (Appendix 1).

Table 5.8: ICD-10 substance groups in the intentional self-poisoning presentations.

ICD-10 group	Cases, n (%)
X60	48 (47%)
X61	61 (60%)
X62	13 (13%)
X63	6 (6%)
X64	17 (17%)
X65	28 (27%)
X67	0 (0%)
X68	1 (1%)
X69	1 (1%)

X60 Intentional self-poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics; X61 Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, NEC; X62 Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], NEC; X63 Intentional self-poisoning by and exposure to other drugs acting on the autonomic nervous system; X64 Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances; X65 Intentional self-poisoning by and exposure to alcohol; X66 Intentional self-poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours; X67 Intentional self-poisoning by and exposure to other gases and vapours; X68 Intentional self-poisoning by and exposure to pesticides; X69 Intentional self-poisoning by and exposure to other and unspecified chemicals and noxious substances. NEC = 'not elsewhere classified'.

A total of 56 cases (55%) involved at least one non-psychotropic medicine, meaning medicines with no apparent psychiatric effect such as antidepressant or antipsychotic effects (Table 5.9). Two-thirds of cases involved at least one psychotropic medicine, with one-third involving an antidepressant, and one-fifth involving a benzodiazepine or zopiclone. The specific substances are described in 5.4.5.3.

Table 5.9: Substance categories in the intentional self-poisoning presentations.

Case contains at least one of the following	Yes; n (%)
Non-opioid analgesic	47 (46%)
Opioid analgesic	13 (13%)
Antipsychotic	14 (14%)
Antidepressant	35 (34%)
Benzodiazepine or zopiclone	19 (19%)
Non-psychotropic medicine	56 (55%)
No psychotropic medicines at all	36 (35%)

5.4.5.1 The number of substances taken

The study participants had intentionally exposed themselves to a median of two substances (range: 1-7). Alcohol (ethanol) as a co-ingestant was counted in this number as a substance. A total of 43 cases (42%) involved one substance, while 23 (22%) had two, 15 (15%) had three, 12 (12%) had four, four (4%) had five, three (3%) had six, and one case had seven substances. The number of substances was unknown in one case (1%).

5.4.5.2 The number of tablets taken

The ISP presentations in this study involved taking a median of 24 tablets in total (range: 5-220), and a median of 15 tablets of an individual substance (range: 1-120). The total number of tablets taken was missing in four cases, while the number of tablets taken of a single substance was missing in 11 instances.

5.4.5.3 Specific substances taken

The specific substances taken by the participants are presented in Table 5.10, in order of most frequent appearance. Paracetamol appeared in 38 cases (37%), while alcohol (ethanol) was encountered in 36 (35%). Alcohol was coded as a substance in the case if it had been noted by the ED clinician, or if the participant had a positive BAC reading.

Other substances appearing frequently included the nonsteroidal anti-inflammatory drug (NSAID) ibuprofen with 18 cases, the antipsychotic quetiapine in 12, the antidepressant venlafaxine in 11, the hypnotic zopiclone in 10, and the opioid analgesic codeine in eight cases (Table 5.10). Only one case reported an 'unspecified substance' (or several such substances).

5.4.5.4 The dose of substances taken

Based on the reported amount of tablets taken, the number of DDDs was calculated using the individual drug DDD value information on the WHO website (World Health Organization, 2016a). The participants were exposed to a median total load of 8.2 DDD of substances (range: 0.3 to 151). Individual substance exposure had a median value of 4.5 DDD (range: 0.3 to 90). Again, DDDs do not describe the clinical severity of poisoning, but rather simply the multiples of normal daily dosing taken, for simple comparisons between substances.

The exposure to paracetamol had a median value of 3.3 DDD (range: 0.3 to 10), which is equivalent to 10g of paracetamol. This amount is the 'threshold' for antidote treatment in Australasia (Daly et al., 2008). It should be noted that to calculate the DDDs of morphine sulphate taken (in two presentations), the amounts were converted to equivalent amounts of morphine to use the WHO DDD value for morphine, 0.1 g per day.

Table 5.10: The specific substances taken by the study participants.

Specific substance taken	Typical indication	Cases, n (%)
Paracetamol	Non-opioid analgesic	38 (37%)
Alcohol	Recreational substance	36 (35%)
Ibuprofen	Non-opioid analgesic	18 (18%)
Quetiapine	Antipsychotic	12 (12%)
Venlafaxine	Antidepressant	11 (11%)
Zopiclone	Sedative-hypnotic	10 (10%)
Codeine	Opioid analgesic	8 (8%)
Citalopram	Antidepressant	7 (7%)
Fluoxetine	Antidepressant	7 (7%)
Sertraline	Antidepressant	6 (6%)
Tramadol	Opioid analgesic	4 (4%)
Clonazepam	Sedative-hypnotic	3 (3%)
Diazepam	Sedative-hypnotic	3 (3%)
Escitalopram	Antidepressant	3 (3%)
Lorazepam	Sedative-hypnotic	3 (3%)
Aripiprazole	Antipsychotic	2 (2%)
Atorvastatin	Hypercholesterolemia	2 (2%)
Bisoprolol	Hypertension	2 (2%)
Clomipramine	Antidepressant	2 (2%)
Diclofenac	Non-opioid analgesic	2 (2%)
Isotretinoin	Acne	2 (2%)
Loratadine	Allergy	2 (2%)
Morphine sulphate	Opioid analgesic	2 (2%)
Naproxen	Non-opioid analgesic	2 (2%)
unspecified iron tablet	Anaemia	2 (2%)
Acetylsalicylic acid	Non-opioid analgesic	1 (1%)
Aciclovir	Antiviral	1 (1%)
Alprazolam	Sedative-hypnotic	1 (1%)
Amitriptyline	Antidepressant	1 (1%)
Amoxicillin	Antibiotic	1 (1%)
Bromhexine	Mucolytic	1 (1%)
Buspirone	Anxiolytic	1 (1%)
Caffeine	Stimulant	1 (1%)
Cetirizine	Allergy	1 (1%)
Cilazapril	Hypertension	1 (1%)
Clonidine	Hypertension	1 (1%)
Dabigatran	Anticoagulant	1 (1%)
Domperidone	Antiemetic	1 (1%)
Doxycycline	Antibiotic	1 (1%)

Specific substance taken	Typical indication	Cases, n (%)
Famotidine	Heartburn	1 (1%)
Gabapentin	Antiepileptic	1 (1%)
Lansoprazole	Ulcers	1 (1%)
Levomepromazine	Antipsychotic	1 (1%)
Lithium	Bipolar disorder	1 (1%)
MDMA	Recreational substance	1 (1%)
Melatonin	Sleeping aid	1 (1%)
Metaldehyde	Molluscicide	1 (1%)
Metoclopramide	Antiemetic	1 (1%)
Nitrofurantoin	Antibiotic	1 (1%)
Olanzapine	Antipsychotic	1 (1%)
Orphenadrine citrate	Muscle relaxant	1 (1%)
OTC 'sleeping tablet'	Natural product	1 (1%)
Oxybutynin	Anticholinergic	1 (1%)
Oxycodone	Opioid analgesic	1 (1%)
Periciazine	Antipsychotic	1 (1%)
Phenelzine	Antidepressant	1 (1%)
Phenoxymethylpenicillin	Antibiotic	1 (1%)
Phenylephrine	Decongestant	1 (1%)
Prazosin	Hypertension	1 (1%)
Propranolol	Hypertension	1 (1%)
Rizatriptan	Migraine	1 (1%)
Sodium valproate	Antiepileptic	1 (1%)
statin (unknown)	Hypercholesterolemia	1 (1%)
Sumatriptan	Migraine	1 (1%)
Terbinafine	Antifungal	1 (1%)
Thyroxine	Hypothyroidism	1 (1%)
Unspecified substance(s)	N/A	1 (1%)

OTC = “over-the-counter” [medicine]

5.4.6 Alcohol as part of the presentation

As noted in Table 5.10 previously, alcohol consumption and intoxication was indicated in 36 (35%) of the presentations. Some of the limitations of detecting alcohol presence and indicating its significance to the presentation are discussed in the study limitations 5.5.4.

The amount of alcohol which was consumed

The amount of alcohol that had been consumed was unknown or unable to be quantified in 14 cases of the 36 (40%). For the 22 cases with details recorded, the amounts were converted into New Zealand Standard Drinks (Health Promotion Agency, 2016). This proved to be challenging, however, as the level of detail recorded by the clinicians varied from specifying the number of Standard Drinks to stating “four beers” without any indication as to which strength or size they may have been. Only four cases had the alcohol consumption recorded in New Zealand Standard Drinks already.

To address this imprecision and to get an estimate, alcohol consumption was calculated in each presentation for two amounts: ‘Mildest options’, meaning the smallest typical, known New Zealand commercial container size with the mildest alcohol content of the drink in question, and ‘Strongest options’, meaning the largest typical container size with the strongest alcohol content. In summary, to calculate Standard Drinks consumed, based on the New Zealand Health Promotion Agency booklet (2016) and Meenan Wine & Spirits Ltd (Dunedin) which imports alcohol beverages (personal communication, 6th March 2018), the following presumptions and minimum and maximum concentrations were used:

1) 'spirits’ was 37.5% or 57% alcohol spirits;
2) ‘one shot’ was 30ml;
3) beer strength was either 2.5% or 8%;
4) ‘a bottle of beer’ was a 330ml bottle;
5) ‘a can of beer’ was a 330ml or 440ml can;
6) ‘1 bottle of wine’ was 750ml, and the strength was either 12% or 15.5%;
7) ‘a bottle of ready-to-drink (RTD) mix’ was a 330ml container of 4.8% or 7% strength alcohol.

When the ‘Mildest option’ (the mildest alcohol strengths and smallest container sizes) was calculated for all cases, the median was 7.1 New Zealand Standard Drinks. The ‘Strongest option’ (the strongest alcohol and largest container sizes) had a median value of 10.8 Standard Drinks (Table 5.11). These values act as guides only, to indicate and estimate the

magnitude of the 'true' alcohol consumption in the presentations, which was unable to be determined accurately.

Table 5.11: Standard drinks consumed by the twenty-two participants with alcohol consumption details available.

Standard drinks	Median	Range
'Mildest options'	7.1	(0.45-22.5)
'Strongest options'	10.8	(1.0-67.6)

Blood alcohol levels

Blood alcohol levels were tested in 17 (49%) of the 35 participants who were known to have consumed alcohol prior to presentation, whereas in only 13 (21%) of the 62 participants who had not consumed any (Table 5.12). The 30 measured BAC results had a median value of 6 mmol/l (27.5 mg/100ml), ranging from 0 to 52 mmol/l (0 to 240 mg/100ml). A total of 14 results (47%) exceeded the New Zealand drink driving infringement offence limit of 50 mg/100ml for those aged 20 and over (New Zealand Legislation, 1998), indicating impairment of cognition, function, and judgment. The median excess was 72 mg/100ml (range of excess: 42 to 190 mg/100ml) over the 50 mg/100ml limit.

Table 5.12: Blood alcohol level testing occurring in the study participants by alcohol consumption status.

Alcohol consumed?	Not measured	Measured	Total cases
No	49	13	62
Yes	18	17	35
Unknown	N/A	N/A	5

The timing of alcohol ingestion in relation to other substances taken, and in relation to presentation to the ED, is described in the following section, and further in 5.6 together with the other study findings and implications.

5.4.7 Timeline of the intentional self-poisoning event

A third of the presentations where timelines were known involved ingesting only one substance, and a further 16% involved taking all involved substances together, necessitating consideration of only one time of ingestion during treatment (Table 5.13). Of the cases involving alcohol ingestion, two-thirds indicated that alcohol was taken at a time point before the ingestion of the other substances involved in the intentional self-poisoning.

The time of substance ingestion was available for only 50 presentations (49%). Of these 50 cases, 10 indicated that alcohol was taken first, sometime before other, solid-format substances (tablets, capsules, etc.), and for these presentations the time of the 'solid substance' ingestion was recorded as the time of ingestion. In this study sample, the ISP ingestion occurred 1.9 hours (median; range 0 to 72 hours) before presentation to the ED. A total of 25 participants presented in under two hours after the exposure (50% of those who had this information recorded).

Table 5.13: The timeline of substance exposure in the presentations.

Sequence of substance exposure	Alcohol consumed?		Total, n (%)
	No	Yes	
Unknown	18	5	23 (23%)
N/A, only one substance	36	0	36 (35%)
Alcohol first, then other(s)	N/A	25	25 (25%)
Sequence given	2	0	2 (2%)
All together	10	6	16 (16%)

5.4.8 Sources of substances

Participants were asked about where and how they obtained the substances which they had taken in the intentional self-poisoning episode that was being treated. Data were not collected on whether these were self-reported or reported by someone else such as a paramedic or a family member present, but clinicians were requested to record all relevant, applicable sources and means of obtaining the substances.

5.4.8.1 Sources of substances used in the poisoning event

A total of 80 participants self-reported that they had used their own medications in the ISP event (Table 5.14). The majority of participants, or 88, only reported one source, while 14 reported two, and three reported three different sources. No participant refused to respond to this question. Interestingly, one participant had a note of being on weekly dispensing of their medications.

Table 5.14: The sources of substances used in intentional self-poisoning.

Sources of substances	Cases, n (% of the total 102 cases*)
Own medication	80 (78%)
Convenience etc. store	13 (13%)
Relative or friend	13 (13%)
OTC pharmacy medication	8 (8%)
Unknown	5 (5%)

*Column sum is greater than 102, as some participants had multiple sources of substances.
OTC = “over-the-counter” [medicine]

5.4.8.2 Means of obtaining substances

Participants often used medications which had been specifically prescribed, or which they purchased themselves (Table 5.15). A total of 83 participants reported only one means of obtaining the substances, while 19 reported two different sources. Two participants (2%) refused to respond to this question.

Table 5.15: Means of obtaining substances for the intentional self-poisoning.

Means of obtaining	Cases, n (%)
Prescribed	71 (70%)
Self-purchased	24 (24%)
Accumulated from prior prescriptions	8 (8%)
Bought/obtained without prescription*	6 (6%)
Stolen	5 (5%)
Other**	3 (3%)
Friend***	2 (2%)
Refused to say	2 (2%)

*By someone other than self. **Included two accounts of 'home supply' (substances previously purchased and stored at home), one account of 'from a friend' but unclear if stolen or given to the patient. ***Supplied willingly by a friend.

5.4.8.3 Sources of medications with no clear indication listed

As described previously in 5.4.3, 48% of the presentations in this study had no pre-existing medical conditions listed. Some of these cases involved apparently taking prescription medications which would require a specific, clear indication to be prescribed to someone, which was not evident in the study material. These included, for example, instances of an antidepressant being listed as prescribed to the patient, but depression or another applicable condition was not listed.

A total of 19% of cases appeared to have a psychotropic medication, and 8% a non-psychotropic medication taken in the overdose, which was described as being prescribed to the person, but there were no matching conditions listed (Table 5.16). It was not possible to investigate whether the relevant conditions did not apply to the patient, or were not listed by the clinicians. A further 27% of cases appeared to involve medications which did not match typical pharmacotherapy expected for the conditions which were listed, but they were described as having been prescribed to the participant. Again, it was not possible to determine the rationale for these drugs being prescribed from the study material.

Table 5.16: Correlation between recorded pre-existing conditions and the medications involved in the presentation.

Correlation description			Cases; n (%)
At least one condition listed, and	Potentially matching own prescription medications taken		21 (21%)
	Potentially matching non-prescription medications taken		2 (2%)
	Potentially matching own and someone else's prescription medications taken		2 (2%)
	Medications apparently unrelated to conditions listed		28 (27%)
No medical conditions listed, and	Own prescription medications taken:	Psychotropic	19 (19%)
		Non-Psychotropic	8 (8%)
		Both psychotropic and non-psychotropic	3 (3%)
	Someone else's medications taken		5 (5%)
	An unknown mixture of own and others' medications		1 (1%)
	Non-pharmacy medications taken		11 (11%)
	OTC pharmacy medications taken		1 (1%)
Unknown			1 (1%)

OTC = "over-the-counter" [medicine]

5.4.8.4 Stockpiling substances for future intentional self-poisoning

Stockpiling, or specifically saving up medications on purpose with the intent of taking them all together later in an intentional overdose, was indicated in 12 presentations (Table 5.17). Two-thirds of cases self-reported that stockpiling had not occurred, while in 27 cases it was unclear.

Table 5.17: Stockpiling of substances by the participant in preparation for the intentional self-poisoning event.

Substances stockpiled?	Cases, n (%)
No	63 (62%)
Yes	12 (12%)
Unknown	6 (6%)
Not ticked*	21 (21%)

*Clinician had not indicated anything about this, not ticked as 'unknown'.

5.5 Limitations of Study 3

This study is affected by several limitations due to practical restrictions, and to ensure that patient safety and priority of medical care were maintained. This section presents these limitations, their implications for the study sample, and the interpretation of results.

5.5.1 Sample representativeness

A key issue to consider is sample representativeness, or how well the results can be expected to describe ISP in New Zealand or other contexts. This section aspires to describe how selection biases affected patient recruitment in the study.

Limitations relating to the study locations

The study locations were not a random sample of New Zealand EDs. Three-quarters of cases were recruited in Dunedin, and therefore best describe the population in that city. Wellington ED was thought to be very 'research-friendly' due to the additional, specific poisoning data collection which they already routinely do (described in Chapter 3), but recruitment was very slow there, leading to a relative overrepresentation of Dunedin cases in the study sample.

As all participating study hospitals were in urban locations, perhaps not surprisingly a clear majority of participants were from urban domicile areas. The study does not therefore necessarily describe the experiences of those residing in rural New Zealand locations.

Limitations relating to approaching patients at the ED

Recruitment was limited to patients who were willing and able to consider participation. Their experiences may not reflect those of ISP patients who did not participate. The sample recruited was by necessity a statistically non-representative sample, as those who were aggressive, too unwell, or taken to the ICU or another unit were not approached for participation. We were unable to follow them up later during their care pathway when they

might have been well enough to be asked, due to not having paid hospital staff available to the project to track them.

Subsequently only those deemed 'well enough' medically and mentally by the treating clinician, and who were close to discharge from the ED, were approached. A clear majority of participants fell into ATS category 3, to be seen by a doctor within 30 minutes, but as NMDS does not collect triage category information (National Health Board, 2015), we were unable to compare the study sample ATS category distribution to that of all people presenting to ED for ISP. Those who were not asked about participation due to staff forgetting or not knowing to ask them, or where staff members may not have wished to ask for various reasons, were obviously not included in the study, and their experiences may have been different from those of the study participants.

It should also be noted that towards the end of the data collection period, specifically from 4th September 2017 to 25th October 2017 (52 days, 10% of the total 535 days), the new Dunedin Hospital Medical Assessment Unit was open. This unit sees patients from the ED who have multiple comorbidities but who do not need ED level of care. Patients requiring intravenous antidote treatment after a significant paracetamol overdose may have been admitted to this unit, and may have been missed from the study sample after the 4th of September, though there were three paracetamol ISP cases from Dunedin in the recruited sample after this change. We were unable to assess the impact of this new ward on potentially missed matching patients due to the de-identified nature of the study, and due to limitations in recording multiple treatment locations in NMDS data.

Limitations relating to ED staff

Study locations differed in key staff being present to facilitate data collection. The PhD candidate was based in Dunedin and therefore often able to do reminders there. The local key collaborator was also often present at the ED, and willing to facilitate data collection. Wellington data collection occurred only when one or more of three key personnel were present, and was therefore very sporadic. The local study advocate was frequently present at Southland ED, therefore effectively facilitating data collection there. We were unable to

investigate whether the days of the week of presentations co-occurred with any one staff member being present as the date of presentation was not recorded for de-identifying purposes.

Limitations relating to repeat presentations

Due to the de-identified nature of the study, and to protect the confidentiality of participants, we were unable to control for a person appearing multiple times in the study material. Staff at one study location felt that they would only let a person participate once, and felt that they would not even ask one particular patient about participation as it might encourage that person to present again due to ISP just to be able to take part in the study again. This type of selection bias was impossible to prevent, as patient safety was in question. To the best of our knowledge, this only involved one specific patient at one study location, but possible further instances cannot be excluded.

As a result of a person potentially appearing more than once in the dataset their sources of substances and means of obtaining them could be over-represented, if they chose to use the same avenues again in a further ISP presentation. There were no means of controlling this or investigating the extent of it, as patient identities were kept secret, and the consent forms only had the participant name, and no other identifying details. Participant confidentiality was of greater importance.

Limitations relating to the total eligible sample of matching patients

The total number of eligible ISP patients during the study period was extracted through EDIS at every study site by the clinicians or admin staff on site in Dunedin and Wellington, and through NMDS for Southland ED (see 5.2.3). As Southland ED was unable to provide this number, and the number of eligible patients was extracted from NMDS which only includes patients who stayed for longer than three hours, the total eligible sample, and the eligible sample for Southland ED are potentially under-estimated.

A previous Christchurch-based study by Buchanan (1991) attempted to improve identification of ISP presentations by additionally searching hospital records to find possible

cases missing from ED data. This was not possible in this study due to practical reasons. All three study sites in this current study use EDIS which is a computer-based patient management system, and cases were extracted and counted based on a recorded poisoning diagnosis, and an indication of intentional self-harm. Without doing additional 'key word' searches some relevant cases may have been missed. As diagnoses are entered electronically, they are searchable, and if a poisoning diagnosis had been entered, it should have been extracted in the searches done in Dunedin and Wellington. Due to not being able to purchase staff time to do additional searches, this was not able to be examined and therefore, similar to the total eligible sample, these local eligible sample numbers may be under-reported.

5.5.2 Suicidal ideation or intent

A limitation of the study is that there was no measurement of suicidal ideation or intent. We do not therefore know whether these cases were in any way of 'comparable seriousness', or whether the desired outcome of the poisoning was similar. The intended outcomes, if stated by the patients, were not recorded for the study. ED staff were requested to approach patients presenting due to intentional self-poisoning, or 'intentional self-harm through poisoning, which does not need to be a suicide attempt'. Regardless of these instructions we cannot be sure that no other types of overdoses such as purely recreational were included, or that more ambiguous cases were not unnecessarily excluded. The aim of this study was not to describe the specific objective such as suicidal intent behind these presentations.

Details on intent which were available were limited to those recorded on the data collection form. As staff mostly coded the cases by ICD-10 codes T36-T50 ('poisoning through agent X' which does not indicate intent), we could only trust their judgement in this matter. We were unable to verify the intent in each case as they were de-identified upon release to the PhD candidate. The participants did present to the ED and were subsequently admitted for assessment, however, and therefore represented cases of poisoning which needed to be addressed. Regardless of specific objectives they should

therefore all be taken into account when informing policy-making about the extent of resources needed to treat poisoning in New Zealand.

The reason why a suicidal intent scale was not included was purely pragmatic and practical: staff have little time for extra work, and need to fill in many forms. Including a further form in addition to the current data collection form would have increased the time spent on each case, making obtaining permission to do the study at the sites more challenging. Also, some staff might have needed to be trained to use a suicide ideation scale tool, and might have felt unsure or uncomfortable using one. This is especially true for larger sites, which often have specialist mental health or other staff administering such tests, and other staff may wish to leave suicidal ideation testing to them. This opinion was evident in the clinician interviews (Study 2, Chapter 4). To understand motivations behind ISP, especially in repeat presentations, a further study should include measuring suicidal intent in its design and tools.

5.5.3 Listing all substances

Staff were requested to list all substances which the patient had taken. As some data forms listed clinically insignificant ingestions such as taking one tablet, it appears that they did indeed do as requested. Despite the best efforts of the clinicians, it remained possible that patients had not revealed all substances they had taken, especially as some would not necessarily manifest clinically through noticeable symptoms. We were unable to investigate or control for this. As the median presentation time was two hours post-exposure, symptoms (if any) could be expected to be observable.

Previously in Study 2 interviews, some clinicians mentioned that patients do not always reveal all the substances that they have taken, or downplay or exaggerate the amounts that they have taken (see 4.4.5.1). It can therefore be presumed that some substance information or number of tablets taken presented here may be inaccurate, especially in the cases where no BAC measurement or toxicology screening (where/when available) were

done to confirm the claims made by the patient. This would affect all national poisoning data which are collected, not just this study sample.

5.5.4 Describing the exposure

When describing the DDDs of a substance which were taken in the ISP, a conservative approach of using the lowest reported amount of tablets and other dosing units taken was used. This may have led to systematic error and underestimation of 'true' exposure doses. Similar to potential under-reporting of substances, it is possible that participants chose not to report everything they had taken, or downplayed how much (see 4.4.5.1).

Additionally, if multiple medical indications had different DDDs listed, the highest DDD value was used to get a conservative 'DDDs ingested' value as the data did not include indications that the participants were taking the medications for. This may have also introduced systematic error into those few drugs where multiple indications did occur, and may have led to underestimation of exposure dose if an 'unnecessarily high' DDD was chosen. The only substance in this study affected thus was one case of clonidine, where there were two clinical indications with differing DDD values: 0.45mg/day for antihypertensive effect, and 0.1mg/day for antimigraine effect (World Health Organization, 2016a). The effect of this systematic bias was therefore not considered significant in this study sample.

Reporting of alcohol amounts which had been ingested lacked systematic rigour (see 5.4.6). As consumption would have often occurred prior to presentation at the ED, amounts were self-reported by the patient, with possible confounding effects from intoxication, leading to (for example) simple forgetfulness of how much had been consumed. In addition to this, clinicians recorded details in a way that necessitated several presumptions to be made. This introduced a source of systematic error to the alcohol consumption figures. Further, alcohol levels measured in blood would naturally be affected by how long it had been since the last ingestion, and would reduce with passing time. The values presented may therefore be underestimated.

Collecting the timeline details of the exposure was poor. This may have been due to the structure of the data collection tool, as timelines are apparently always enquired about to guide treatment at the ED (see Study 2, Chapter 4). Despite this, timeline details were only available from half of the cases in this present study. This limits the interpretations which can be made, as the other half of the sample had unknown timelines.

5.5.5 Sources and means of obtaining substances

Even though the study was de-identified and participants were ensured their data would remain confidential, the possibility of a participant not wishing to disclose true sources of substances cannot be excluded. If for example obtaining them involved illicit means, the participant may not have wanted to disclose that. As these details were in general self-reported, there were no means of verifying any claims.

5.5.6 Summary of study limitations

In summary, substances and amounts taken, the reason for taking them, and the sources of substances were self-reported by the participant, or obtained from other informants, with possible errors introduced in the details either by accident or deliberately. As these cases were de-identified, after a final content check done by the local PI and release to the researcher there were no avenues for confirming any details or filling in missing details. Also, the study sample was affected by key staff presence for recruitment, and patient characteristics of being physically and mentally well enough and non-combative to be asked about participation. The results naturally only directly describe those who participated, and can only be used to approximate ISP behaviour in New Zealand.

5.6 Discussion: Study 3

In this study I investigated the substances taken in an intentional self-poisoning event and the sources of them, as chosen by people presenting to public hospital EDs. As discussed in the results and limitations sections of this chapter previously, the sample of participants

was not free of bias, nor did it consist of consecutive patients, but represented only those who were medically and mentally well enough to be asked about participation, and who were indeed asked. The results should therefore be interpreted in the context of giving an indication of New Zealand hospital-presented intentional self-poisoning episodes and their properties only, rather than as a statistically representative sample. The results do not necessarily describe the experiences of those who do not present to the hospital at all, nor of those whose poisoning is more severe, requiring treatment at the ICU or a high dependency unit, and who were therefore excluded from participation as they did not stay at the ED until they would have been stable enough to be approached. Overall only a fifth of those approached about study participation declined to take part, but due to ethical consideration they could not be characterised and compared to those who did choose to participate.

The study population

The study sample was very young, as also seen in national data in Study 1 (Chapter 2). It was therefore not surprising that it included many single people who were students, and that only a third of the participants had non-psychiatric pre-existing illnesses listed. Only a third of participants had a psychiatric condition listed, which is much lower than previous findings of 92.0% of people who present to EDs due to intentional self-harm (ISH, also including other means besides ISP; Haw et al., 2001). A recent systematic review of the literature also found that 81.2% of young people and 83.9% of adults engaging in ISH lived with a psychiatric illness (Hawton et al., 2013). Additionally, 65.3% of the study population in the study by Haw and colleagues (2001) had presented previously due to ISH. Though our data in this present study do not describe re-presentation as a result of de-identification measures, Study 1 describing a similar New Zealand population presenting to the ED due to ISP consisted of only 24% repeat presentations (see 2.4.2.4). This may indicate differences between the study populations described by Haw and colleagues (2001), and this present study, but does not explain the lower prevalence of psychiatric diagnosis recorded in the study material. Skegg (2005) suggests that ISH presenters to EDs who are in a crisis may be ‘over diagnosed’ with psychiatric illness due to diagnostic

interview structures ('false positives'). This could perhaps explain the much higher rate of psychiatric illness in the study by Haw and colleagues (2001).

When the conditions listed, the medications taken, and whether they were prescribed to the participant themselves were compared in the present study sample, it became apparent that in some cases psychiatric medications had been prescribed to participants and taken in the overdose but no psychiatric illness had been recorded in the study material. This does not necessarily indicate 'inappropriate prescribing', with no clear indication for the medication, or insufficient transfer of medical information from primary care to ED, but may be an effect of imprecise data collection. It was not possible to investigate this from the de-identified data. The prevalence of psychiatric illness may therefore be under-reported in this present study sample.

Because of the small study size (102 participants) the absolute number of people of other ethnicities besides New Zealand European/Pākeha was low, and their experiences are not well represented. Also, the sample was predominantly urban, with very few cases with people from rural locations. As access to health services may be more challenging in remote areas, sources of substances may perhaps differ from urban locations. This would be an important area of future research. Access to community pharmacies, potentially impacting dispensing of prescription medications and purchases of "over-the-counter" (OTC; not requiring a prescription when purchased from a pharmacy) products, has declined in rural localities New Zealand in the past few decades (Norris et al., 2014). A future study should look into access to both pharmaceuticals, as well as carers in rural areas, and characterise ISP in those areas.

Help-seeking behaviour and further care pathways

Interestingly, the study participants mostly self-referred themselves to the hospital, or were referred by a lay person close to them such as a partner or a family member. This is in line with previous evidence from Australia (Buykx et al., 2012). Only a fifth of the participants in the present study were referred by professional services. This may reflect the 'less pharmacologically serious' nature of these poisonings, as most participants fell

into ATS triage category 3, where they were considered well enough to wait for 30 minutes before being seen by medical staff. If the clinical effects of the poisoning were less severe, participants may have felt no need to involve any other healthcare facilities in seeking treatment. Those affected by more severe poisonings may have been referred by professional services such as general practitioner (GP) clinics, but they may have been excluded from the study due to further referral from the ED to treatment at other units such as the ICU. As we have no data on the characteristics of those who declined to take part or were missed from recruitment, this cannot be confirmed.

Notably, it is encouraging that many of the participants did decide to seek help from the ED by themselves. Self-referral to hospital may give a 'reward' to the ISP patient in the form of experiencing reassurance from a face-to-face consultation (Watts et al., 2004). We do not currently know the full extent of ISP behaviour in the community which does not lead to seeking formal help. A recent international review found that less than half of young people engaging in self-harming behaviour may seek formal help from health services, and up to two-thirds from informal sources such as friends or family (Michelmore and Hindley, 2012). The authors of this review found that even fewer young people reported receiving help as a result of their help-seeking, which is of concern. The New Zealand Multidisciplinary Health and Development Study, based on a small sample of 26-year-olds who reported help-seeking for self-harm (as described by the relevant ICD-9 codes, the version prior to ICD-10) found that most young women contacted a GP, while young men tended to approach emergency services (Nada-Raja et al., 2003). In this study, help from emergency services was rated less favourably by the young people than help from GPs and other services. Larkin and Beautrais (2010) have argued, however, that EDs are not used to their full potential in linking people presenting due to self-injurious behaviour to further care. This will be discussed further in Chapter 6.

As seen in a previous study from Christchurch, participants mostly presented in the evening and at night (Buchanan, 1991), which creates demand for adequate staffing to meet the needs of timely care. Toxicology testing and consulting services may be limited at night, though the New Zealand National Poisons Centre does offer Medical Toxicologist specialist

consultation for medical professionals 24 hours a day, every day (personal communication, Dr Adam Pomerleau, Director of the National Poisons Centre, 13th February 2018).

Two-thirds of the participants fell into ATS category 3 (to be seen within 30 minutes). The Royal Australian and New Zealand College of Psychiatrists (RANZCP) acknowledges the importance of EDs as the 'entry point to care' for many people engaging in self-harming behaviour, and previously recommended that young people presenting for such reasons should be triaged to ATS 3, or seen even sooner (Royal Australian and New Zealand College of Psychiatrists Clinical Practice Guidelines Team For Deliberate Self-Harm, 2004). The updated RANZCP guidelines now recommend that "waiting times should be minimised" (Carter et al., 2016). Participants in this present study appear to have mostly been seen within the 30-minute time frame, though this is only a presumption based on their ATS coding. From the medical side of the presentations, the appropriateness of ATS 3 for these poisonings was unable to be investigated in the study material, but the distribution of ATS categories presented in Table 5.5 closely resembles the distribution observed in a study by Buykx and colleagues (2010a) from Melbourne, although their study looked at both accidental and intentional overdoses with medicines, and did not describe the two intent groups separately. Depending on how much time has passed, it may be necessary to wait further until four hours have passed from the exposure, as blood levels which guide treatment will not be informative until that time (Daly et al., 2008). Activated charcoal usually needs to be given within two hours of exposure for decontamination (definitely in the case of paracetamol; Daly et al., 2008), and that could be an argument for being seen sooner. But as the treatment of poisoning was described by participants of Study 2 (Chapter 4) to be mostly supportive (supporting vital functions and 'waiting it out' in a supervised environment), patients may truly be able to wait at the ED until being seen after 30 minutes. Ingesting several substances compared to one does not necessarily indicate a more severe poisoning as a result, as the pharmacological effects of each drug, and possible interactions and potentiating each other, worsening the overall effects, would be dependent on the individual substances, and the amounts of each that were taken.

Nearly all participants received a psychiatric referral from the ED. This is in line with a previous study describing referral of people presenting to Wellington ED due to intentional self-harm (Kuehl et al., 2012). The median length of stay at ED was six hours, which would likely offer sufficient time to engage the local EPS, as all localities had 24/7 availability for such services. Access to and engagement with follow-up care after the acute care given at the ED was not investigated in this study. These and patient satisfaction with care at the ED as well as in follow-up care are a topic of interest for further study. Only four presentations (4%) had a length of stay longer than 24 hours, suggesting that a significant proportion of ISP presentations may have been missed in Study 1 (Chapter 2) where only presentations of at least 24 hours duration were included.

Substances taken

The self-reported substances in ISP represented the ICD-10 groups 'X61' and 'X60' most frequently, as also observed in Study 1 (Chapter 2), and in a previous New Zealand study (Peiris-John et al., 2014). Two-thirds of the cases involved a psychotropic medication. While the substances were self-reported, direct questions to the patient about what they have taken are considered generally reliable (Study 2, Chapter 4; Rygnestad et al., 1990, Prescott et al., 2009). Clinical observations together with a history (events leading to the presentation) are usually sufficient to treat the ISP patient, and toxicology results are not needed (Rygnestad et al., 1990).

The median number of substances involved in the presentation was two, which is close to that observed in a study done in Melbourne (Buykx et al., 2010b). The proportion of single-substance events was slightly higher than in an older study from the UK (Townsend et al., 2001). It was slightly lower than in a recent study from the UK, though this can be explained by the study design where they did not calculate alcohol (ethanol) in this number, as done in this current study (Armstrong et al., 2012). This may have been as there is no DDD defined for alcohol, and the UK study investigated amounts taken in multiples of DDD.

Alcohol may also be considered to be "not a drug", or to be less significant as a toxicant to the presentation, and may therefore not be recorded in the clinical notes about a self-

poisoning (Rygnestad et al., 1990). Alcohol was involved in a third of the cases in the current study, which is similar to a recent study done in Melbourne (Buykx et al., 2010b), and older data from Auckland (Large et al., 1980). This is a higher rate than the observed 21% in NMDS data (Study 1, Chapter 2), and the 5% in 'Hazards Data' (Study 1b, Chapter 3). This difference will be further discussed in Chapter 6.

People engaging in non-suicidal self-injurious behaviour can be impulsive when facing negative affect (Glenn and Klonsky, 2010), and alcohol may perhaps further reduce their inhibitions (Dick et al., 2010). Indeed in this present study, 70% of those whose ISP involved alcohol had first ingested alcohol, and then later taken other substances. While this is not evidence of alcohol "easing them into ISP", it is of note for future study and consideration when planning prevention initiatives. This will be further discussed in Chapter 6.

The substances most frequently seen in these ISP cases closely matched those seen in Study 1b (Chapter 3), and a previous study of substances seen in overdose and misuse at Wellington ED also using the 'Hazards Data' (Freeman and Quigley, 2015). They also match those seen in studies done in the UK (Armstrong et al., 2012, Prescott et al., 2009). Paracetamol was the most frequently seen substance in all of these studies, and selective serotonin reuptake inhibitor (SSRI) antidepressants, opioid analgesics, hypnotics, and NSAIDs were also commonly observed. Prevention efforts should therefore be focused especially on these substances, as discussed further in this chapter and in Chapter 6.

Amounts of substances taken

The median individual substance dose and the total load of substances taken in multiples of DDDs observed in this study were lower than the 9.3 DDDs in sole-substance ISP and the total load of 20 DDD in men and 13 DDD in women which were observed in a study done in York, UK (Armstrong et al., 2012). The participants in the York study took a mean paracetamol dose of 4.0 DDD, which is close to that observed in this study. The amount of paracetamol taken was above the 'threshold' for antidote treatment, and would be of concern to the treating clinicians. Giving the antidote in a timely fashion determines outcomes, most importantly potential liver damage from paracetamol (Daly et al., 2008).

While comparing DDDs allows overall analysis of amounts taken, it does not describe the seriousness or clinical significance for all substances in a similar way. The effect of having more multiples of DDDs of one substance compared to another will depend on the 'Therapeutic Index' of each medication, or how far a therapeutic dose is from a toxic one. To improve the usefulness of the results in describing severity of poisoning, a future study should collect patient weights as well, which was not done in this study. This would enable calculation of exposure in dose per kilogram of weight of the patient, which can be used to compare to established toxicity and lethality thresholds for individual substances if available.

Recording alcohol consumption data

Recording of alcohol consumed prior to or as part of the ISP event was poor even though the data collection form specifically requested it, and therefore the range of alcohol consumed was an estimate. It is impossible to determine why reporting was so poor. Perhaps a clearer request to report alcohol amounts in Standard Drinks instead of a free text field could have increased reporting. This could be attempted in a future study to better describe harm from alcohol.

Although the relationship between alcohol consumption and risk of self-harm in young people is not simple, measures to reduce excessive alcohol consumption are believed to be beneficial for prevention of ISH (Rossow et al., 2007). Young New Zealanders, aged 18-24, had the highest rate of hazardous drinking from all age groups (Ministry of Health – Manatū Hauora, 2018a). As these young people comprised two-thirds of the participants in the present study, they are an important target group for prevention activities. Recording information about their alcohol use is therefore of importance, and will be discussed further in Chapter 6.

Sources of substances

A clear majority of the study participants reported that they used their own prescription medications in the overdose. This is in line with findings from a study done in Melbourne (Buykx et al., 2010b), and two older studies from Auckland and Christchurch (Werry and

Pedder, 1976, Buchanan, 1991). The implication of this is that prescribers should be aware of risks involved with specific substances that may be frequently appearing in intentional overdoses. If they consider a patient to be at risk of ISP, they should attempt to choose an alternative, less toxic medicine, if available. This would naturally not always be possible, but should be included in planning and tailoring pharmacotherapy approaches to the patient's needs.

Only a tenth of participants reported that they had specifically been 'stockpiling' their medications with the intent to take them in overdose, which may indicate that the majority of participants had impulsive, less planned decisions to take an overdose, or perhaps just did not feel a need to accumulate medications, believing that the ones they had were sufficient to lead to the outcome they wished to achieve. Older data from Auckland suggested impulsive choices, taking what was easily available at the time of the ISP event (Large et al., 1980). The minority who were 'stockpiling' are of concern, however, and encountering such behaviour in ISP patients should ideally 'trigger' a notification to the prescribing physician. The reasons for choosing a specific substance, state of mind while taking the overdose (through retrospective reflection), or desired outcomes were not investigated in this study. These should be topics for future research.

Evidence from the UK regarding paracetamol as a chosen overdose agent indicated that people chose it because it was easily available, were aware of its dangerousness in overdose, but that half of the participants expected it to cause unconsciousness, which it does not (Hawton et al., 1995). While well-planned events involving substances which are, for example, freely available at supermarkets may be difficult to prevent due to the option to 'shop around' until sufficient amounts are obtained, impulsive events could possibly be prevented through limiting pack sizes, as done in the UK and Ireland with paracetamol (Hawton et al., 1996, Hawton et al., 2001, Turvill et al., 2000, Donohoe et al., 2006). Large paracetamol overdoses, leading to liver transplants and admissions to liver units were reduced significantly through this approach in these countries. Another approach is packaging medications in blister packs, where 'popping out' large numbers of tablets takes

time, perhaps leading to the person reconsidering before going through an impulsive act (Turvill et al., 2000), or simply containing less tablets to take (Hawton et al., 1996).

Interestingly, staff had noted that one participant in this current study was on weekly dispensing of their medications. This is called 'controlled prescribing', where only a specified amount of medications is released to a patient considered at risk of overdose, in a pre-determined time frame. The amount and frequency of dispensing are chosen so that the amount the patient has access to at any given time is small enough not to be fatal if taken in overdose. This requires a functioning 'therapeutic alliance' between the prescriber, patient, and pharmacy, where everyone agrees to the regimen. The inconvenience of having multiple dispensings must be balanced by keeping the patient safe, and through regular communication between the parties involved.

Timelines of the presentation

Recording timelines of the poisoning exposure was poor in this current study, but from the cases where this information was available, the substances were taken a median of two hours prior to presentation. A study from the UK considered alcohol consumption to be relevant if it occurred within the six hours prior to an ISH event (Haw et al., 2005). In the present study, timelines were not always available if substances (including alcohol) were taken at different times, but in half of the cases substances were taken together. Any causal relationships such as alcohol consumption leading to further ISP could not be made from this cross-sectional study design.

Similar to the present study, a previous Christchurch study found that 54% of ISP patients had presented within two hours of exposure (Buchanan, 1991). A more recent Australian study observed that half of the ISP patients in the study presented within six hours of exposure (Buykx et al., 2012). These timeframes suggest that there would be sufficient time to initiate antidote therapy in for example the case of paracetamol overdose, or to give activated charcoal to reduce absorption (Daly et al., 2008). Absorption to the body from the gastrointestinal tract varies greatly by substance, sometimes by whether food and drink have also been consumed or not, and by the tablet formulation used (fast-release vs.

sustained-release), but some absorption could be expected to have occurred within two hours. Still, some participants presented much later, potentially risking more difficult treatment with the whole dose absorbed and pharmacological effect fully observable. While mortality from poisoning is relatively low as in-hospital mortality is under 1% (Study 1, Chapter 2), and much of the treatment of a poisoning is supportive (see Study 2, Chapter 4), treatment would still occur under professional medical and nursing care.

This current study could be improved through changing the structure of the data collection form: it appeared that some clinicians may have missed the fields for entering timeline information, as the local PIs were sometimes able to fill in the details from EDIS even though the original clinician had not filled anything in. To obtain better descriptive data, the proportion of cases with unknown timelines should be reduced from what was observed in this study.

Implications for prevention of overdoses with specific agents: some examples

Of the specific substances seen most often in ISP presentations, paracetamol has been discussed above. Ibuprofen is similarly available at supermarkets and pharmacies without a prescription, but its toxicity is much lower than that of paracetamol, and interventions would generally be required only for massive ingestions involving over 100 tablets of 200mg strength (National Poisons Centre, 2018b). The adverse health effects of overuse of ibuprofen are associated with chronic use rather than incidental overdoses (Sandler et al., 1991).

Australia chose to change legislation on codeine availability, and limit it to prescription products only from 1st February 2018 (Therapeutic Goods Administration, 2018). This prompted Medsafe to start a review of codeine availability in New Zealand, which is ongoing at present (Medsafe, 2018). Currently there are several codeine-containing OTC products available from New Zealand pharmacies. OTC codeine preparations are of concern due to potential for addiction to the substance and subsequent harm (Robinson et al., 2010). The results of the ongoing safety review will determine whether codeine remains

available without prescription in New Zealand or not. This is an example of pharmacovigilance activities which should be constantly occurring if new threats or harms are identified or old ones need to be reassessed. This will be further discussed in Chapter 6.

The SSRI antidepressants citalopram, fluoxetine, and sertraline, and the serotonin-noradrenaline reuptake inhibitor (SNRI) antidepressant venlafaxine are available by prescription only, but are indicated for people who are suffering from depression, and are therefore in the risk group for self-harm including ISP (Skegg, 2005). Similar to the risks in depression, the antipsychotic quetiapine is used to treat psychosis and bipolar disorder which both also inherently involve risk of self-harming behaviours occurring. Further, quetiapine is used 'off-label' to treat sleep problems, anxiety, mood disorders, and other psychiatric conditions or issues in New Zealand (Monasterio and McKean, 2011, Huthwaite et al., 2018). Some of these underlying conditions may also increase the risk of ISP (Skegg, 2005). Prescribers of these antidepressants and antipsychotic should therefore be mindful about the possibility of their patient using these medicines in ISP, and perhaps consider controlled prescribing. Older data from Auckland indicated that people engaged in ISP within a month of obtaining a prescription for psychotropic medication from their doctor (Large et al., 1980). While SSRIs are of relatively low toxicity, venlafaxine and quetiapine can cause significant cardiac arrhythmias, seizures, and anticholinergic effects such as delirium in overdose (National Poisons Centre, 2018a, National Poisons Centre, 2018d, National Poisons Centre, 2018c).

The hypnotic zopiclone is used to treat insomnia, and may be used for people with depression (Health Navigator New Zealand, 2018). The same caution in prescribing should be practiced as described above: patients should not be prescribed large amounts, and treatment should be temporary and short-term only. Zopiclone overdoses are often relatively non-lethal, requiring maintaining sufficient airways only (National Poisons Centre, 2018f); however, if the person does not present to obtain professional care for this, more severe consequences may ensue.

As shown in the brief, simplified examples above, individual substances and sometimes whole groups of similar medicines need to be considered by their specific availability and toxicity profiles. The New Zealand Pharmacovigilance Centre collects adverse drug event information from the public and health care professionals, and reports to Medsafe, a business unit within the Ministry of Health – Manatū Hauora, which conducts reviews and makes recommendations about medication safety activities and legislation (New Zealand Pharmacovigilance Centre, 2018). More specific data are needed about hospital presentations due to medications to assist in this pharmacovigilance work.

5.7 Summary of Study 3

In this study the role of medications previously seen in Study 1 (Chapter 2) and Study 1b (Chapter 3) was confirmed in a different ISP patient sample. The main source of ISP substances was shown to be people's own prescription medications, as also seen in previous New Zealand studies from 1976 and 1989 (Werry and Pedder, 1976, Buchanan, 1991). With this updated information, the overall implications of this PhD project will be discussed in the following Chapter 6.

CHAPTER 6 : DISCUSSION

6.1 Introduction

This is the final chapter in the thesis and provides a summary of the findings of Studies 1, 1b, 2, and 3 presented in previous chapters. It also answers the research questions set for the Doctor of Philosophy (PhD) project in 1.8. A summary of the strengths and weaknesses of these studies is presented to assist in understanding the limitations of this project as a whole. The limitations of each individual study have been discussed in detail previously in their respective chapters. The main findings are discussed together to highlight implications for public health.

6.2 Summary of project findings

The four studies contributed to recommendations about actions to be taken to address harm caused by intentional self-poisoning (ISP) in New Zealand (summarised in 6.2.8). The subsequent implications are discussed in 6.4.

6.2.1 Study 1 – Ministry of Health data

Study 1 (Chapter 2) investigated and described current national data on intentional deaths due to self-poisoning (suicides; Mortality Dataset), deaths due to self-poisoning of undetermined intent (UDP), and public hospital presentations due to the same causes (in the National Minimum Dataset, NMDS). As evidenced in many previous studies, men were at particular risk of fatal ISP, and women at risk of hospital presentations. Young people under the age of 25 had the highest rates of hospital presentations due to ISP, as well as Māori men and women, New Zealand European women, and people from more deprived neighbourhoods.

The level of detail about specific substances involved in the poisoning was poor in both datasets from a poisoning prevention perspective. Only a third of the Mortality dataset cases had specific substances listed, and International Statistical Classification of Diseases

and Related Health Problems 10th Revision (ICD-10) coding in those cases suggested that not all substances involved were listed. McDowell and colleagues (2005) note that not all substances are screened for in post-mortem examinations and may therefore be left undetected, further emphasising that these are a minimum estimate of the drugs involved in poisoning deaths.

Similarly, ICD-10 coding in the NMDS did not allow identification of specific substances in that dataset, with the notable exceptions of alcohol and paracetamol. In conclusion, more detailed data collection was recommended, through specifying the substances rather than describing ICD-10 groups only which are too broad to effectively inform prevention planning and to identify high-risk substances.

6.2.2 Study 1b – Comparison of datasets

A specific poisoning dataset ('Hazards Data') collected at one Emergency Department (ED) was compared to NMDS data of the same presentations (Chapter 3). This was done to investigate whether specific data collection offered advantages over the current national hospital presentation dataset, NMDS.

Emergency Department clinicians in Wellington routinely entered details about poisoning cases into a built-in data collection tool on the electronic patient management system. In this study these were extracted into a dataset and analysed. This 'Hazards Data' offered specific substance information, which NMDS currently does not. Clinical coders were able to improve case allocation into specific intent categories (ICD-10 codes) for NMDS over the free-text formatted, clinician-performed 'Hazards Data' intent coding. They were also able to improve the correct allocation of substances involved in the ISP presentations into ICD-10 groups. Clinical coders have the advantage of using a 'coding assistant' which gives the correct ICD-10 code for a substance, while clinicians filling in 'Hazards Data' do not. If intent coding in 'Hazards Data' could be improved through, for example, staff education and offering pre-determined values only, the richness of this dataset's substance information could be used to full extent.

6.2.3 Study 2 – Clinician interviews

Clinician interviews (Chapter 4) highlighted some of the difficulties in determining intent behind a poisoning accurately if the patient was unwilling to disclose it. Clinicians commented that limitations on staff time, not knowing what further (mental health) treatment the patient received after discharge from ED, and temporal changes in intent made determining intent challenging. The main goal of emergency medicine is to treat the acute medical issues. As basic medical treatment of poisonings is the same regardless of intent behind them, determining intent at the ED is significant from a 'duty of care' perspective only. This entails keeping the ISP patient safe while at the ED, and then referring them to specialist mental health services such as the Emergency Psychiatric Service (EPS) if so indicated by their mental state.

When clinical coders were interviewed for this study, they described how they manually change the NMDS ICD-10 code names to include the specific substance involved in the poisoning. They described that this was national policy. This was not known by the research team previously, as these specific substance data have not been published. They could, however, inform policy-planning through better descriptive national poisoning data.

6.2.4 Study 3 – Prospectively collected data

Study 3 (Chapter 5) collected cross-sectional data on the specific substances involved in public hospital presentations due to ISP, and participants' means and sources of obtaining the substances. The most frequently encountered specific agents were described, and they were found to be largely psychotropic medications and non-opioid analgesics. Alcohol was also frequently involved in these presentations. Medications prescribed specifically for the participant were found to be the most common means of obtaining the substances for the ISP event. This highlights the importance of prescriber monitoring of risk of self-harm in their patient who may be at such risk, and indicates that safety measures such as limiting amounts of medications released to the patient may be needed.

6.2.5 Answering the research questions

Through the four studies summarised in the previous sections, this PhD project aimed to answer three research questions. This section presents specific, brief answers to them.

I. What information about intentional self-poisoning can be obtained from Ministry of Health datasets to plan poisoning prevention initiatives? What are the gaps in these data, and how could these be addressed?

This research found that while Mortality and NMDS datasets describe national events on a broad level, there are severe limitations to informing poisoning prevention planning. Substance groups, described by ICD-10 groups, and intent behind the event could be indicated through a maximum of 20 diagnosis code fields. ICD-10 grouping is not informative enough to identify specific substances of concern. It is outdated, and does not describe modern medications well.

II. How do emergency medicine professionals identify poisonings and investigate intent behind them, and how does that information become national hospital presentation data?

This project found that paramedics, ED doctors and nurses all gather information from the patient, other informants, and through circumstantial evidence. This information is collated and finally summarised in the discharge summary, and based on the doctor's discharge diagnosis and the patient files generally, clinical coders convert the presentation into national data (NMDS). Clinical coders do not interpret data but only create ICD-10 codes based on the doctor's notes.

Clinicians described that poisonings are often identified by the patient informing them of such an event or through circumstantial evidence such as empty pill packages, but otherwise through observing vital signs and looking for a collection of typical symptoms (a toxidrome). Toxicology testing is mostly done only to determine alcohol and paracetamol levels in blood, to guide treatment. Otherwise clinicians rely on evident symptoms, and on the patient being honest and telling them what they have taken. The same was evident in

identifying intent: clinicians felt that most patients will freely admit to an intentional overdose. If the patient was not willing to disclose anything to the clinician, circumstantial and other evidence could be used. But ultimately determining intent was dependent on what the patient admitted to, and this could change as time passed, complicating interpretation of data.

III. Which specific substances do people use in episodes of intentional self-poisoning, and where do they obtain these substances?

The most common specific substances were identified and named through this project. The most common substances across three studies are summarised in Table 6.1. A clear majority of cases involved the participant taking their own, prescribed medications in the ISP event.

6.2.7 Specific substances of concern: summary

Three studies in this PhD project characterised specific substances involved in ISP. Observed rates of ten most commonly encountered substances are summarised in Table 6.1 to better illustrate and summarise the paucity of detail in NMDS hospital presentation data. These agents were identified through collecting more detailed substance data, and this information can be used to plan specific, targeted prevention measures. It should be noted that while Study 1 included cases of UDP, Studies 1b and 3 did not.

There was generally good agreement in rates of substance prevalence in ISP across the three studies, however, alcohol and ibuprofen did not appear to follow this trend (Table 6.1). A higher rate of alcohol presence was observed in Mortality and NMDS data in Study 1, and in the prospectively collected data of Study 3, compared to 'Hazards Data' (Study 1b). This is an interesting finding from an alcohol harm-monitoring perspective, though through these studies the reasons for these differences can only be speculated on (see section 6.4).

A higher rate of ibuprofen presence was observed in Study 3, where most of the cases were from Dunedin, in comparison to Study 1b which described ISP in Wellington. These may

reflect differences between localities, supporting local monitoring of poisoning trends to address the specific needs of local populations.

Table 6.1: Summaries of substance prevalence from the studies in the thesis for a selection of specific medicines.

	Study 1 (NMDS)	Study 1 (deaths*)	Study 1b (ISP**)	Study 3
Paracetamol	29%	2.7%	31%	37%
Alcohol (ethanol)	19%	44.3%	5.0%	35%
Ibuprofen	unknown	0%	3.8%	18%
Quetiapine	unknown	2.3%	9.0%	12%
Venlafaxine	unknown	4.1%	3.7%	11%
Zopiclone	unknown	11.6%	9.0%	10%
Codeine	unknown	6.6%	5.0%	8%
Citalopram	unknown	3%	3.8%	7%
Fluoxetine	unknown	1.7%	3.7%	7%
Sertraline	unknown	0%	2.3%	6%

NMDS = National Minimum Dataset (hospital presentations); ISP = intentional self-poisoning. *Only a third of the deaths had specific substance information available in the Ministry of Health Mortality dataset. **'Hazards Data': This column describes the substances in the 1,067 cases which were classified as intentional self-poisoning in the study sample.

6.2.8 Definition of intentional self-poisoning: summary

Both 'first impression definitions' of ISP in Study 2 and Study 3-related questions from clinicians about inclusion criteria indicated that the definition of ISP needed clarification. To collect uniform data, and to ensure intended inclusion criteria are adhered to, any study investigating ISP needs to specify the definition it uses. A particular distinction needs to be made in regards to recreational overdoses. While there is some overlap between suicidal

intention and the desire to 'get high' for recreational purposes (Vingoe et al., 1999), purely recreational overdoses with no indication of intent to harm self were excluded in this PhD project. In practice, this needed to be clarified to ED clinical staff in reminders while they were collecting data for Study 3.

Haw and colleagues (2005) used a similar distinction: "Self-poisoning is defined as the intentional self-administration of more than the prescribed dose of any drug, whether or not there is evidence that the act was intended to result in death. This also includes poisoning with non-ingestible substances and gas and overdoses of recreational drugs and severe alcohol intoxication, *where the clinical staff consider that these are cases of deliberate self-harm*." Carter and colleagues (2016) discussed the history of the term, and noted that there is disagreement among researchers and clinicians about whether ISP should be included in, for example, the concept 'non-suicidal self-injury' (NSSI). In their review of the literature Carter and colleagues reached the conclusion to accept multiple definitions of intentional self-harm as per the original publications in their review, since the definitions varied. Different definitions complicate comparisons of study populations and findings, however, and an international definition for ISP would be needed. Publications describing ISP need to therefore clarify the definition they have used.

6.2.9 Recommendations

Based on the findings of the four studies, summarised in the previous sections, the following five recommendations were formulated:

I. More detailed data about poisonings, recording the specific agent(s) if known, including alcohol intoxication, should be collected nationally in New Zealand;
II. To collect uniform poisoning data nationwide, communication and information flow between the ED and other units such as mental health facilities should be improved to: a) enable efficient transfer of information from paramedics and triage nurses to the treating doctor; and b) enable ED doctors to record a discharge diagnosis which reflects intent as accurately as possible;

III. Ongoing education and refresher courses about recording poisoning data should be offered to clinical staff and clinical coders;
IV. A national lead body to utilise these data to specifically monitor trends in poisoning, or local entities performing such tasks, should be established or assigned;
V. These specific poisoning data should be made available for researchers to enable independent analysis and inform policy-makers.

These recommendations and their implications are discussed in 6.4.

6.3 Summary of project strengths and weaknesses

Strengths of the four studies in this PhD project include analysis of ISP in young people. Rates of hospital presentations due to self-harm, including ISP, are high in those aged under 25 years (Skegg, 2005, Evans et al., 2005). As Studies 1 and 3 investigated ISP and included people younger than 25 (though Study 3 only included those aged 16-24), a gap in New Zealand literature was able to be filled. A previous nationwide study did not describe this age group (Peiris-John et al., 2014).

Another strength is that the process of identifying a poisoning and then determining intent behind it to produce national data on poisonings was described, which has not previously been done. The limitations of any dataset need to be described to understand the implications for data properties. This PhD project highlighted some of the limitations of currently collected NMDS data, and suggested improvements.

Further, a study on substances in ISP and sources of them was conducted. No current New Zealand national dataset collects information on sources of substances, which were able to be determined through Study 3. These were an update on previous New Zealand data (Buchanan, 1991), and are of importance for poisoning prevention planning activities.

Weaknesses of the present studies include the inability to describe suicidal intent involved in the ISP events. When suicidal intent is not determined, these results do not necessarily reflect the need for professional mental health intervention in the study populations, and

thereby do not inform policy and service planning sufficiently. From a service-planning perspective, for the ED to serve their patients, intent does not change medical treatment of a poisoning, but directs referral for further care and follow-up care. Intentional self-poisoning, whether suicidal or not, is of concern (Ting et al., 2012).

All substances and amounts taken were self-reported in Study 3, and likely also in Studies 1 and 1b, and may therefore contain errors. Self-reported, ingested substances were shown to be either correct or sufficiently accurate for treatment decisions in 80% of ISP presentations in a small Finnish study comparing what the patient had reported to results of a drug screening test (Pohjola-Sintonen et al., 2000). Similar observations were made in a Norwegian study, where the authors concluded that for clinical management of the poisoning at the ED, self-reported substance information is generally sufficient (Rygnestad et al., 1990). Both studies concluded that while drug screening could assist treatment, it was not essential. In this present project, the extent of information available about the exposure agents and its clinical relevance to treatment (sufficient or not) was not measured.

The present studies also did not measure or estimate medical seriousness of the poisoning exposure. Amounts which had been taken were described in Defined Daily Doses (DDDs), but these do not describe toxicological effect (World Health Organization, 2016b). Australasian Triage Scale (ATS) scores indicating acuity of initial presentation, length of stay at hospital, and the discharging department can be used as proxies to estimate 'seriousness', but collecting patient weight would enable calculation of exposure dose per kilogram of body weight. Harmful, toxic, and lethal doses are given in literature for comparison, and could give indication about relative toxicological seriousness. Data of this nature are not collected in national hospital presentation databases, but rather through national Poisoning Information Centres (PICs) which may collect this information when they are contacted for advice on how to treat a poisoning (Zakharov et al., 2013). Exposure extent data are not collected therefore in cases where no call to a PIC is made, and others have justifiably argued that PIC call data do not reflect the full extent of the burden caused by poisoning on health services or society (Watts et al., 2004, Menkes et al., 2011). Our

current national data, as well as data from these present studies, only indicates that an agent was present in the self-poisoning event. To further assess impact, exposure doses per kilogram of body weight should be collected, perhaps at a single monitoring site ('sentinel site') to assess feasibility of such data collection.

6.4 Implications

This section discusses the recommendations presented in 6.2.9 in detail. It also discusses taking a 'whole systems approach' to ISP prevention, and gives examples of specific action plans to address harm from substances used in ISP. The importance of the ED as an avenue for linking ISP patients to further care is also explored briefly.

I. More detailed data about poisonings, recording the specific agent(s) if known, including alcohol intoxication, should be collected nationally in New Zealand;

The Ministry of Health (MOH) should take the lead for this initiative. Study 1 (Chapter 2) found that reporting substances used in the self-poisoning in MOH data in the NMDS is not ideal for planning specific prevention measures such as restricting inappropriate access to medications that frequently appear in overdoses. This was due to insufficient level of detail in ICD-10 codes which describe the poisoning agents. Studies 1b (Chapter 3) and 3 (Chapter 5) further showed that collecting more detailed poisoning data is feasible, though consistent data collection and quality require monitoring and ongoing training.

Study 2 (Chapter 4) found that apparently specific data are already collected into the NMDS data packages sent to the MOH, however, it is unclear to what extent they are being used currently, as there have not been publications describing them. These data, if indeed available, should be utilised (see recommendation V.). Further, 'sentinel units' in suitable, strategic locations, monitoring hospital-treated intentional self-harm (ISH), have been proposed as a means to improve the usefulness of national data collections (Carter et al., 2016). As Wellington Regional Hospital ED already has an established system, it could be

used as a pilot 'sentinel unit' to assess and validate poisoning data collection for this purpose.

Investigating solely hospital presentations leads to underestimation of the impacts of ISP (Hovda et al., 2008). Data from other agencies operating in the field of poisoning treatment and prevention should be integrated into analyses to further improve data representativeness, and to include cases not presenting to the ED. The New Zealand National Poisons Centre and four Poisons Information Centres in Australia, for example, collect specific substance information from calls to their helplines which can be used to inform targeted prevention strategies (National Poisons Centre, 2018e, Robinson et al., 2014). Collaboration and data sharing between agencies collecting poisoning data should be facilitated.

It was found in Study 1b (Chapter 3) that Capital & Coast District Health Board (CCDHB) successfully petitioned the MOH for permission to add 'artificial' ICD-10 codes for substances of abuse which did not have codes of their own. This enabled monitoring harm from these substances. Including such codes in national monitoring, or perhaps at 'sentinel sites' only, should be investigated. While the ICD-10 does not offer sufficient level of detail about poisoning agents, the next version, ICD-11, is scheduled to be released in 2018 (World Health Organization, 2018a), and may perhaps better describe the modern selection of medications through updated substance (group) codes.

The Australasian College of Emergency Medicine (ACEM) recently recommended that New Zealand adopt Systematized Nomenclature of Medicine – Clinical Terms (SNOMED-CT) clinical terms coding to better describe ED presentations (letter to the Ministry of Health, by Associate Professor Peter Jones and Dr Tom Morton on behalf of ACEM, 25th August 2017 (Jones and Morton, 2017)). SNOMED-CT is a system of clinical terms which can be used to record diagnoses, and it is in the process of being trialled and implemented in select New Zealand DHBs (Ministry of Health – Manatū Hauora, 2018b). SNOMED-CT offers more specific codes for substances (SNOMED International, 2018, Liljeqvist et al., 2014), and has been successfully used to monitor harm from alcohol (Descallar et al., 2012, Gale et al.,

2015), and to automatically extract mental health-related presentations in Australian EDs (Liljeqvist et al., 2014). Devising a system to automatically extract poisoning-related presentations through specific SNOMED-CT codes could therefore be explored at one of the sites which is already using this coding system.

II. To collect uniform poisoning data nationwide, communication and information flow between the ED and other units such as mental health facilities should be improved to: a) enable efficient transfer of information from paramedics and triage nurses to the treating doctor; and b) enable ED doctors to record a discharge diagnosis which reflects intent as accurately as possible;

The MOH, together with the DHBs, should take the lead for this initiative. Transfer of information was identified as an important process in the clinician interviews of Study 2 (Chapter 4). Previously in Chapter 5.6 electronic transfer of handover material, or a standardised handover form were discussed as possible solutions to this. Two out of three EDs in Study 2 had direct electronic transfer of information, and one had an electronic device print-out being handed to ED in handovers. Electronic transfer can facilitate accurate handovers, but needs to be audited to ensure the accuracy (Raptis et al., 2009, Murray et al., 2012).

As discussed previously, adopting SNOMED-CT clinical codes could improve options available for clinicians to allocate a specific poisoning diagnosis code. Some doctors pointed out in Study 2 interviews (4.4.3) that they were occasionally unable to give a code on EDIS that would fully describe the final diagnosis that they wanted to indicate. SNOMED-CT could assist in this.

III. Ongoing education and refresher courses about recording poisoning data should be offered to clinical staff and clinical coders;

This initiative should be led by the DHBs. Davie and colleagues (2008) have argued previously that to improve NMDS data quality, more training should be offered to doctors about recording diagnoses on electronic patient management systems. Further,

international evidence shows that ISP and other poisoning events are often investigated from hospital admission data, as in this thesis, and artificial differences in rates may arise from different practices or treatment recommendations across localities (Hovda et al., 2008, Clements et al., 2016). Clinical coding practices between and within localities should be standardised, and specific training relating to coding ISH presentations and/or development of such official guidelines and policies could assist in improving data quality (Clements et al., 2016). Offering training to improve data quality is important, but this could also be offered as a means to improve clinical staff job satisfaction, as many clinicians wish to have further training to manage ISH patients (including ISP), as they do not feel confident about managing such patients (Dennis et al., 1997). In this way, if training addressed both needs, better results could perhaps be obtained. This warrants study.

IV. A national lead body to utilise these data to specifically monitor trends in poisoning, or local entities performing such tasks, should be established or assigned;

In consultation with key stakeholders such as the National Poisons Centre, Royal Australian and New Zealand College of Psychiatrists, Australasian College of Emergency Medicine, and others, the MOH should be the initiator for this recommendation. To facilitate sharing and combining poisoning information from different sources, and to make comprehensive analyses (as discussed in recommendation I.), a national lead agency should be established. This argument has been made by others as well; most recently by Peiris-John and colleagues (2014). The American Association of Poison Control Centers is an example of such an organisation, which collates poisons information from its member centres, and collaborates with Federal government agencies to address safety issues identified through their dataset (American Association of Poison Control Centers, 2018). Trends in most commonly encountered substances may vary between localities, and therefore local monitoring at 'sentinel sites' could also be established (discussed in 6.2.6), and coordination of these could be performed by the national lead agency.

V. These specific poisoning data should be made available for researchers to enable independent analysis and informing policy-makers.

The MOH should take the lead in this initiative, in consultation with universities and other research-active institutions, as well as potential end users of the findings, to discuss and enhance the potential for mutually beneficial research projects. The MOH holds several datasets which can be used for research purposes and, for example, to inform injury prevention. The Ministry of Business, Innovation and Employment (MBIE), together with the MOH, recently released the first New Zealand Health Research Strategy (Ministry of Business Innovation and Employment – Hīkina Whakatutuki and Ministry of Health – Manatū Hauora, 2017). This strategy spans the years 2017 to 2027. One of the four strategic priorities set in it involves translating research findings into policy and practice, which the MOH will lead. A specific action involved in this includes enabling and embedding translation across the health sector. In this spirit, assisting independent researchers to collaborate with public healthcare operators such as DHBs, to produce high quality health data and links between existing and possible new datasets should be supported.

6.4.1 A 'whole systems approach' for prevention

A 'whole systems approach' to intentional self-poisoning prevention efforts was suggested by clinician interviewees in Study 2. This type of approach entails identifying problems, formulating a strategy, setting targets, and monitoring performance (World Health Organization, 2004). No single effort, program, or initiative can resolve all issues causing problematic behaviour such as ISP, but through, for example, addressing social issues, access to mental health services, and education, a comprehensive approach can be adopted. The underlying risk factors of ISP need to be addressed to support specific initiatives such as limiting inappropriate access to medicines (McDowell et al., 2005). More specific poisoning data, such as suggested and presented in this PhD project, are but a piece in this whole. Nevertheless, such data can help inform policy on where resources need to be focused.

People engage in ISH for various reasons, and therefore clinicians need to have various approaches to best manage each patient (Bancroft et al., 1976, Allen, 1995, McAllister, 2003, Hatcher et al., 2015). Any one intervention is unlikely to be acceptable and effective for all (Hatcher et al., 2015). Through a 'whole systems approach' different areas may be addressed, and management of treatment tailored better to the patient.

6.4.2 Choosing a specific drug

The most frequently encountered substances were mostly the same ones throughout Studies 1, 1b, and 3. This implies that poisoning prevention efforts could perhaps focus more aggressively on these specific medications. The high prevalence of psychotropic medications in (Western) hospital presentations due to ISP, also seen in this present PhD project, has been evident for decades (Evans, 1967, Ghodse, 1977). Some researchers have argued that non-psychotropic medications do not need to be addressed when planning restrictions to access to prevent ISP (Allgulander and Fisher, 1990); however, this seems counterintuitive as paracetamol and ibuprofen appeared frequently in ISP events in the studies presented in this thesis. While attempting to restrict inappropriate access to these medications may be challenging due to the possibility of 'shopping around' from multiple retailers to obtain a sufficient amount for an overdose, evidence on the positive effect of paracetamol pack size reduction from the UK and Ireland shows promise (Hawton et al., 1996, Hawton et al., 2001, Turvill et al., 2000, Donohoe et al., 2006). It should be noted that paracetamol is currently available in New Zealand pharmacies in 100-tablet packages without a prescription, allowing people to obtain a significant quantity in one purchase.

Similar to previous data from New Zealand (Buchanan, 1991, Ardagh et al., 2001) and Australia (Buykx et al., 2010b), the present project found that people used mostly their own prescription medications in ISP. To improve prescription medicine safety, prescribers should adopt a comprehensive approach similar to a 'whole systems approach' of injury prevention discussed previously. This would involve considering risks and benefits, choosing a safer alternative medication (if available), patient education, and making sure

unused medications are safely disposed of and not accumulated at home (Buykx et al., 2010b).

Disposal of unused medications provides one means of reducing access to medicines at home that could be used impulsively for ISP. A study from New Zealand found that a third of medication returns to two community pharmacies involved a change to another treatment (Braund et al., 2008). A further third of medications returned in this study involved products which had expired, and a tenth were returned because the patient was unsure what they were prescribed for. The authors of the 2008 study concluded that prescribers should consider prescribing only a trial amount of new medications, and could prescribe a specified packet size of 'taken as required' medications rather than, for example, 'three months' supply' to prevent unused medications accumulating at home (Braund et al., 2008). Further survey evidence from New Zealand indicated that two-thirds of the participants had unused medications at home, and a quarter would get all their prescribed medications dispensed, even if they felt that they would not be needed (Braund et al., 2009). In this survey, the reason a third of unused medications were stored at home was that the condition being treated had eased, while a tenth involved a change in therapy (Braund et al., 2009). Together these studies indicate that prescribers should address amounts prescribed, especially when new pharmacotherapies are implemented, and that there are significant amounts of unused medications in people's homes.

It has been shown in New Zealand and international studies that few people know where to return unused medications for safe disposal (Braund et al., 2009, Tong et al., 2011). Pharmacists could assist in patient education about medication safety, and in disposing of unused medications. They can be seen as 'guardians of drug therapy' (Westein et al., 2001). Since patients or their carers may obtain prescription medications from pharmacies, this offers an opportunity to reach out to them through pharmacies. This could involve reminding the patient to only take the medications as indicated, and to return any unused or expired products to the pharmacy. The current evidence base for interventions to reduce medication wastage and overdoses of prescription medications is very limited, however, and requires further study (West et al., 2014, Paulozzi, 2012). As pharmacists understand

the distribution chain of medicines, they could contribute to planning specific ISP prevention interventions to be evaluated.

The choices that people make in the substances which are taken in ISP may vary. This present project did not investigate this aspect. Choosing a substance for an intentional overdose, the opportunities and planning for access to sufficient amounts to actually cause harm and to what people expect to cause harm, and expectations of consequences of an overdose should be investigated in a further study. The importance of this is highlighted through examples of substances frequently encountered in the studies presented in this thesis: paracetamol and alcohol.

6.4.2.1 Specific substance example: paracetamol

In the case of paracetamol, participants in an older study from the United Kingdom (UK) did not choose it for ISP for any particular reason (Gazzard et al., 1976). Others in a more recent study knew that paracetamol was harmful to the liver, and wished to specifically damage their liver by taking small, repeated overdoses (Allen, 1995). On the other hand, another study found that people chose paracetamol for ISP because they believed it was dangerous and (incorrectly) that it would cause them to drift into unconsciousness (Hawton et al., 1995). Half of the participants in this study purchased paracetamol specifically to overdose with it, and only a fifth did not expect paracetamol to cause immediate effects but (correctly) in a delayed fashion, well over 24 hours after ingestion (Hawton et al., 1995).

Two-thirds of the participants in this more recent study would have chosen something else if they had known about the delayed toxicity of paracetamol, or if they had known that there was an antidote included in the tablet, preventing harmful effects from an overdose (Hawton et al., 1996). Only a quarter of participants, however, felt that they would not have taken paracetamol in ISP if the package had included a warning label about toxicity.

Further, only 20% of the participants of the older study stated that they would have taken fewer tablets or chosen something else, if the paracetamol tablets had been in a blister pack (Gazzard et al., 1976). This was in contrast to the more recent study, where the risk of

taking a large overdose of over 25g of paracetamol was 3.0-fold (95% confidence interval; CI 1.12-9.95) when taking loose tablets compared to blister-packaged tablets (Hawton et al., 1996). Of those who had taken loose tablets, however, two-thirds speculated that blister-packaging would not have made them take any less tablets (Hawton et al., 1996). Similarly, two-thirds felt that a smaller pack size would not have affected their choice to take it in ISP. This was in contrast to having paracetamol available by prescription only, as three-quarters of participants would not have chosen it in that case (Hawton et al., 1996).

A global review of paracetamol overdoses found that the lowest rates of poisonings were in countries where it is only available from pharmacies (Gunnell et al., 2000). This perhaps reflects the finding of prescription-only status deterring some ISP patients from choosing paracetamol (Hawton et al., 1996). This may be due to the 'inconvenience' of access to it, or the delay that visiting a pharmacy specifically to purchase it, or visiting a doctor to obtain a prescription may cause. The authors of the global review concluded that reducing pack size of paracetamol should be done to prevent overdoses (Gunnell et al., 2000), and there is supporting evidence for this, as described in the previous section. Presently, paracetamol is available in New Zealand through supermarkets and other retailers, and in large package sizes through online pharmacies (Freeman and Quigley, 2015). Pharmacovigilance activities should be directed at investigating the choices made when paracetamol is used in ISP in New Zealand to address its frequent appearance in intentional overdoses.

6.4.2.2 Specific substance example: alcohol

Differences in alcohol-drinking culture across regions affect outcomes of ISP due to the frequency of alcohol intoxication co-occurrence in the poisoning (Hatzitolios et al., 2001). Alcohol is important as a co-ingestant, as it may increase the effects of other drugs taken simultaneously, such as potentiating opioid overdoses (Haw et al., 2005, Reith et al., 2005). Similar to Study 3 findings (Chapter 5), alcohol was involved in a third of ISP presentations in a large, retrospective Australian toxicology database study (Chitty et al., 2018). The authors of that study concluded that alcohol was not simply a 'facilitator' to ISP, but an integral part of it. Further, mental health assessments are made more difficult due to

alcohol intoxication in ISP, or alcohol may cause a significant delay in performing those (Haw et al., 2005). Alcohol is therefore an important factor in ISP.

It was found in Study 3 (Chapter 5) that few people presenting to EDs due to ISP had blood alcohol levels tested. Only half of the patients thought to have consumed alcohol were tested for it, and only 21% of those thought to not have consumed any were tested. The true extent of alcohol involvement in ISP may be underreported, as there were significant differences between rates of alcohol observed between different sources of information in this present PhD project (described previously in 6.2.6). It appears therefore that alcohol involvement should be recorded more systematically in national datasets. ICD-10 includes codes for recording specific concentration ranges of alcohol measured in blood which could be used to record results (World Health Organization, 2015). As clinicians interviewed in Study 2 (see 4.4.7.2) suggested that control of alcohol consumption and education about it could be effective to reduce rates of ISP, investment in improving alcohol monitoring appears further justified.

6.4.3 Follow-up care

While this thesis focuses on data quality, follow-up care after an ISP presentation may determine future outcomes for patients and will therefore be discussed briefly here. Patients engaging in ISH may be frequent users of ED services, and this offers an opportunity for intervention or for linking them to further care (Colman et al., 2004, Larkin and Beautrais, 2010). Failure to refer people presenting due to alcohol and other substance intoxication to such follow-up care may increase their risk of future suicide (Bennett et al., 2002). Evidence from the UK, however, indicated that those ISP patients who were discharged directly from the ED were less likely to be offered specialist assessment and follow-up care than those who were discharged from other wards (Kapur et al., 1999). Yet an ED presentation due to ISP should trigger a review of the patient's management plan (Buykx et al., 2012).

Many ISP patients in Study 3 were allocated to ATS category 3 or higher (less urgent). A recent review of literature on multiple presenters to ED found that if clinicians simply focus on triage scores to indicate 'appropriateness' of an ED presentation, this can introduce (unconscious) bias towards patients who have low triage scores (Nelson et al., 2011). This review found that while acute care needs were met at the ED, addressing other needs may be poor. The implication of this finding for ISP patients presenting to EDs is that while their acute, medical needs are addressed, assessing their needs for follow-up care may not be. The rate of referral to EPS in Study 3 (Chapter 5) was high, however, so referrals were occurring. Study 3 did not investigate the success of these referrals, or indeed actual occurrence of a follow-up care contact. These should be investigated in a future study.

While a referral for follow-up care may be given, the resulting outcomes are unclear. There is little formal evidence for the efficacy of therapeutic interventions in helping prevent ISH in adolescents (Ougrin et al., 2015), and two recent Cochrane reviews concluded that the evidence base for effect of medications and psychiatric therapies in reducing ISH is poor (Hawton et al., 2015, Hawton et al., 2016). Also, having easy access to treatment for ISP does not guarantee that the treatment works (Harrington et al., 1998). There may be other benefits to the patient, however, which are not easily quantified. While there was no evidence that monthly general practitioner (GP) contacts after ISP helped to reduce suicidality, hopelessness, and depression scores (Grimholt et al., 2015a), patients felt that the GP was listening to them and involving them in treatment planning, which made them feel satisfied with their care (Grimholt et al., 2015b). GPs may be able to provide a holistic approach to coordinating treatment, and link the patient to other services to assist in recovery (Grimholt et al., 2015b). The evidence base about the efficacy of interventions addressing ISP and ISH should be grown.

6.5 Recommendations for further studies

The literature searches, studies, and discussions in this thesis highlighted areas of study which should be addressed in the future. While the rates of ISP have been determined for

various population groups, the experiences of small ethnic groups, those living in rural areas, those not presenting to hospitals for formal care, those whose poisoning was more severe (e.g. led to an intensive care episode) should be investigated further. The apparent differences in rates of ISP across different DHBs and the reasons for them should be investigated. Together these studies would improve our understanding of which population groups are at risk of ISP, and where prevention initiatives should be targeted most urgently.

Studies regarding patient behaviour that could be conducted include investigating patient choices in why they took a particular substance, their expectations of the outcome, the dose they took (measured per kilogram of weight for assessing toxicity), and the mental state that the patient was in at the time of the exposure and the suicidal ideation involved (if applicable). Further, the extent of 'Frequent Dispensing for Safety and co-prescribed medicines', which covers the dispensing of prescription medications weekly or at other tailored intervals to prevent incidents of ISP, should be determined. Its feasibility, along with patient and prescriber satisfaction, and its outcomes should be investigated. These studies would contribute to pharmacovigilance activities and to planning safer pharmacotherapy regimens for those who are at risk of ISP.

The studies in this PhD project indicated that alcohol data may not currently be optimally collected or recorded. This should be compared across localities to identify any regional differences. The involvement and timing of alcohol ingestion in relation to ISP also warrants further study. These studies would contribute to characterising and addressing harm from alcohol.

Assessing engagement with follow-up care after episodes of ISP, as well as patient satisfaction and needs for such care should be studied. These have the potential to improve this care, which in turn may lead to fewer events of ISP by the patient. This could be tied together with an assessment of costs involved in treating people who have self-poisoned. A further cost-related study could investigate the financial impact and feasibility of covering some of the additional costs relating to 'Frequent Dispensing for Safety and co-prescribed

medicines', when a patient may need to travel to the pharmacy several times a week, for example, incurring costs from petrol or public transport fees.

Together these lines of study would fill several gaps in our knowledge about ISP and its impact within society. The findings are expected to contribute to planning policy and prevention efforts.

6.6 Concluding remarks

This PhD project investigated New Zealand national datasets on intentional self-poisoning, and highlighted the lack of detail about the specific substances involved. From a practical poisoning prevention perspective this makes planning prevention initiatives difficult, as it is unclear which substances should be addressed as a priority. Collecting more specific poisoning agent information was shown to be feasible, and could significantly inform prevention efforts. A potential 'sentinel site' to monitor poisonings already exists in Wellington Regional Hospital ED. A national lead agency to direct and guide local poisoning information collection and utilisation should be established. This agency could facilitate cross-linking across different poisoning datasets collected in New Zealand, as hospital presentations do not capture or describe all poisonings. Calls to the National Poisons Centre, and reports to the New Zealand Pharmacovigilance Centre should be considered together with the specific hospital presentation poisoning data to obtain a more comprehensive understanding of substances causing the most harm.

REFERENCES

ABBOTT, V., CREIGHTON, M., HANNAM, J., VINCENT, T. & COULTER, C. 2012. Access in New Zealand to antidotes for accidental and intentional drug poisonings. *The Journal of Primary Health Care,* 4**,** 100-105.

ACCIDENT COMPENSATION CORPORATION. 2015. *Accident Compensation Corporation home page* [Online]. Available: http://www.acc.co.nz/ [Accessed 03/11/2015].

AHMAD, O. B., BOSCHI-PINTO, C., LOPEZ, A. D., MURRAY, C. J., LOZANO, R. & INOUE, M. 2001. *Age standardization of rates: a new WHO standard,* Geneva, World Health Organization.

ALLEN, C. 1995. Helping with deliberate self-harm: Some practical guidelines. *Journal of Mental Health,* 4**,** 243-250.

ALLGULANDER, C. & FISHER, L. 1990. Clinical predictors of completed suicide and repeated self-poisoning in 8895 self-poisoning patients. *European Archives of Psychiatry and Neurological Sciences,* 239**,** 270-276.

AMERICAN ASSOCIATION OF POISON CONTROL CENTERS. 2018. About us [Online]. Available: https://www.aapcc.org/About-us [Accessed 13/08/2018].

ARDAGH, M. & BALASINGAM, A. 1996. Trends in gastrointestinal decontamination for deliberate self poisoning in Christchurch. *The New Zealand Medical Journal,* 109**,** 462-463.

ARDAGH, M., FLOOD, D. & TAIT, C. 2001. Limiting the use of gastrointestinal decontamination does not worsen the outcome from deliberate self-poisoning. *The New Zealand Medical Journal,* 114**,** 423-425.

ARMSTRONG, T. M., DAVIES, M. S., KITCHING, G. & WARING, W. S. 2012. Comparative Drug Dose and Drug Combinations in Patients that Present to Hospital Due to Self-Poisoning. *Basic & Clinical Pharmacology & Toxicology,* 111**,** 356-360.

BANCROFT, J., SKRIMSHIRE, A. & SIMKIN, S. 1976. The reasons people give for taking overdoses. *The British Journal of Psychiatry,* 128**,** 538-548.

BECK, A. T., KOVACS, M. & WEISSMAN, A. 1979. Assessment of suicidal intention: the Scale for Suicide Ideation. *Journal of Consulting and Clinical Psychology*, 47, 343-352.

BENNETT, S., COGGAN, C., HOOPER, R., LOVELL, C. & ADAMS, P. 2002. Presentations by youth to Auckland emergency departments following a suicide attempt. *International Journal of Mental Health Nursing,* 11**,** 144-153.

BETHELL, J. & RHODES, A. E. 2009. Identifying deliberate self-harm in emergency department data. *Health Reports,* 20**,** 35-42.

BORMAN, B. 1995. *Standardising rates of disease,* Wellington, Public Health Commission.

BRAUND, R., CHUAH, F., GILBERT, R., GN, G., SOH, A., TAN, L., TIONG, H.S. & YUEN, Y.-C. 2008. Identification of the reasons for medication returns. *New Zealand Family Physician,* 35, 248-252.

BRAUND, R., PEAKE, M.B. & SHIEFFELBIEN, L. 2009. Disposal practices for unused medications in New Zealand. *Environment International*, 35, 952-955.

BRENNER, R. A., SCHEIDT, P. C., ROSSI, M. W., CHENG, T. L., OVERPECK, M. D., BOENNING, D. A., WRIGHT, J. L., KAVEE, J. D. & BOYLE, K. E. 2002. Injury surveillance in the ED: Design, implementation, and analysis. *The American Journal of Emergency Medicine*, 20, 181-187.

BROWN, G. K., HENRIQUES, G. R., SOSDJAN, D. & BECK, A. T. 2004. Suicide intent and accurate expectations of lethality: predictors of medical lethality of suicide attempts. *Journal of Consulting and Clinical Psychology,* 72**,** 1170-1174.

BRUNTON, M. 16/07/2015. *RE: Importance of collecting self-identified ethnicity data.* Personal communication given to KUMPULA, E.-K.

BUCHANAN, W. 1991. A year of intentional self poisoning in Christchurch. *The New Zealand Medical Journal,* 104**,** 470-472.

BUCKLEY, N. A. & MCMANUS, P. R. 2004. Changes in fatalities due to overdose of anxiolytic and sedative drugs in the UK (1983–1999). *Drug Safety,* 27**,** 135-141.

BUYKX, P., DIETZE, P., RITTER, A. & LOXLEY, W. 2010a. Characteristics of medication overdose presentations to the ED: how do they differ from illicit drug overdose and self-harm cases? *Emergency Medicine Journal*, 27, 499-503.

BUYKX, P., LOXLEY, W., DIETZE, P. & RITTER, A. 2010b. Medications used in overdose and how they are acquired–an investigation of cases attending an inner Melbourne emergency department. *Australian and New Zealand Journal of Public Health,* 34**,** 401-404.

BUYKX, P., RITTER, A., LOXLEY, W. & DIETZE, P. 2012. Patients Who Attend the Emergency Department Following Medication Overdose: Self-reported Mental Health History and Intended Outcomes of Overdose. *International Journal of Mental Health and Addiction,* 10**,** 501-511.

CAMIDGE, D., WOOD, R. & BATEMAN, D. 2003. The epidemiology of self-poisoning in the UK. *The British Journal of Clinical Pharmacology*, 56, 613-619.

CAREERS.CO.NZ. 2017. *Jobs database: Clinical coder* [Online]. Available: https://www.careers.govt.nz/jobs-database/health-and-community/health/clinical-coder/ [Accessed 13/12/2017].

CARLSTEN, A., ALLEBECK, P. & BRANDT, L. 1996. Are suicide rates in Sweden associated with changes in the prescribing of medicines? *Acta Psychiatrica Scandinavica,* 94**,** 94-100.

CARTER, G., PAGE, A., LARGE, M., HETRICK, S., MILNER, A. J., BENDIT, N., WALTON, C., DRAPER, B., HAZELL, P. & FORTUNE, S. 2016. Royal Australian and New Zealand College of Psychiatrists clinical practice guideline for the management of deliberate self-harm. *Australian & New Zealand Journal of Psychiatry,* 50**,** 939-1000.

CHAPMAN, A. L., GRATZ, K. L. & BROWN, M. Z. 2006. Solving the puzzle of deliberate self-harm: The experiential avoidance model. *Behaviour Research and Therapy,* 44**,** 371-394.

CHITTY, K. M., DOBBINS, T., DAWSON, A. H., ISBISTER, G. K. & BUCKLEY, N. A. 2017. Relationship between prescribed psychotropic medications and co-ingested alcohol in intentional self-poisonings. *The British Journal of Psychiatry*, 210, 203-208.

CHITTY, K. M., KIRBY, K., OSBORNE, N. J., ISBISTER, G. K. & BUCKLEY, N. A. 2018. Co-ingested alcohol and the timing of deliberate self-poisonings. *Australian & New Zealand Journal of Psychiatry,* 52**,** 271-278.

CLEMENTS, C., TURNBULL, P., HAWTON, K., GEULAYOV, G., WATERS, K., NESS, J., TOWNSEND, E., KHUNDAKAR, K. & KAPUR, N. 2016. Rates of self-harm presenting to general hospitals: a comparison of data from the Multicentre Study of Self-Harm in England and Hospital Episode Statistics. *BMJ Open*, 6, e009749.

COGGAN, C., HOOPER, R. & ADAMS, B. 2002. Self-reported injury rates in New Zealand. *The New Zealand Medical Journal,* 115**,** 1-9.

COLMAN, I., DRYDEN, D. M., THOMPSON, A. H., CHAHAL, A. M., BORDEN, K., ROWE, B. H. & VOAKLANDER, D. C. 2004. Utilization of the emergency department after self-inflicted injury. *Academic Emergency Medicine,* 11**,** 136-142.

CONNER, K. R., LANGLEY, J., TOMASZEWSKI, K. J. & CONWELL, Y. 2003. Injury hospitalization and risks for subsequent self-injury and suicide: a national study from New Zealand. *The American Journal of Public Health,* 93**,** 1128-1131.

CONWELL, Y., DUBERSTEIN, P. R., COX, C., HERRMANN, J., FORBES, N. & CAINE, E. D. 1998. Age differences in behaviors leading to completed suicide. *The American Journal of Geriatric Psychiatry*, 6, 122-126.

COOPER, J., KAPUR, N., DUNNING, J., GUTHRIE, E., APPLEBY, L. & MACKWAY-JONES, K. 2006. A clinical tool for assessing risk after self-harm. *Annals of Emergency Medicine,* 48**,** 459-466.

CORONIAL SERVICES OF NEW ZEALAND – PURONGO O TE AO KAKARAURI. 2018. *About Coroners & Coronial Services - What a Coroner does* [Online]. Available: https://coronialservices.justice.govt.nz/about/what-a-coroner-does/ [Accessed 21/02/2018 2018].

CRESWELL, J. W., FETTERS, M. D. & IVANKOVA, N. V. 2004. Designing a mixed methods study in primary care. *The Annals of Family Medicine*, 2, 7-12.

CROMBIE, I. K. & MCLOONE, P. 1998. Does the availability of prescribed drugs affect rates of self poisoning? *The British Journal of General Practice*, 48, 1505.

DALY, F. F., FOUNTAIN, J. S., MURRAY, L., GRAUDINS, A. & BUCKLEY, N. A. 2008. Guidelines for the management of paracetamol poisoning in Australia and New Zealand-explanation and elaboration. *The Medical Journal of Australia,* 188**,** 296-301.

DAVIE, G., LANGLEY, J., SAMARANAYAKA, A. & WETHERSPOON, M. 2008. Accuracy of injury coding under ICD-10-AM for New Zealand public hospital discharges. *Injury Prevention,* 14**,** 319-323.

DAVIES, M. 2011. Concept mapping, mind mapping and argument mapping: what are the differences and do they matter? *Higher Education*, 62, 279-301.

DAWSON, S., KING, L. & GRANTHAM, H. 2013. Review article: Improving the hospital clinical handover between paramedics and emergency department staff in the deteriorating patient. *Emergency Medicine Australasia,* 25**,** 393–405.

DE LEO, D., BURGIS, S., BERTOLOTE, J. M., KERKHOF, A. J. & BILLE-BRAHE, U. 2006. Definitions of suicidal behavior: lessons learned from the WHO/EURO multicentre Study. *Crisis: The Journal of Crisis Intervention and Suicide Prevention,* 27**,** 4-15.

DENNIS, M., BEACH, M., EVANS, P. A., WINSTON, A. & FRIEDMAN, T. 1997. An examination of the accident and emergency management of deliberate self harm. *Journal of Accident & Emergency Medicine,* 14**,** 311-315.

DEPARTMENT OF HEALTH. 2012. *The Australian Standard Drink* [Online]. Available: http://www.alcohol.gov.au/internet/alcohol/publishing.nsf/Content/standard [Accessed 14/03/2018].

DESCALLAR, J., MUSCATELLO, D. J., WEATHERBURN, D., CHU, M. & MOFFATT, S. 2012. The association between the incidence of emergency department attendances for alcohol problems and assault incidents attended by police in New South Wales, Australia, 2003–2008: a time–series analysis. *Addiction,* 107**,** 549-556.

DICK, D. M., SMITH, G., OLAUSSON, P., MITCHELL, S. H., LEEMAN, R. F., O'MALLEY, S. S. & SHER, K. 2010. Understanding the construct of impulsivity and its relationship to alcohol use disorders. *Addiction Biology,* 15**,** 217-226.

DONOHOE, E., WALSH, N. & TRACEY, J. 2006. Pack-size legislation reduces severity of paracetamol overdoses in Ireland. *Irish Journal of Medical Science,* 175**,** 40-42.

DOYLE, L., BRADY, A.-M. & BYRNE, G. 2009. An overview of mixed methods research. *Journal of Research in Nursing*, 14, 175-185.

ELLISON-LOSCHMANN, L. & PEARCE, N. 2006. Improving access to health care among New Zealand's Maori population. *American Journal of Public Health,* 96**,** 612-617.

EVANS, E., HAWTON, K., RODHAM, K. & DEEKS, J. 2005. The prevalence of suicidal phenomena in adolescents: a systematic review of population-based studies. *Suicide and Life-Threatening Behavior,* 35**,** 239-250.

EVANS, J. G. 1967. Deliberate self-poisoning in the Oxford area. *British Journal of Preventive & Social Medicine,* 21**,** 97-107.

EXETER, D., ROBINSON, E. & WHEELER, A. 2009. Antidepressant dispensing trends in New Zealand between 2004 and 2007. *Australian & New Zealand Journal of Psychiatry,* 43**,** 1131-1140.

FINKELSTEIN, Y., MACDONALD, E. M., HOLLANDS, S., SIVILOTTI, M. L., HUTSON, J. R., MAMDANI, M. M., KOREN, G., JUURLINK, D. N., SAFETY, C. D. & NETWORK, E. R. 2016. Repetition of intentional drug overdose: a population-based study. *Clinical Toxicology,* 54**,** 585-589.

FREEMAN, N. & QUIGLEY, P. 2015. Care versus convenience: examining paracetamol overdose in New Zealand and harm reduction strategies through sale and supply. *The New Zealand Medical Journal,* 128**,** 28-34.

GALE, M., MUSCATELLO, D. J., DINH, M., BYRNES, J., SHAKESHAFT, A., HAYEN, A., MACINTYRE, C. R., HABER, P., CRETIKOS, M. & MORTON, P. 2015. Alcopops, taxation and harm: a segmented time series analysis of emergency department presentations. *BMC Public Health,* 15**,** 468.

GALLAGHER, L. M., KAPPATOS, D., TISCH, C. & ELLIS, P. M. 2012. Suicide by poisoning in New Zealand—a toxicological analysis. *The New Zealand Medical Journal,* 125, 15-25.

GAZZARD, B., DAVIS, M., SPOONER, J. & WILLIAMS, R. 1976. Why do people use paracetamol for suicide? *British Medical Journal,* 1**,** 212-213.

GHODSE, A. H. 1977. Deliberate self-poisoning: a study in London casualty departments. *British Medical Journal,* 1**,** 805-808.

GJELSVIK, B., HEYERDAHL, F. & HAWTON, K. 2012. Prescribed medication availability and deliberate self-poisoning: a longitudinal study. *The Journal of Clinical Psychiatry*, 73, e548-54.

GLENN, C. R. & KLONSKY, E. D. 2010. A multimethod analysis of impulsivity in nonsuicidal self-injury. *Personality Disorders: Theory, Research, and Treatment,* 1**,** 67-75.

GORMAN, D. & MASTERTON, G. 1990. General practice consultation patterns before and after intentional overdose: a matched control study. *British Journal of General Practice,* 40**,** 102-105.

GRESHAM, C., UTTING, K., WILLIAMS, C. & SCHEP, L. 2013. Colchicine poisoning: defusing the ticking time bomb. *The New Zealand Medical Journal,* 126**,** 115-116.

GRIMHOLT, T. K., JACOBSEN, D., HAAVET, O. R., SANDVIK, L., JORGENSEN, T., NORHEIM, A. B. & EKEBERG, O. 2015a. Effect of systematic follow-up by general practitioners after deliberate self-poisoning: a randomised controlled trial. *PloS One,* 10**,** e0143934.

GRIMHOLT, T. K., JACOBSEN, D., HAAVET, O. R., SANDVIK, L., JORGENSEN, T., NORHEIM, A. B. & EKEBERG, O. 2015b. Structured follow-up by general practitioners after deliberate self-poisoning: a randomised controlled trial. *BMC Psychiatry,* 15**,** 245.

GUNNELL, D., EDDLESTON, M., PHILLIPS, M. R. & KONRADSEN, F. 2007. The global distribution of fatal pesticide self-poisoning: systematic review. *BMC Public Health*, 7, 357.

GUNNELL, D., HO, D. & MURRAY, V. 2004. Medical management of deliberate drug overdose: a neglected area for suicide prevention? *Emergency Medicine Journal*, 21, 35-38.

GUNNELL, D., MURRAY, V. & HAWTON, K. 2000. Use of paracetamol (acetaminophen) for suicide and nonfatal poisoning: worldwide patterns of use and misuse. *Suicide and Life-threatening Behavior,* 30**,** 313-326.

HALL, A. & CURRY, C. 1994. Changing epidemiology and management of deliberate self poisoning in Christchurch. *The New Zealand Medical Journal,* 107**,** 396-399.

HAMPSON, N. B. & BODWIN, D. 2013. Toxic co-ingestions in intentional carbon monoxide poisoning. *Journal of Emergency Medicine,* 44**,** 625-630.

HAMPSON, N. B., KRAMER, C. C., DUNFORD, R. G. & NORKOOL, D. M. 1994. Carbon monoxide poisoning from indoor burning of charcoal briquets. *Journal of the American Medical Association,* 271**,** 52-53.

HARRINGTON, R., KERFOOT, M., DYER, E., MCNIVEN, F., GILL, J., HARRINGTON, V., WOODHAM, A. & BYFORD, S. 1998. Randomized trial of a home-based family intervention for children who have deliberately poisoned themselves. *Journal of the American Academy of Child & Adolescent Psychiatry,* 37**,** 512-518.

HARRISS, L., HAWTON, K. & ZAHL, D. 2005. Value of measuring suicidal intent in the assessment of people attending hospital following self-poisoning or self-injury. *The British Journal of Psychiatry,* 186**,** 60-66.

HATCHER, S., SHARON, C. & COLLINS, N. 2009. Epidemiology of intentional self-harm presenting to four district health boards in New Zealand over 12 months, and comparison with official data. *Australian and New Zealand Journal of Psychiatry,* 43**,** 659-665.

HATCHER, S., SHARON, C., HOUSE, A., COLLINS, N., COLLINGS, S. & PILLAI, A. 2015. The ACCESS study: Zelen randomised controlled trial of a package of care for people presenting to hospital after self-harm. *The British Journal of Psychiatry,* 206**,** 229-236.

HATZITOLIOS, A. I., SION, M., ELEFTHERIADIS, N., TOULIS, E., EFSTRATIADIS, G., VARTZOPOULOS, D. & ZIAKAS, A. 2001. Parasuicidal poisoning treated in a Greek medical ward: epidemiology and clinical experience. *Human & Experimental Toxicology,* 20**,** 611-617.

HAW, C., HAWTON, K., CASEY, D., BALE, E. & SHEPHERD, A. 2005. Alcohol dependence, excessive drinking and deliberate self-harm. *Social Psychiatry and Psychiatric Epidemiology,* 40**,** 964-971.

HAW, C., HAWTON, K., HOUSTON, K. & TOWNSEND, E. 2001. Psychiatric and personality disorders in deliberate self-harm patients. *The British Journal of Psychiatry,* 178**,** 48-54.

HAWTON, K., BANCROFT, J., CATALAN, J., KINGSTON, B., STEDEFORD, A. & WELCH, N. 1981. Domiciliary and out-patient treatment of self-poisoning patients by medical and non-medical staff. *Psychological Medicine,* 11**,** 169-177.

HAWTON, K. & FAGG, J. 1990. Deliberate self-poisoning and self-injury in older people. *International Journal of Geriatric Psychiatry,* 5**,** 367-373.

HAWTON, K., HARRISS, L., HALL, S., SIMKIN, S., BALE, E. & BOND, A. 2003. Deliberate self-harm in Oxford, 1990–2000: a time of change in patient characteristics. *Psychological Medicine*, 33, 987-995.

HAWTON, K., SAUNDERS, K., TOPIWALA, A. & HAW, C. 2013. Psychiatric disorders in patients presenting to hospital following self-harm: a systematic review. *Journal of Affective Disorders,* 151**,** 821-830.

HAWTON, K., TOWNSEND, E., DEEKS, J., APPLEBY, L., GUNNELL, D., BENNEWITH, O. & COOPER, J. 2001. Effects of legislation restricting pack sizes of paracetamol and salicylate on self poisoning in the United Kingdom: before and after study. *British Medical Journal,* 322**,** 1-7.

HAWTON, K., WARE, C., MISTRY, H., HEWITT, J., KINGSBURY, S., ROBERTS, D. & WEITZEL, H. 1995. Why patients choose paracetamol for self poisoning and their knowledge of its dangers. *British Medical Journal,* 310**,** 164.

HAWTON, K., WARE, C., MISTRY, H., HEWITT, J., KINGSBURY, S., ROBERTS, D. & WEITZEL, H. 1996. Paracetamol self-poisoning characteristics, prevention and harm reduction. *The British Journal of Psychiatry,* 168**,** 43-48.

HAWTON, K., WITT, K. G., TAYLOR SALISBURY, T. L., ARENSMAN, E., GUNNELL, D., HAZELL, P., TOWNSEND, E. & VAN HEERINGEN, K. 2015. Pharmacological interventions for self-harm in adults. *The Cochrane Library*.

HAWTON, K., WITT, K. G., TAYLOR SALISBURY, T. L., ARENSMAN, E., GUNNELL, D., HAZELL, P., TOWNSEND, E. & VAN HEERINGEN, K. 2016. Psychosocial interventions for self-harm in adults. *The Cochrane Library*.

HEALTH NAVIGATOR NEW ZEALAND. 2018. *Zopiclone* [Online]. Available: https://www.healthnavigator.org.nz/medicines/z/zopiclone/ [Accessed 05/03/2018].

HEALTH PROMOTION AGENCY 2016. *The straight up guide to standard drinks,* Wellington, Health Promotion Agency.

HIDER, P., HELLIWELL, P., ARDAGH, M. & KIRK, R. 2001. The epidemiology of emergency department attendances in Christchurch. *The New Zealand Medical Journal,* 114**,** 157-159.

HOCKEY, R., HORTH, A. & PITT, W. R. 2000. Validation study of injury surveillance data collected through Queensland hospital emergency departments. *Emergency Medicine Australasia,* 12**,** 310-316.

HOVDA, K. E., BJORNAAS, M., SKOG, K., OPDAHL, A., DROTTNING, P., EKEBERG, O. & JACOBSEN, D. 2008. Acute poisonings treated in hospitals in Oslo: a one-year prospective study (I): pattern of poisoning. *Clinical Toxicology,* 46**,** 35-41.

HOWELL, S. C., WILLS, R. A. & JOHNSTON, T. C. 2014. Should diagnosis codes from emergency department data be used for case selection for emergency department key performance indicators? *Australian Health Review,* 38**,** 38-43.

HOWSON, M. A., YATES, K. M. & HATCHER, S. 2008. Re-presentation and suicide rates in emergency department patients who self-harm. *Emergency Medicine Australasia,* 20**,** 322-327.

HUTHWAITE, M., TUCKER, M., MCBAIN, L. & ROMANS, S. 2018. Off label or on trend: a review of the use of quetiapine in New Zealand. *The New Zealand Medical Journal*, 131, 45-50.

INTERNATIONAL NARCOTICS CONTROL BOARD 2016. *Availability of Internationally Controlled Drugs: Ensuring Adequate Access for Medical and Scientific Purposes,* Vienna, United Nations, International Narcotics Control Board.

JAMISON, E. C. & BOL, K. A. 2016. Previous suicide attempt and its association with method used in a suicide death. *The American Journal of Preventive Medicine,* 51**,** S226-S233.

JONES, P. & MORTON, T. 2017. Letter to the Ministry of Health on behalf of ACEM: The Acute Care Data Vacuum in New Zealand.

KAPUR, N., HOUSE, A., CREED, F., FELDMAN, E., FRIEDMAN, T. & GUTHRIE, E. 1999. General hospital services for deliberate self-poisoning: an expensive road to nowhere? *Postgraduate Medical Journal,* 75**,** 599-602.

KARASOULI, E., OWENS, D., ABBOTT, R. L., HURST, K. M. & DENNIS, M. 2011. All-cause mortality after non-fatal self-poisoning: a cohort study. *Social Psychiatry and Psychiatric Epidemiology,* 46**,** 455-462.

KNOTTNERUS, J. A., VAN WEEL, C. & MURIS, J. W. 2002. Evidence base of clinical diagnosis: evaluation of diagnostic procedures. *British Medical Journal,* 324**,** 477.

KOOL, B., CHELIMO, C., ROBINSON, E. & AMERATUNGA, S. 2011. Deaths and hospital admissions as a result of home injuries among young and middle-aged New Zealand adults. *The New Zealand Medical Journal,* 124**,** 16-25.

KUEHL, S., NELSON, K. & COLLINGS, S. 2012. Back so soon: rapid re-presentations to the emergency department following intentional self-harm. *The New Zealand Medical Journal,* 125**,** 1-10.

KUMPULA, E.-K., NADA-RAJA, S., NORRIS, P. & QUIGLEY, P. 2017. A descriptive study of intentional self-poisoning from New Zealand national registry data: exploring the challenges. *Australian and New Zealand Journal of Public Health,* 41**,** 535-540.

KYPRI, K., CHALMERS, D., LANGLEY, J. D. & WRIGHT, C. 2002. Adolescent injury morbidity in New Zealand, 1987–96. *Injury Prevention,* 8**,** 32-37.

LANGLEY, J., STEPHENSON, S., CRYER, C. & BORMAN, B. 2002. Traps for the unwary in estimating person based injury incidence using hospital discharge data. *Injury Prevention,* 8**,** 332-337.

LANGLEY, J., STEPHENSON, S., THORPE, C. & DAVIE, G. 2006. Accuracy of injury coding under ICD-9 for New Zealand public hospital discharges. *Injury Prevention*, 12, 58-61.

LARGE, R. G., EPSTON, A., KIRKER, J. M. & KYDD, R. R. 1980. Self poisoning: who supplies the drugs? 100 examples. *The New Zealand Medical Journal,* 91**,** 218-221.

LARKIN, G. L. & BEAUTRAIS, A. L. 2010. Emergency departments are underutilized sites for suicide prevention. *Crisis: The Journal of Crisis Intervention and Suicide Prevention,* 31**,** 1-6.

LEECH, N. L. & ONWUEGBUZIE, A. J. 2009. A typology of mixed methods research designs. *Quality & Quantity*, 43, 265-275.

LEPA, T., NORRIS, P., HORSBURGH, S. & TAUNGAPEAU, F. 2013. Accuracy of National Health Index numbers for Pacific people in New Zealand. *Australian and New Zealand Journal of Public Health,* 37**,** 189-190.

LILJEQVIST, H. T., MUSCATELLO, D., SARA, G., DINH, M. & LAWRENCE, G. L. 2014. Accuracy of automatic syndromic classification of coded emergency department diagnoses in identifying mental health-related presentations for public health surveillance. *BMC Medical Informatics and Decision Making,* 14**,** 84.

LILLEY, R., OWENS, D., HORROCKS, J., HOUSE, A., NOBLE, R., BERGEN, H., HAWTON, K., CASEY, D., SIMKIN, S. & MURPHY, E. 2008. Hospital care and repetition following self-harm: multicentre comparison of self-poisoning and self-injury. *The British Journal of Psychiatry,* 192**,** 440-445.

LIU, K. Y., BEAUTRAIS, A., CAINE, E., CHAN, K., CHAO, A., CONWELL, Y., LAW, C., LEE, D., LI, P. & YIP, P. 2007. Charcoal burning suicides in Hong Kong and urban Taiwan: an illustration of the impact of a novel suicide method on overall regional rates. *Journal of Epidemiology & Community Health,* 61**,** 248-253.

MANN, J. J., APTER, A., BERTOLOTE, J., BEAUTRAIS, A., CURRIER, D., HAAS, A., HEGERL, U., LONNQVIST, J., MALONE, K., MARUSIC, A., MEHLUM, L., PATTON, G., PHILLIPS, M., RUTZ, W., RIHMER, Z., SCHMIDTKE, A., SHAFFER, D., SILVERMAN, M., TAKAHASHI, Y., VARNIK, A., WASSERMAN, D., YIP, P. & HENDIN, H. 2005. Suicide Prevention Strategies. A Systematic Review. *Journal of the American Medical Association,* 294**,** 2064-2074.

MARSON, R., TAYLOR, D. M., ASHBY, K. & CASSELL, E. 2005. Victorian Emergency Minimum Dataset: factors that impact upon the data quality. *Emergency Medicine Australasia,* 17**,** 104-112.

MAURI, M. C., CERVERI, G., VOLONTERI, L. S., FIORENTINI, A., COLASANTI, A., MANFRÉ, S., BORGHINI, R. & PANNACCIULLI, E. 2005. Parasuicide and drug self-poisoning: analysis of the epidemiological and clinical variables of the patients admitted to the Poisoning Treatment Centre (CAV), Niguarda General Hospital, Milan. *Clinical Practice and Epidemiology in Mental Health*, 1, 5.

MCALLISTER, M. 2003. Multiple meanings of self harm: A critical review. *International Journal of Mental Health Nursing,* 12**,** 177-185.

MCDOWELL, R., FOWLES, J. & PHILLIPS, D. 2005. Deaths from poisoning in New Zealand: 2001–2002. *The New Zealand Medical Journal,* 118**,** 1-9.

MEDSAFE 2018. Report: Reconsideration of the classification of codeine [Online]. Available: http://www.medsafe.govt.nz/profs/class/Agendas/Agen58/6.1%20Codeine.pdf [Accessed 15/02/2018].

MEENAN WINE & SPIRITS LTD. 06/03/2018. *RE: Alcohol content in beverages.* Personal communication given to KUMPULA, E.-K.

MENKES, D. B., SHIEFFELBIEN, L. M. & HUTHWAITE, M. 2011. Hypnosedative access and risk of harm. *The New Zealand Medical Journal,* 124, 69-73.

MICHELMORE, L. & HINDLEY, P. 2012. Help-seeking for suicidal thoughts and self-harm in young people: A systematic review. *Suicide and Life-Threatening Behavior,* 42**,** 507-524.

MILES, M. B. & HUBERMAN, A. M. 1994. Qualitative data analysis: An expanded sourcebook, Thousand Oaks, Sage Publishing.

MILES, M. B., HUBERMAN, A. M. & SALDAÑA, J. 2014. Qualitative data analysis: An expanded sourcebook, Los Angeles, Sage Publications.

MILNER, A. J. & DE LEO, D. 2010. Who seeks treatment where? Suicidal behaviors and health care: Evidence from a community survey. *The Journal of Nervous and Mental Disease,* 198**,** 412-419.

MINISTRY FOR THE ENVIRONMENT – MANATŪ MŌ TE TAIAO & STATISTICS NEW ZEALAND 2014. New Zealand's Environmental Reporting Series: 2014 Air domain report. Ministry for the Environment and Statistics New Zealand.

MINISTRY OF BUSINESS INNOVATION AND EMPLOYMENT – HĪKINA WHAKATUTUKI & MINISTRY OF HEALTH – MANATŪ HAUORA 2017. *New Zealand Health Research Strategy 2017-2027,* Wellington, Ministry of Business, Innovation and Employment and Ministry of Health.

MINISTRY OF HEALTH – MANATŪ HAUORA 2004. *Ethnicity Data Protocols for the Health and Disability Sector,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA 2009. *National Health Index Data Dictionary version 5.3,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA. 2012a. *Coding query database: Alcohol intoxication with overdose of drug* [Online]. Available: http://www.health.govt.nz/nz-health-statistics/classification-and-terminology/using-icd-10-am-achi-acs/coding-queries/coding-query-database/coding-query-database/alcohol-intoxication-overdose-drug [Accessed 27/09/2017].

MINISTRY OF HEALTH – MANATŪ HAUORA 2012b. *Suicide Facts: Deaths and intentional self-harm hospitalisations 2009,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA 2014a. *Mortality and Demographic Data 2011,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA. 2014b. *New Zealand clinical coding policies: Local rulings* [Online]. Available: http://www.health.govt.nz/nz-health-statistics/classification-and-terminology/icd-10-am-achi-acs/new-zealand-clinical-coding-policies [Accessed 13/12/2017].

MINISTRY OF HEALTH – MANATŪ HAUORA. 2015a. *Emergency department triage* [Online]. Available: http://www.health.govt.nz/our-work/hospitals-and-specialist-care/emergency-departments/emergency-department-triage [Accessed 15/08/2015].

MINISTRY OF HEALTH – MANATŪ HAUORA 2015b. *Factsheet: Short stay emergency department events,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA 2015c. *Publicly funded hospital discharges - 1 July 2012 to 30 June 2013,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA 2015d. *Suicide Facts: Deaths and intentional self-harm hospitalisations 2012,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA 2016. *Suicide Facts: Deaths and intentional self-harm hospitalisations 2013,* Wellington, Ministry of Health – Manatū Hauora.

MINISTRY OF HEALTH – MANATŪ HAUORA. 2018a. *Annual Update of Key Results 2016/17: New Zealand Health Survey* [Online]. Available: https://www.health.govt.nz/publication/annual-update-key-results-2016-17-new-zealand-health-survey [Accessed 06/03/2018 2018].

MINISTRY OF HEALTH – MANATŪ HAUORA. 2018b. *New Zealand SNOMED CT National Release Centre* [Online]. Available: https://www.health.govt.nz/nz-health-statistics/classification-and-terminology/new-zealand-snomed-ct-national-release-centre [Accessed 16/03/2018 2018].

MINISTRY OF JUSTICE – TĀHŪ O TE TURE 2014. *The Effectiveness of Alcohol Pricing Policies,* Wellington, Ministry of Justice – Tāhū o te Ture.

MINISTRY OF TRANSPORT – TE MANATŪ WAKA. 2009. *A vehicle scrappage trial for Christchurch and Wellington: May 2009,* Wellington, Ministry of Transport – Te Manatū Waka.

MOHAN, M. K., BISHOP, R. O. & MALLOWS, J. L. 2013. Effect of an electronic medical record information system on emergency department performance. *Medical Journal of Australia,* 198**,** 201-204.

MONASTERIO, E. & MCKEAN, A. 2011. Off-label use of atypical antipsychotic medications in Canterbury, New Zealand. *The New Zealand Medical Journal*, 124, 24-29.

MURRAY, S. L., CROUCH, R. & AINSWORTH-SMITH, M. 2012. Quality of the handover of patient care: a comparison of pre-Hospital and Emergency Department notes. *International Emergency Nursing,* 20**,** 24-27.

MUSCATELLO, D. J., CHURCHES, T., KALDOR, J., ZHENG, W., CHIU, C., CORRELL, P. & JORM, L. 2005. An automated, broad-based, near real-time public health surveillance system using presentations to hospital Emergency Departments in New South Wales, Australia. *BMC Public Health,* 5**,** 141.

NADA-RAJA, S., MORRISON, D. & SKEGG, K. 2003. A population-based study of help-seeking for self-harm in young adults. *Australian & New Zealand Journal of Psychiatry,* 37**,** 600-605.

NATIONAL CANCER INSTITUTE. 2018. *NCI Dictionary of Cancer Terms* [Online]. Available: https://www.cancer.gov/publications/dictionaries/cancer-terms/def/indication [Accessed 08/03/2018 2018].

NATIONAL HEALTH BOARD 2015. *National Minimum Dataset (Hospital Events) Data Dictionary, version 7.8,* Wellington, Ministry of Health – Manatū Hauora.

NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM 2005. *A pocket guide for alcohol screening and brief intervention,* Rockville, MD, National Institute on Alcohol Abuse and Alcoholism.

NATIONAL POISONS CENTRE. 2018a. *Citalopram* [Online]. Available: http://www.toxinz.com/Spec/2261535 [Accessed 15/02/2018].

NATIONAL POISONS CENTRE. 2018b. *Ibuprofen* [Online]. Available: http://www.toxinz.com/Spec/2173418 [Accessed 15/02/2018].

NATIONAL POISONS CENTRE. 2018c. *Quetiapine* [Online]. Available: http://www.toxinz.com/Spec/2365716 [Accessed 15/02/2018].

NATIONAL POISONS CENTRE. 2018d. *Venlafaxine* [Online]. Available: http://www.toxinz.com/Spec/2261677 [Accessed 15/02/2018].

NATIONAL POISONS CENTRE. 2018e. *What does the NPC do?* [Online]. Available: http://www.poisons.co.nz/about.php [Accessed 07/03/2018].

NATIONAL POISONS CENTRE. 2018f. *Zopiclone* [Online]. Available: http://www.toxinz.com/Spec/2363104 [Accessed 15/02/2018].

NEALE, J. 2000. Suicidal intent in non-fatal illicit drug overdose. *Addiction,* 95**,** 85-93.

NELSON, K., CONNOR, M., WENSLEY, C., MOSS, C., PACK, M. & HUSSEY, T. 2011. People who present on multiple occasions to emergency departments. *Emergency Medicine Australasia*, 23, 532-540.

NEW ZEALAND INJURY PREVENTION STRATEGY SECRETARIAT 2010. *Estimating government expenditure on injury prevention,* Wellington, Accident Compensation Corporation (ACC).

NEW ZEALAND INJURY PREVENTION STRATEGY SECRETARIAT 2012. *The New Zealand Injury Prevention Outcomes Report – June 2012,* Wellington, Accident Compensation Corporation (ACC).

NEW ZEALAND LEGISLATION 1996. Hazardous Substances and New Organisms Act 1996. Wellington.

NEW ZEALAND LEGISLATION 1998. Land Transport Act 1998. Wellington.

NEW ZEALAND NURSES ORGANISATION 2016. *Fact sheet: Understanding Duty of Care, 2016,* Wellington, New Zealand Nurses Organisation.

NEW ZEALAND PHARMACOVIGILANCE CENTRE. 2018. *New Zealand Pharmacovigilance Centre - About.* [Online]. Available: https://nzphvc.otago.ac.nz/about/ [Accessed 16/02/2018].

NEW ZEALAND TRANSPORT AGENCY – WAKA KOTAHI. 2006. *New Zealand motor vehicle registration statistics 2005*, Palmerston North, New Zealand Transport Agency – Waka Kotahi.

NEW ZEALAND TRANSPORT AGENCY – WAKA KOTAHI. 2013. *New Zealand motor vehicle registration statistics 2012*, Palmerston North, New Zealand Transport Agency – Waka Kotahi.

NEW ZEALAND UNION OF STUDENTS' ASSOCIATIONS 2017. *Income & Expenditure Report 2017 - The Cost of Being a Student in New Zealand,* Wellington, New Zealand Union of Students' Associations.

NORRIS, P., HORSBURGH, S., SIDES, G., RAM, S. & FRASER, J. 2014. Geographical access to community pharmacies in New Zealand. *Health & Place,* 29**,** 140-145.

O'CATHAIN, A., MURPHY, E. & NICHOLL, J. 2007. Why, and how, mixed methods research is undertaken in health services research in England: a mixed methods study. *BMC Health Services Research*, 7, 85.

O'DEA, D. & TUCKER, S. 2005. *The Cost of Suicide to Society,* Wellington, Ministry of Health - Manatū Hauora.

O'DEA, D. & WREN, J. 2012. *New Zealand estimates of the total social and economic cost of injuries. For all injuries, and the six injury priority areas. For each of years 2007 to 2010. In June 2010 dollars.,* Wellington, New Zealand Injury Prevention Strategy.

OFFICE FOR DISABILITY ISSUES – TE TARI MŌ NGĀ TAKE HAUĀTANGA. 2016. *Indicators from the 1996, 2001 and 2006 New Zealand Disability Surveys for monitoring progress on outcomes for disabled people* [Online]. Available: http://www.odi.govt.nz/resources/research/outcomes-for-disabled-people/nz-dep.html [Accessed 01/02/2016].

ÖSTRÖM, M., THORSON, J. & ERIKSSON, A. 1996. Carbon monoxide suicide from car exhausts. *Social Science & Medicine,* 42**,** 447-451.

OUGRIN, D., TRANAH, T., STAHL, D., MORAN, P. & ASARNOW, J. R. 2015. Therapeutic interventions for suicide attempts and self-harm in adolescents: systematic review and meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry,* 54**,** 97-107.

PARR, M., ANAES, F., DAY, A., KLETCHKO, S., CRONE, P. & RANKIN, A. 1990. Theophylline poisoning—a review of 64 cases. *Intensive Care Medicine,* 16**,** 394-398.

PAULOZZI, L.J. Prescription drug overdoses: a review. *Journal of Safety Research*, 43, 283-289.

PEIRIS-JOHN, R., KOOL, B. & AMERATUNGA, S. 2014. Fatalities and hospitalisations due to acute poisoning among New Zealand adults. *Internal Medicine Journal,* 44**,** 273-281.

POHJOLA-SINTONEN, S., KIVISTÖ, K. T., VUORI, E., LAPATTO-REINILUOTO, O., TIULA, E. & NEUVONEN, P. J. 2000. Identification of drugs ingested in acute poisoning: correlation of patient history with drug analyses. *Therapeutic Drug Monitoring,* 22**,** 749-752.

POMERLEAU, A. 13/02/2018. *RE: Availability of Medical Toxicologist specialist advice from the National Poisons Centre.* Personal communication given to KUMPULA, E.-K.

PRESCOTT, K., STRATTON, R., FREYER, A., HALL, I. & LE JEUNE, I. 2009. Detailed analyses of self-poisoning episodes presenting to a large regional teaching hospital in the UK. *The British Journal of Clinical Pharmacology,* 68**,** 260-268.

QUIGLEY, P. 21/02/2016. *RE: Measuring blood alcohol concentrations in Emergency Department presentations.* Personal communication given to KUMPULA, E.-K.

RAHMAN, A., MARTIN, C., GRAUDINS, A. & CHAPMAN, R. 2014. Deliberate self-poisoning presenting to an emergency medicine network in South-East Melbourne: a descriptive study. *Emergency Medicine International*, 2014.

RAPTIS, D. A., FERNANDES, C., CHUA, W. & BOULOS, P. B. 2009. Electronic software significantly improves quality of handover in a London teaching hospital. *Health Informatics Journal,* 15**,** 191-198.

REITH, D., FOUNTAIN, J. & TILYARD, M. 2005. Opioid poisoning deaths in New Zealand (2001–2002). *The New Zealand Medical Journal,* 118**,** 1-8.

REITH, D., FOUNTAIN, J., TILYARD, M. & MCDOWELL, R. 2003. Antidepressant poisoning deaths in New Zealand for 2001. *The New Zealand Medical Journal,* 116, 1-7.

RETTERSTØL, N. 1993. Death due to overdose of antidepressants: experiences from Norway. *Acta Psychiatrica Scandinavica,* 87**,** 28-32.

ROBINSON, G. M., ROBINSON, S., MCCARTHY, P. & CAMERON, C. 2010. Misuse of over-the-counter codeine-containing analgesics: dependence and other adverse effects. *The New Zealand Medical Journal,* 123, 59-64.

ROBINSON, J., WYLIE, C., LYNCH, C. & LYNCH, A.-M. 2014. *Practice Standards for Australian Poisons Information Centres 2014* [Online]. Available: https://www.childrens.health.qld.gov.au/wp-content/uploads/PDF/poisons/poison-prac-standards-2014.pdf [Accessed 07/03/2018 2018].

ROCKETT, I. R., SMITH, G. S., CAINE, E. D., KAPUSTA, N. D., HANZLICK, R. L., LARKIN, G. L., NAYLOR, C. P., NOLTE, K. B., MILLER, T. R. & PUTNAM, S. L. 2014. Confronting death from drug self-intoxication (DDSI): prevention through a better definition. *The American Journal of Public Health,* 104**,** e49-e55.

ROSSOW, I., YSTGAARD, M., HAWTON, K., MADGE, N., VAN HEERINGEN, K., DE WILDE, E. J., DELEO, D., FEKETE, S. & MOREY, C. 2007. Cross-national comparisons of the association between alcohol consumption and deliberate self-harm in adolescents. *Suicide and Life-Threatening Behavior,* 37**,** 605-615.

ROYAL AUSTRALIAN AND NEW ZEALAND COLLEGE OF PSYCHIATRISTS CLINICAL PRACTICE GUIDELINES TEAM FOR DELIBERATE SELF-HARM 2004. Australian and New Zealand clinical practice guidelines for the management of adult deliberate self-harm. *Australian & New Zealand Journal of Psychiatry,* 38**,** 868-884.

RYGNESTAD, T., AARSTAD, K., GUSTAFSSON, K. & JENSSEN, U. 1990. The clinical value of drug analyses in deliberate self-poisoning. *Human & Experimental Toxicology,* 9**,** 221-230.

SANDLER, D. P., BURR, F. R. & WEINBERG, C. R. 1991. Nonsteroidal anti-inflammatory drugs and the risk for chronic renal disease. *Annals of Internal Medicine,* 115**,** 165-165.

SCHMIDTKE, A., BILLE-BRAHE, U., DE LEO, D., KERKHOF, A., BJERKE, T., CREPEF, P., HARING, C., HAWTON, K., LÖNNQVIST, J. & MICHEL, K. 1996. Attempted suicide in Europe: rates, trend. S and sociodemographic characteristics of suicide attempters during the period 1989–1992. Results of the WHO/EURO Multicentre Study on Parasuicide. *Acta Psychiatrica Scandinavica*, 93, 327-338.

SKEGG, K. 2005. Self-harm. *The Lancet,* 366**,** 1471-1483.

SMITH, A. 20/09/2015. *RE: Reliability of National Health Index numbers in the National Minimum Dataset.* Personal communication given to KUMPULA, E.-K.

SNOMED INTERNATIONAL. 2018. *SNOMED International SNOMED CT Browser* [Online]. Available: http://browser.ihtsdotools.org/ [Accessed 16/03/2018].

STAIKOWSKY, F., THEIL, F., MERCADIER, P., CANDELLA, S. & BENAIS, J. P. 2004. Change in profile of acute self drug-poisonings over a 10–year period. *Human & Experimental Toxicology*, 23, 507-511.

STATISTICS NEW ZEALAND – TATAURANGA AOTEAROA. 2016. *Subnational population estimates (DHB, DHB constituency), by age and sex, at 30 June 2006-15 (2015 boundaries)* [Online].

Available: http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/subnational-pop-estimates-tables.aspx [Accessed 27 Jan 2016].

STATISTICS NEW ZEALAND. 2018. *2013 Census map - population and dwelling map* [Online]. Available: http://archive.stats.govt.nz/StatsMaps/Home/People%20and%20households/2013-census-population-dwelling-map.aspx [Accessed 16/02/2018].

STEEL, K., GERTMAN, P. M., CRESCENZI, C. & ANDERSON, J. 1981. Iatrogenic illness on a general medical service at a university hospital. *New England Journal of Medicine,* 304**,** 638-642.

TALBOT, R. & BLEETMAN, A. 2007. Retention of information by emergency department staff at ambulance handover: do standardised approaches work? *Emergency Medicine Journal***,** 539-542.

THERAPEUTIC GOODS ADMINISTRATION. 2018. *Codeine information hub - Changes to patient access for medicines containing codeine* [Online]. Available: https://www.tga.gov.au/codeine-info-hub [Accessed 15/02/2018].

THOMPSON, T. 2010. ICD-10-AM Classification for Morbidity Coding (presentation). Wellington: Ministry of Health – Manatū Hauora.

TING, S. A., SULLIVAN, A. F., BOUDREAUX, E. D., MILLER, I. & CAMARGO, C. A. 2012. Trends in US emergency department visits for attempted suicide and self-inflicted injury, 1993–2008. *General Hospital Psychiatry,* 34**,** 557-565.

TONG, A.Y.C., PEAKE, B.M. & BRAUND, R. Disposal practices for unused medications around the world. *Environment International*, 37, 292-298.

TOWNSEND, E., HAWTON, K., HARRISS, L., BALE, E. & BOND, A. 2001. Substances used in deliberate self-poisoning 1985–1997: trends and associations with age, gender, repetition and suicide intent. *Social psychiatry and psychiatric epidemiology,* 36**,** 228-234.

TURVILL, J., BURROUGHS, A. & MOORE, K. 2000. Change in occurrence of paracetamol overdose in UK after introduction of blister packs. *The Lancet,* 355**,** 2048-2049.

UNITED KINGDOM DEPARTMENT OF HEALTH 2015. *Alcohol Guidelines Review – Report from the Guidelines development group to the UK Chief Medical Officers*, London, Department of Health.

UNITSLAB.COM. 2018. *Ethyl Alcohol [units calculator]* [Online]. Available: http://unitslab.com/index.php/node/147 [Accessed 16/01/2018].

VINGOE, L., WELCH, S., FARRELL, M., STRANG, J., VINGOE, L., WELCH, S., FARRELL, M. & STRANG, J. 1999. Heroin overdose among a treatment sample of injecting drug misusers: accident or suicidal behaviour? *Journal of Substance use,* 4**,** 88-91.

WALSH, B. W. & ROSEN, P. M. 1988. *Self-mutilation: Theory, research, and treatment,* New York, Guilford press.

WASSERMAN, D. & WASSERMAN, C. 2009. *Oxford textbook of suicidology and suicide prevention: a global perspective,* Oxford, Oxford University Press.

WATTS, M., FOUNTAIN, J. S., REITH, D. & SCHEP, L. 2004. Compliance with poisons center referral advice and implications for toxicovigilance. *Journal of Toxicology: Clinical Toxicology,* 42**,** 603-610.

WEIR, P. & ARDAGH, M. 1998. The epidemiology of deliberate self poisoning presenting to Christchurch Hospital emergency department. *The New Zealand Medical Journal,* 111**,** 126-129.

WERRY, J. S. & PEDDER, J. 1976. Self poisoning in Auckland. *The New Zealand Medical Journal,* 83**,** 183-187.

WEST, L.M., DIACK, L., CORDINA, M. & STEWART, D. 2014. A systematic review of the literature on 'medication wastage': an exploration of causative factors and effect of interventions. *International Journal of Clinical Pharmacy*, 36, 873-881.

WESTEIN, M.P.D., LEUFKENS, H.G.M., & HERINGS, R.M.C. 2001. Determinants of pharmacists' interventions linked to prescription processing. *Pharmacy World & Science*, 23, 98-101.

WHITE, P., GUNSTON, J., SALMOND, C., ATKINSON, J. & CRAMPTON, P. 2008. *Atlas of Socioeconomic Deprivation in New Zealand NZDep2006,* Wellington, Ministry of Health – Manatū Hauora.

WORLD HEALTH ORGANIZATION 2004. *World report on road traffic injury prevention,* Geneva, World Health Organization.

WORLD HEALTH ORGANIZATION. 2015. *International Statistical Classification of Diseases and Related Health Problems 10th Revision* [Online]. Available: http://apps.who.int/classifications/icd10/browse/2015/en [Accessed 09/02/2015].

WORLD HEALTH ORGANIZATION. 2016a. *ATC/DDD Index 2016* [Online]. Available: https://www.whocc.no/atc_ddd_index/ [Accessed 01/12/2016].

WORLD HEALTH ORGANIZATION. 2016b. *DDD: Definition and general considerations* [Online]. Available: http://www.whocc.no/ddd/definition_and_general_considera/ [Accessed 01/12/2016].

WORLD HEALTH ORGANIZATION. 2018a. *The 11th Revision of the International Classification of Diseases (ICD-11) is due by 2018! - Contribute to ICD-11* [Online]. Available: http://www.who.int/classifications/icd/revision/en/ [Accessed 16/03/2018].

WORLD HEALTH ORGANIZATION. 2018b. *Use of ATC/DDD* [Online]. Available: https://www.whocc.no/use_of_atc_ddd/ [Accessed 14/03/2018].

YATES, K. M. 2003. Accidental poisoning in New Zealand. *Emergency Medicine,* 15**,** 244-249.

YONG, G., DENT, A. W. & WEILAND, T. J. 2008. Handover from paramedics: observations and emergency department clinician perceptions. *Emergency Medicine Australasia,* 20**,** 149-155.

ZAKHAROV, S., NAVRATIL, T. & PELCLOVA, D. 2013. Suicide attempts by deliberate self-poisoning in children and adolescents. *Psychiatry Research,* 210**,** 302-307.

APPENDIX 1: ADDITIONAL MATERIAL TO STUDY 1 (CHAPTER 2)

Appendix 1.1: ICD-10 classes used in data management with examples of substances in these classes

Table A1.1: Some examples of substances in the ICD-10 groups involving intentional and undetermined intent poisonings (World Health Organization, 2015).

ICD-10 code	Description of ICD-10 groups involved	Examples of substances in group
X60, Y10	Poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics; intentional or undetermined intent	Acetylsalicylic acid Ibuprofen Paracetamol
X61, Y11	Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, NEC; intentional or undetermined intent	Antidepressants (fluoxetine, amitriptyline) Antipsychotics (quetiapine, risperidone) Benzodiazepines (diazepam, clonazepam) Antiepileptics (valproic acid, phenytoin)
X62, Y12	Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], NEC, unspecified place, during unspecified activity; intentional or undetermined intent	Cannabis Cocaine Lysergic acid diethylamide (LSD) Opioids (codeine, tramadol)
X63, Y13	Poisoning by and exposure to other drugs acting on the autonomic nervous system; intentional or undetermined intent	Anticholinergics (atropine, scopolamine) Cholinergics (nicotine, muscarine) Sympathomimetics (adrenaline, salbutamol) Sympatholytics (alpha and beta blockers)
X64, Y14	Poisoning by and exposure to other and unspecified drugs, medicaments and biological substances; intentional or undetermined intent	Anaesthetics (general, local) Antibiotics Insulin and other diabetes medications Therapeutic gases (oxygen, carbon dioxide)
X65, Y15	Poisoning by and exposure to alcohol; intentional or undetermined intent	Ethanol Methanol
X66, Y16	Poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours; intentional or undetermined intent	Benzene and homologues Petroleum derivatives
X67, Y17	Poisoning by and exposure to other gases and vapours; intentional or undetermined intent	Carbon monoxide (CO) Helium (non-medicinal) Utility gases (LPG etc.)

X68, Y18	Poisoning by and exposure to pesticides; intentional or undetermined intent	Herbicides (glyphosate) Insecticides (organophosphates) Rodenticides (warfarin used as a rodenticide)
X69, Y19	Poisoning by and exposure to other and unspecified chemicals and noxious substances; intentional or undetermined intent	Corrosive acids and alkalis Paints and dyes Poisonous foodstuffs and plants Soaps and detergents

* NEC = 'not elsewhere classified'

Appendix 1.2: ICD-10 classes used in investigating specific substances

Table A1.2: ICD-10 groups describing poisonings without indication of intent, T36-T65 (World Health Organization, 2015).

ICD-10 code	Description of ICD-10 groups involved	Subgroups within ICD-10 main group
Poisoning by drugs, medicaments and biological substances (T36-T50), Incl.: overdose of these substances, wrong substance given or taken in error		
T36	Poisoning by systemic antibiotics *Excl.: antibiotics: antineoplastic (T45.1); locally applied NEC (T49.0); topically used for: ear, nose and throat (T49.6); eye (T49.5)*	T36.0 Penicillins T36.1 Cefalosporins and other beta-lactam antibiotics T36.2 Chloramphenicol group T36.3 Macrolides T36.4 Tetracyclines T36.5 Aminoglycosides (Streptomycin) T36.6 Rifamycins T36.7 Antifungal antibiotics, systemically used T36.8 Other systemic antibiotics **T36.9 Systemic antibiotic, unspecified**
T37	Poisoning by other systemic anti-infectives and antiparasitics *Excl.: anti-infectives: locally applied NEC (T49.0) topically used (for): ear, nose and throat (T49.6); eye (T49.5)*	T37.0 Sulfonamides T37.1 Antimycobacterial drugs, Excl.: rifamycins (T36.6), streptomycin (T36.5) T37.2 Antimalarials and drugs acting on other blood protozoa, Excl.: hydroxyquinoline derivatives (T37.8) T37.3 Other antiprotozoal drugs T37.4 Anthelminthics T37.5 Antiviral drugs, Excl.: amantadine (T42.8), cytarabine (T45.1) T37.8 Other specified systemic anti-infectives and antiparasitics (Hydroxyquinoline derivatives), Excl.: antimalarial drugs (T37.2) **T37.9 Systemic anti-infective and antiparasitic, unspecified**
T38	Poisoning by hormones and their synthetic substitutes and antagonists, NEC *Excl.: mineralocorticoids and their antagonists (T50.0); oxytocic hormones (T48.0);*	T38.0 Glucocorticoids and synthetic analogues, Excl.: glucocorticoids, topically used (T49.-) T38.1 Thyroid hormones and substitutes T38.2 Antithyroid drugs T38.3 Insulin and oral hypoglycaemic [antidiabetic] drugs T38.4 Oral contraceptives (Multiple- and single-ingredient preparations) T38.5 Other estrogens and progestogens (Mixtures and substitutes)

	parathyroid hormones and derivatives (T50.9)	T38.6 Antigonadotrophins, antiestrogens, antiandrogens, NEC (Tamoxifen) T38.7 Androgens and anabolic congeners T38.8 Other and unspecified hormones and their synthetic substitutes (Anterior pituitary [adenohypophyseal] hormones) **T38.9 Other and unspecified hormone antagonists**
T39	Poisoning by nonopioid analgesics, antipyretics and antirheumatics	T39.0 Salicylates T39.1 4-Aminophenol derivatives (Paracetamol) T39.2 Pyrazolone derivatives T39.3 Other nonsteroidal anti-inflammatory drugs [NSAID] T39.4 Antirheumatics, NEC, Excl.: glucocorticoids (T38.0), salicylates (T39.0) T39.8 Other nonopioid analgesics and antipyretics, NEC **T39.9 Nonopioid analgesic, antipyretic and antirheumatic, unspecified**
T40	Poisoning by narcotics and psychodysleptics [hallucinogens] *Excl.: intoxication meaning inebriation (F10-F19)*	T40.0 Opium T40.1 Heroin T40.2 Other opioids (Codeine, Morphine) T40.3 Methadone T40.4 Other synthetic narcotics (Pethidine) T40.5 Cocaine **T40.6 Other and unspecified narcotics** T40.7 Cannabis (derivatives) T40.8 Lysergide [LSD] **T40.9 Other and unspecified psychodysleptics [hallucinogens]** (Mescaline, Psilocin, Psilocybine)
T41	Poisoning by anaesthetics and therapeutic gases *Excl.: benzodiazepines (T42.4), cocaine (T40.5), opioids (T40.0-T40.2)*	T41.0 Inhaled anaesthetics, Excl.: oxygen (T41.5) T41.1 Intravenous anaesthetics (Thiobarbiturates) **T41.2 Other and unspecified general anaesthetics** T41.3 Local anaesthetics **T41.4 Anaesthetic, unspecified** T41.5 Therapeutic gases (Carbon dioxide, Oxygen)
T42	Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs *Excl.: intoxication meaning inebriation (F10-F19)*	T42.0 Hydantoin derivatives T42.1 Iminostilbenes (Carbamazepine) T42.2 Succinimides and oxazolidinediones T42.3 Barbiturates, Excl.: thiobarbiturates (T41.1) T42.4 Benzodiazepines T42.5 Mixed antiepileptics, NEC T42.6 Other antiepileptic and sedative-hypnotic drugs (Methaqualone, Valproic acid), Excl.: carbamazepine (T42.1) **T42.7 Antiepileptic and sedative-hypnotic drugs, unspecified** (Sleeping: draught, drug, tablet)

		T42.8 Antiparkinsonism drugs and other central muscle-tone depressants (Amantadine)
T43	Poisoning by psychotropic drugs, NEC *Excl.: appetite depressants (T50.5), barbiturates (T42.3), benzodiazepines (T42.4), intoxication meaning inebriation (F10-F19), methaqualone (T42.6), psychodysleptics [hallucinogens] (T40.7-T40.9)*	T43.0 Tricyclic and tetracyclic antidepressants T43.1 Monoamine-oxidase-inhibitor antidepressants T43.2 Other and unspecified antidepressants T43.3 Phenothiazine antipsychotics and neuroleptics T43.4 Butyrophenone and thioxanthene neuroleptics **T43.5 Other and unspecified antipsychotics and neuroleptics**, Excl.: rauwolfia (T46.5) T43.6 Psychostimulants with abuse potential, Excl.: cocaine (T40.5) T43.8 Other psychotropic drugs, NEC **T43.9 Psychotropic drug, unspecified**
T44	Poisoning by drugs primarily affecting the autonomic nervous system	T44.0 Anticholinesterase agents T44.1 Other parasympathomimetics [cholinergics] T44.2 Ganglionic blocking drugs, NEC T44.3 Other parasympatholytics [anticholinergics and antimuscarinics] and spasmolytics, NEC (Papaverine) T44.4 Predominantly alpha-adrenoreceptor agonists, NEC (Metaraminol) T44.5 Predominantly beta-adrenoreceptor agonists, NEC, Excl.: beta-adrenoreceptor agonists used in asthma therapy (T48.6) T44.6 Alpha-adrenoreceptor antagonists, NEC, Excl.: ergot alkaloids (T48.0) T44.7 Beta-adrenoreceptor antagonists, NEC T44.8 Centrally acting and adrenergic-neuron-blocking agents, NEC, Excl.: clonidine (T46.5), guanethidine (T46.5) **T44.9 Other and unspecified drugs primarily affecting the autonomic nervous system** (Drug stimulating both alpha- and beta-adrenoreceptors)
T45	Poisoning by primarily systemic and haematological agents, NEC	T45.0 Antiallergic and antiemetic drugs, Excl.: phenothiazine-based neuroleptics (T43.3) T45.1 Antineoplastic and immunosuppressive drugs (Antineoplastic antibiotics, Cytarabine), Excl.: tamoxifen (T38.6) T45.2 Vitamins, NEC, Excl.: nicotinic acid (derivatives)(T46.7), vitamin K (T45.7) T45.3 Enzymes, NEC T45.4 Iron and its compounds T45.5 Anticoagulants T45.6 Fibrinolysis-affecting drugs

		T45.7 Anticoagulant antagonists, vitamin K and other coagulants T45.8 Other primarily systemic and haematological agents (Liver preparations and other antianaemic agents, Natural blood and blood products, Plasma substitute), Excl.: immunoglobulin (T50.9), iron (T45.4) **T45.9 Primarily systemic and haematological agent, unspecified**
T46	Poisoning by agents primarily affecting the cardiovascular system *Excl.: metaraminol (T44.4)*	T46.0 Cardiac-stimulant glycosides and drugs of similar action T46.1 Calcium-channel blockers T46.2 Other antidysrhythmic drugs, NEC, Excl.: beta-adrenoreceptor antagonists (T44.7) T46.3 Coronary vasodilators, NEC (Dipyridamole), Excl.: beta-adrenoreceptor antagonists (T44.7), calcium-channel blockers (T46.1) T46.4 Angiotensin-converting-enzyme inhibitors T46.5 Other antihypertensive drugs, NEC (Clonidine, Guanethidine, Rauwolfia), Excl.: beta-adrenoreceptor antagonists (T44.7), calcium-channel blockers (T46.1), diuretics (T50.0-T50.2) T46.6 Antihyperlipidaemic and antiarteriosclerotic drugs T46.7 Peripheral vasodilators (Nicotinic acid (derivatives)), Excl.: papaverine (T44.3) T46.8 Antivaricose drugs, including sclerosing agents **T46.9 Other and unspecified agents primarily affecting the cardiovascular system**
T47	Poisoning by agents primarily affecting the gastrointestinal system	T47.0 Histamine H2-receptor antagonists T47.1 Other antacids and anti-gastric-secretion drugs T47.2 Stimulant laxatives T47.3 Saline and osmotic laxatives T47.4 Other laxatives (Intestinal atonia drugs) T47.5 Digestants T47.6 Antidiarrhoeal drugs, Excl.: systemic antibiotics and other anti-infectives (T36-T37) T47.7 Emetics T47.8 Other agents primarily affecting the gastrointestinal system **T47.9 Agent primarily affecting the gastrointestinal system, unspecified**
T48	Poisoning by agents primarily acting on smooth and skeletal muscles and the respiratory system	T48.0 Oxytocic drugs, Excl.: estrogens, progestogens and antagonists (T38.4-T38.6) T48.1 Skeletal muscle relaxants [neuromuscular blocking agents] T48.2 Other and unspecified agents primarily acting on muscles T48.3 Antitussives

		T48.4 Expectorants T48.5 Anti-common-cold drugs T48.6 Antiasthmatics, NEC (Beta-adrenoreceptor agonists used in asthma therapy: Salbutamol), Excl.: beta-adrenoreceptor agonists not used in asthma therapy (T44.5), anterior pituitary [adenohypophyseal] hormones (T38.8) **T48.7 Other and unspecified agents primarily acting on the respiratory system**
T49	Poisoning by topical agents primarily affecting skin and mucous membrane and by ophthalmological, otorhinolaryngological and dental drugs *Incl.: glucocorticoids, topically used*	T49.0 Local antifungal, anti-infective and anti-inflammatory drugs, NEC T49.1 Antipruritics T49.2 Local astringents and local detergents T49.3 Emollients, demulcents and protectants T49.4 Keratolytics, keratoplastics and other hair treatment drugs and preparations T49.5 Ophthalmological drugs and preparations (Eye anti-infectives) T49.6 Otorhinolaryngological drugs and preparations (Ear, nose and throat anti-infectives) T49.7 Dental drugs, topically applied T49.8 Other topical agents (Spermicides) **T49.9 Topical agent, unspecified**
T50	Poisoning by diuretics and other and unspecified drugs, medicaments and biological substances	T50.0 Mineralocorticoids and their antagonists T50.1 Loop [high-ceiling] diuretics T50.2 Carbonic-anhydrase inhibitors, benzothiadiazides and other diuretics (Acetazolamide) T50.3 Electrolytic, caloric and water-balance agents (Oral rehydration salts) T50.4 Drugs affecting uric acid metabolism T50.5 Appetite depressants T50.6 Antidotes and chelating agents, NEC (Alcohol deterrents) T50.7 Analeptics and opioid receptor antagonists T50.8 Diagnostic agents **T50.9 Other and unspecified drugs, medicaments and biological substances** (Acidifying agents, Alkalizing agents, Immunoglobulin, Immunologicals, Lipotropic drugs, Parathyroid hormones and derivatives)
Toxic effects of substances chiefly nonmedicinal as to source (T51-T65)		
T51	Toxic effect of alcohol	T51.0 Ethanol (Ethyl alcohol), Excl.: acute alcohol intoxication or "hangover" effects (F10.0), drunkenness (F10.0), pathological alcohol intoxication (F10.0) T51.1 Methanol (Methyl alcohol) T51.2 2-Propanol (Isopropyl alcohol) T51.3 Fusel oil (Alcohol: amyl, butyl [1-butanol], propyl [1-propanol]

		T51.8 Other alcohols **T51.9 Alcohol, unspecified**
T52	Toxic effect of organic solvents *Excl.: halogen derivatives of aliphatic and aromatic hydrocarbons (T53.-)*	T52.0 Petroleum products (Gasoline [petrol], Kerosine [paraffin oil], Paraffin wax, Petroleum: ether, naphtha, spirits) T52.1 Benzene, Excl.: homologues of benzene (T52.2), nitroderivatives and aminoderivatives of benzene and its homologues (T65.3) T52.2 Homologues of benzene (Toluene [methylbenzene], Xylene [dimethylbenzene]) T52.3 Glycols T52.4 Ketones T52.8 Other organic solvents **T52.9 Organic solvent, unspecified**
T53	Toxic effect of halogen derivatives of aliphatic and aromatic hydrocarbons	T53.0 Carbon tetrachloride (Tetrachloromethane) T53.1 Chloroform (Trichloromethane) T53.2 Trichloroethylene (Trichloroethene) T53.3 Tetrachloroethylene (Perchloroethylene, Tetrachloroethene) T53.4 Dichloromethane (Methylene chloride) T53.5 Chlorofluorocarbons T53.6 Other halogen derivatives of aliphatic hydrocarbons T53.7 Other halogen derivatives of aromatic hydrocarbons **T53.9 Halogen derivative of aliphatic and aromatic hydrocarbons, unspecified**
T54	Toxic effect of corrosive substances	T54.0 Phenol and phenol homologues T54.1 Other corrosive organic compounds T54.2 Corrosive acids and acid-like substances (Acid: hydrochloric, sulfuric) T54.3 Corrosive alkalis and alkali-like substances (Potassium hydroxide, Sodium hydroxide) **T54.9 Corrosive substance, unspecified**
T55	Toxic effect of soaps and detergents	-
T56	Toxic effect of metals *Incl.: fumes and vapours of metals, metals from all sources, except medicinal substances, Excl.: arsenic and its compounds (T57.0), manganese and its compounds (T57.2)*	T56.0 Lead and its compounds T56.1 Mercury and its compounds T56.2 Chromium and its compounds T56.3 Cadmium and its compounds T56.4 Copper and its compounds T56.5 Zinc and its compounds T56.6 Tin and its compounds T56.7 Beryllium and its compounds T56.8 Other metals (Thallium) **T56.9 Metal, unspecified**
T57	Toxic effect of other inorganic substances	T57.0 Arsenic and its compounds

		T57.1 Phosphorus and its compounds, Excl.: organophosphate insecticides (T60.0) T57.2 Manganese and its compounds T57.3 Hydrogen cyanide T57.8 Other specified inorganic substances **T57.9 Inorganic substance, unspecified**
T58	Toxic effect of carbon monoxide *Incl.: From all sources*	-
T59	Toxic effect of other gases, fumes and vapours *Incl.: aerosol propellants, Excl.: chlorofluorocarbons (T53.5)*	T59.0 Nitrogen oxides T59.1 Sulfur dioxide T59.2 Formaldehyde T59.3 Lacrimogenic gas (Tear gas) T59.4 Chlorine gas T59.5 Fluorine gas and hydrogen fluoride T59.6 Hydrogen sulfide T59.7 Carbon dioxide T59.8 Other specified gases, fumes and vapours **T59.9 Gases, fumes and vapours, unspecified**
T60	Toxic effect of pesticides *Incl.: wood preservatives*	T60.0 Organophosphate and carbamate insecticides T60.1 Halogenated insecticides, Excl.: chlorinated hydrocarbons (T53.-) T60.2 Other insecticides T60.3 Herbicides and fungicides T60.4 Rodenticides, Excl.: strychnine and its salts (T65.1) T60.8 Other pesticides **T60.9 Pesticide, unspecified**
T61	Toxic effect of noxious substances eaten as seafood *Excl.: allergic reaction to food, such as: anaphylactic shock due to adverse food reaction (T78.0)*	T61.0 Ciguatera fish poisoning T61.1 Scombroid fish poisoning (Histamine-like syndrome) T61.2 Other fish and shellfish poisoning T61.8 Toxic effect of other seafoods **T61.9 Toxic effect of unspecified seafood**
T62	Toxic effect of other noxious substances eaten as food *Excl.: allergic reaction to food, such as: anaphylactic shock due to adverse food reaction (T78.0)*	T62.0 Ingested mushrooms T62.1 Ingested berries T62.2 Other ingested (parts of) plant(s) T62.8 Other specified noxious substances eaten as food **T62.9 Noxious substance eaten as food, unspecified**
T63	Toxic effect of contact with venomous animals	T63.0 Snake venom (Sea-snake venom) T63.1 Venom of other reptiles (Lizard venom) T63.2 Venom of scorpion

		T63.3 Venom of spider T63.4 Venom of other arthropods (Insect bite or sting, venomous) T63.5 Toxic effect of contact with fish (Excl.: poisoning by ingestion of fish (T61.0-T61.2)) T63.6 Toxic effect of contact with other marine animals (Jellyfish, Sea anemone, Shellfish, Starfish), Excl.: poisoning by ingestion of shellfish (T61.2), sea-snake venom (T63.0) T63.8 Toxic effect of contact with other venomous animals (Venom of amphibian) **T63.9 Toxic effect of contact with unspecified venomous animal**
T64	Toxic effect of aflatoxin and other mycotoxin food contaminants	-
T65	Toxic effect of other and unspecified substances	T65.0 Cyanides, Excl.: hydrogen cyanide (T57.3) T65.1 Strychnine and its salts T65.2 Tobacco and nicotine T65.3 Nitroderivatives and aminoderivatives of benzene and its homologues (Aniline [benzenamine], Nitrobenzene, Trinitrotoluene) T65.4 Carbon disulfide T65.5 Nitroglycerin and other nitric acids and esters (1,2,3-Propanetriol trinitrate) T65.6 Paints and dyes, NEC T65.8 Toxic effect of other specified substances **T65.9 Toxic effect of unspecified substance**

* NEC = ‘not elsewhere classified’; Excl. = ‘excluding’; Incl. = ‘including’

[page intentionally blank]

APPENDIX 2: ADDITIONAL MATERIAL TO STUDY 2 (CHAPTER 4)

Appendix 2.1: Study 2 participant information sheet

***NOTE**: Some email addresses and telephone numbers have been redacted in this thesis version but were available to participants in the versions given to them.*

University of Otago Ethics Committee reference number: D16/010 – 20/01/2016

A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP), [Part One: Staff Interviews]

SDHB Project ID: 01199 CCDHB Project ID: SCDHB Project ID: 201606

*Participant information sheet for **HEALTH CARE PROFESSIONAL PARTICIPANTS***

Thank you for showing an interest in this project. Please read this information sheet carefully. Take time to consider and, if you wish, talk with colleagues, before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the aim of this research project?

This study aims to understand i) how patients presenting to an ED are identified as cases of poisoning, and ii) the process used to determine whether these patients have experienced either an accidental or intentional poisoning, or a poisoning of undetermined intent. This is to better understand Ministry of Health hospitalisation data on poisonings, and its characteristics and limitations. This project is being undertaken as part of the requirements for Ms Eeva Kumpula's PhD degree.

Who is funding this project?

This study is funded by a PhD stipend from the School of Pharmacy, University of Otago.

Who are we seeking to participate in the project?

We are seeking ED/acute care health care professionals such as nurses, doctors, paramedics and clinical coders, who have been involved in the care process of patients who may have intentionally self-poisoned. We will aim to interview 5-7 people at every study location (3 hospitals expected). There will be no monetary reimbursement for participating in this research. The results of the full study will be presented to your hospital staff in a format suitable to your hospital (e.g. at a staff meeting).

If you participate, what will you be asked to do?

Should you choose to take part in this study, your participation will involve a face-to-face interview with Eeva, which will be audiotaped. We estimate that the interview would take approximately 20-30 minutes, and it will be held at a time and place that suit you. The questions will focus on your decision-making and observations in your everyday work in relation to people who present to the ED after an overdose, or in the case of coders, how you make decisions about coding. Please be aware that you may decide not to take part in the project without any disadvantage to yourself.

Is there any risk of discomfort or harm from participation?

We expect that participation will not place you at any risk. Participation or non-participation will be kept anonymous. However, should you choose to participate, you may stop or pause the interview at any stage without comment should you wish to do so. Should you experience any distress, we would like to encourage you to contact your clinical supervisor(s) for debriefing and/or access to support.

What information will be collected, and how will it be used?

This project involves an open-questioning technique. The questions will focus on your decision-making and observations in your everyday work in relation to people who present to the ED after an overdose. A semi-structured interview schedule will be used for the study, but the precise nature of the questions which will be asked have not been determined in advance, and will depend on the way in which the interview develops. Consequently, although the School of Pharmacy is aware of the general areas to be explored in the interview, the University of Otago Human Ethics Committee has reviewed the interview schedule, but has not been able to review the precise questions to be used.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable, you are reminded of your right to decline to answer any particular question(s). The interview will be audiotaped, transcribed into text format, and coded and de-identified. The transcript will be used by the project team to investigate the topic of clinical decision making in cases of intentional self-poisoning. The audio files and transcripts will be stored on a password protected computer, and access will be limited to the immediate project team only. The data collected will be retained for at least 5 years in secure storage. Any personal information held on the participants [such as contact details, audiotapes, after they have been transcribed] will be destroyed at the completion of the research even though the de-identified data derived from the research will, in most cases, be kept for much longer or possibly indefinitely. The research conclusions and potentially small excerpts from the interviews may be published in a PhD thesis to be stored in the University of Otago Library (Dunedin, New Zealand), as well as in New Zealand and international scientific journals and other publications. There will be no commercial use of the audiotapes or transcripts.

What about anonymity and confidentiality?

Every attempt will be made to protect the anonymity of participants. The transcript from the audiotaped interview will be de-identified by coding it as for example "Health professional 1". The data will not be compared by professional groups but grouped all together, to further protect your anonymity. The transcripts remain confidential, and only de-identified quotes and aggregate level data will be published in a PhD thesis, and may be published in New Zealand and international scientific journals. At no point will individual interviewees be identified in the resulting publications or oral presentations, and the audiotapes will never be played as part of any presentations of the study. Access to the transcripts and audio files is limited only to the immediate project team listed below, and the files will only be stored on a password-protected computer and/or locked data storage cabinet.

If you agree to participate, can you withdraw later?

You may withdraw from participation in the project at any time before your de-identified data has been combined with other data and published, <u>without comment or disadvantage to yourself</u>. Should you choose to withdraw from the study after you have been interviewed, please contact Ms Eeva-Katri Kumpula on XXX XXXX, (03) XXX XXXX, or eeva-katri.kumpula@otago.XX.

Any questions?

If you have any questions now or in the future, please feel free to contact either:

Ms Eeva-Katri Kumpula, PhD candidate (student researcher) **School of Pharmacy, University of Otago**	Office (03) XXX XXXX Mobile XXX XXX XXXX eeva-katri.kumpula@otago.XX
Professor Pauline Norris, **Professor of Social Pharmacy** **School of Pharmacy, University of Otago**	Office (03) XXX XXXX Mobile XXX XXX XXXX
Dr Shyamala Nada-Raja, **Senior Research Fellow** **Department of Preventive and Social Medicine, University of Otago**	Office (03) XXX XXX

This study has been approved by the Department stated above. However, if you have any concerns about the ethical conduct of the research you may contact the University of Otago Human Ethics Committee through the Human Ethics Committee Administrator (phone: 03 479-8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Appendix 2.2: Study 2 participant consent form

A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP), [Part One: Staff interviews]

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

1. I know that my participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time before the combined data containing my de-identified individual data has been published, without disadvantage;
3. Personal identifying information (my contact details, the audio-tape) will be destroyed at the conclusion of the project but any de-identified raw data on which the results of the project depend will be retained in secure storage for at least five years;
4. This project involves an open-questioning technique. The general line of questioning includes clinical assessment and decision-making involved in caring for patients who may have self-poisoned, especially assessing intent behind the poisoning. The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.

5. I understand the nature and size of the risks of discomfort or harm which are explained in the Information Sheet.
6. I understand that the results of the project may be published and be available in the University of Otago Library and New Zealand and/or international scientific journals or other publications, but I agree that any personal identifying information will remain confidential between myself and the researchers during the study, and will not appear in any spoken or written report of the study. Every attempt will be made to preserve my anonymity.
7. I know that there is no remuneration offered for this study, and that no commercial use will be made of the data.

I agree to take part in this project. Following signature and return to the research team this form will be stored in a secure place for five years.

Signature of participant: Date:

Printed name of participant:

Appendix 2.3 Interview schedule for ED clinician participants

A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP) [Part One: Clinician Interviews]

HRS/SDHB Project ID: 01199, CCDHB Project ID: XXXXX **Eeva-Katri Kumpula, PhD student**

Interview schedule for health care professional semi-structured interviews

1. "This is an interview with **ED Clinician number XX**…" [interviewer comment]
2. "Have you read and understood the information sheet and are **happy to participate**?"
3. **Time** in current job? For how long have you been in **emergency medicine**?
4. Hospital/ED **size**? Approximately how many patients per week/month/year? (any patients)
5. Usual working **hours/shifts** (daytime, night time etc.)?

UNDERSTANDING THE PROCESS: HOW DOES IT GO?

6. **PARAMEDICS**: As a paramedic, what kind of information would you be likely to have available to you at the scene, when going out to attend an emergency? What level of understanding of what had happened would you aim to get and how?
7. **PARAMEDICS**: What is the handover of the patient to ED staff like? How does information about the patient get passed on?
8. When a patient arrives at the ED, who generally **sees them first** there?
9. **ED STAFF**: How much **background information** about what brought the patient to the hospital do you think would be available from the **ambulance** crew, if the person arrives by ambulance?
10. **ED STAFF**: How much information and what kind do you think would be available to you at the patient's bedside, seeing them **for the first time**?
11. **ED STAFF**: When you are assessing and treating a patient at the ED, **what gets recorded** about the patient and what has brought them to the hospital**, and at which stage**?
12. **ED STAFF: How** would the patient data generally be collected and **by whom**? How does it end up on **EDIS**/hospital computer system?

13. Is there an '**initial diagnosis'** at some stage of the care process – and at which stage(s), or only a final one recorded at the end? Who generally makes the **final decision** about recording the **diagnosis code**? (For example X63 or 'anticholinergic poisoning'?)

UNDERSTANDING THE PROCESS: IDENTIFYING INTENT?

14. **How often** do you see cases that you think may be poisonings? (Daily/weekly/monthly/etc.?)
15. How would you **identify poisoning cases** from patients/ patients presenting at the ED? If the patient is unconscious?
16. How would you **investigate the intent** behind the poisoning?
17. What could be "**trigger items**" for you that might raise your suspicion or be useful to you, in determining if a poisoning was intentional, of undetermined intent, or accidental? Are there any **traits or features** that you might look for when assessing the patient, that might make the distinction between accidental or intentional?
18. Do you think people may try to **hide the intent** behind the poisoning? **How** do you think they might do that and how do you think you might respond? Do you tend to **notice** that easily?
19. If you were to **estimate the number**, how many intentional poisoning patients do you think would try to hide the intent behind the poisoning: for example how many out of ten?
20. If considering poisonings that will be finally classified as of '**undetermined intent**', based on your experience, what do you think would be the reason they could not be classified as either intentional or accidental? What level of uncertainty or doubt would generally be involved?
21. How do you think knowing if a poisoning was intentional would **affect the treatment** you might consider prescribing/giving?
22. Intentional self-poisoning/overdoses appear to be a significant strain on ED resources – hypothetically, if you had all the power in the world, how do you think you might try to solve this, to prevent these intentional poisonings from happening?

TERMS USED IN LITERATURE: TO SEE WE ARE 'ON THE SAME PAGE':

23. How would you **describe** an "intentional self-poisoning"/"intentional overdose"?

Appendix 2.4 Interview schedule for clinical coder participants

A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP) [Part One: Clinician Interviews]

HRS/SDHB Project ID: 01199, CCDHB Project ID: XXXXX Eeva-Katri Kumpula, PhD student

Interview schedule for health care professional semi-structured interviews – *CLINICAL CODERS*

24. "This is an interview with **Health professional number XX**…" [interviewer comment]
25. "Have you read and understood the information sheet and are **happy to participate**?"
26. **Time** in current job? For how long have you been a **clinical coder**?
27. Usual working **hours/shifts** (daytime, night time etc.)?

UNDERSTANDING THE PROCESS: HOW DOES IT GO?

28. As a clinical coder, **what kind of information** would you be likely to have available to you, when you take upon the task to code a patient case?
29. If we are thinking of a poisoning case, a patient discharged after a poisoning event, what **level of understanding** of what had happened would you aim to get and how? Can you describe this process please?
30. If you need **further information**, in addition to the doctor's discharge summary, are you able to obtain this? If yes, can you describe this process please?
31. From the poisoning diagnosis, **which clinical coding systems** such as ICD-10 do you code to? Can you describe this process please?
32. When you are finished with coding a case, what happens to the data and its code then?

UNDERSTANDING THE PROCESS: IDENTIFYING INTENT?

33. **How often** during your shifts do you think you would code cases that may be poisonings? (Daily/weekly/monthly/etc.?)

34. How do you **identify poisoning cases** from the data? Do you go by the discharge diagnosis code? What does the poisoning code tell you about the case?
35. How do you **investigate the intent** behind the poisoning to get the correct final code for the case? Can you describe this process please?
36. What are some "**trigger items**" for you that might be useful to you, in determining if a poisoning was intentional, of undetermined intent, or accidental? Are there any **traits or features** that you look for when assessing the material available to you to help you make the distinction between accidental or intentional poisonings?
37. When considering poisonings that will be finally classified as of '**undetermined intent**', based on your experience, what do you think are some of the reasons why they would not be classified as either intentional or accidental? What level of uncertainty or doubt would generally be involved?
38. Do you attend annual or other coding trainings or refresher sessions? If yes, when was the last time you attended?

TERMS USED IN LITERATURE: TO SEE WE ARE 'ON THE SAME PAGE':

39. How would you **describe** an "intentional self-poisoning"/"intentional overdose"?

[page intentionally blank]

APPENDIX 3: ADDITIONAL MATERIAL TO STUDY 3 (CHAPTER 5)

Appendix 3.1: Study 3 participant information sheet (Southland Hospital ED)

***NOTE**: Some email addresses and telephone numbers have been redacted in this thesis version but were available to participants in the versions given to them.*

Participant Information Sheet **for Patients**

Study title:	A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP) [Part Two: Prospective Data]	
Principal investigator:	**Professor Pauline Norris** **School of Pharmacy, University of Otago**	03 XXX XXXX
Contact at Dunedin Hospital:	**Dr Bruce Lambie**	03 XXX XXXX
Contact at Southland Hospital:	**Dr Martin Watts**	03 XXX XXXX
Contact at Wellington Regional Hospital:	**Dr Paul Quigley**	04 XXX XXXX

Introduction

Thank you for showing an interest in this project. Please read this information sheet carefully. Take time to consider and, if you wish, talk with relatives, whānau, or friends,

before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request. If you have family/friends/others with you at the ED, you can choose to have them present or not present while taking part in the study. Please let the clinician know your preference.

What is the aim of this research project?

This project investigates the sources of drugs and other substances used in intentional self-poisonings. It is a part of a PhD thesis project being undertaken at the School of Pharmacy, University of Otago. If we can identify the most common substances used in intentional poisonings, and how they are obtained, we may be able to prevent some of these poisonings in the future.

Who is funding this project?

This study is funded by the School of Pharmacy, University of Otago.

Who are we seeking to participate in the project?

We would like to collect anonymous data from patients aged 16 or older, who are at the emergency department as a result of an intentional self-poisoning.

If you participate, what will you be asked to do?

If you decide to participate, emergency department staff will write down your age, sex, ethnicity, and details about your hospital presentation and the substances involved, on our study form. We are especially interested in where and how you obtained the poisoning substances. The research team cannot identify your responses, as we will separate the consent form (with your name on it) from the data collection sheet (enclosed in an envelope) before looking at it. There will be no financial reward for participation. We would like to emphasise that your participation is voluntary, and if you decide not to participate, this will not affect your treatment at the hospital in any way.

Is there any risk of discomfort or harm from participation?

Discussing your recent self-poisoning may cause you discomfort or distress, however your clinician is there to help you: telling him/her may also ease your mind. But if you feel at any stage that you do not wish to answer a particular question, or you no longer wish to participate, you can inform the clinician and they will either skip the question, or stop writing things down on our form and destroy it. If you feel any distress after you have been discharged from the hospital, you could contact your GP or call for example **Lifeline 0800 543 354** or **Alcohol and Drug Helpline 0800 787 797** for further help.

What specimens, data or information will be collected, and how will they be used?

The information recorded on our study form includes your age, sex, ethnicity, how you arrived at the hospital, who referred you to the hospital, day of the week and time of day of your arrival at the hospital (no dates). Your treatment urgency code (triage code), length of stay at the emergency department, discharge time and destination will also be recorded, as well as which substances/drugs you had taken, how much of them, and where and how you obtained them. If your blood alcohol level was measured, the result will also be recorded. If you do not wish to disclose something, such as where you obtained the substances from, you can choose to not answer and skip a question. The study forms will be kept in a locked data cabinet for 10 years. The information in them will be combined with information from other patients, and together they will describe which substances are used in intentional self-poisonings and how they are obtained. We hope that this can assist in thinking of ways to prevent such poisonings in the future.

What about anonymity and confidentiality?

Your name, date of birth, address, or other contact details will **not** be recorded on the study form. When you fill in your consent form, your name will be recorded on it, but it will be kept confidential in a locked filing cabinet, and no one but the research team will have

access to it. The consent form with your name on it will be separated from your data before looking at it, so the research team will not know which data collection form is yours. The consent forms will also be stored securely in a locked filing cabinet, and will be securely destroyed after 10 years. All electronic files that combine your de-identified data with those of others will be kept on a password-protected computer. Only the research team will have access to them. When we report the results of this study, only results from all participating patients or groups of them will be presented, never results from individual patients.

If you agree to participate, can you withdraw later?

You may withdraw from participation in the project at any time while you are still being treated at the hospital and the doctor/nurse is recording your details, without any disadvantage to yourself: just let the nurse/doctor know this and they will destroy your data form securely. Your treatment at the hospital will not be affected, should you decide to withdraw from the study. You may also inform the hospital staff, through the contact details below FOR ONE MONTH from when you were in the hospital, if you want to withdraw from the study. Otherwise after one and a half months we will de-identify and combine your data form with those of other participants, and it can no longer be taken out.

To withdraw from the study within one month of participation at Southland Hospital, contact Dr Martin Watts, Southland Hospital at (03) XXX XXXX.

Any questions?

If you have any questions about the study now or in the future, please feel free to contact the research team. We will treat your contact as confidential, and will not report it to anyone.

Eeva-Katri Kumpula, PhD student **School of Pharmacy, University of Otago**	(03) XXX XXXX eeva-katri.kumpula@otago.XX

Professor Pauline Norris, Professor of Social Pharmacy **School of Pharmacy, University of Otago**	(03) XXX XXXX
Dr Shyamala Nada-Raja, Senior Research Fellow **Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago**	(03) XXX XXXX

If you feel any distress or discomfort related to your participation in this study or otherwise after you are no longer at the hospital, may we suggest you contact your GP or other trusted healthcare provider, or for example **Lifeline** at **0800 543 354** or **Alcohol and Drug Helpline** at **0800 787 797** for further help.

The unique identifier for this study at the University of Otago is H16/043, at Dunedin Hospital and Southland Hospital it is 01206, and for Wellington Regional Hospital it is 'intentional self-poisoning study'.

This study has been approved by the University of Otago Human Ethics Committee (Health). If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Appendix 3.2: Study 3 participant consent form

***NOTE**: Some email addresses and telephone numbers have been redacted in this thesis version but were available to participants in the versions given to them.*

A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP)

[Part Two: Prospective Data]

Principal Investigator: Professor Pauline Norris, pauline.norris@otago.xx, (03) XXX XXXX

CONSENT FORM FOR PARTICIPANTS

Following signature and return to the research team this form will be stored in a secure place for ten years.

Name of participant:……..

1. I have read the Information Sheet concerning this study and understand the aims of this research project.
2. I have had sufficient time to talk with other people of my choice about participating in the study.

3. I confirm that I meet the criteria for participation which are explained in the Information Sheet.
4. All my questions about the project have been answered to my satisfaction, and I understand that I am free to request further information at any stage.
5. I know that my participation in the project is entirely voluntary, and that I am free to withdraw from the project for up to ONE MONTH after my data was collected, without any disadvantage.
6. I know that as a participant I will be asked about my poisoning presentation, and the details will be recorded on a data collection form by hospital staff for the research team.
7. I know that the questions asked by the doctor/nurse will explore the substances I have taken and how I obtained them, and that if I feel hesitant or uncomfortable I may decline to answer any particular question(s), and /or may withdraw from the project without disadvantage of any kind.
8. I understand the nature and size of the risks of discomfort or harm which are explained in the Information Sheet.
9. I know that when the project is completed, the de-identified data form describing my hospital presentation, and this identifying consent sheet will be separately placed in secure storage and kept for ten years.
10. I understand that the results of the project may be published and be available in the University of Otago Library, but that I agree that any personal identifying information *[only on this consent sheet]* will remain confidential between myself and the researchers during the study, and will not appear in any spoken or written report of the study.
11. I know that there is no remuneration offered for this study, and that no commercial use will be made of the data.

Signature of participant: Date:

Appendix 3.3: Data collection form

***NOTE**: Some email addresses and telephone numbers have been redacted in this thesis version but were available to clinicians filling in the form in the versions given to them.*

A study of public hospital and emergency department (ED) presentations for intentional self-poisoning (ISP) [Part Two: Prospective Data]

HRS/SDHB Project ID: 01206 CCDHB Project ID: 'intentional self-poisoning study'

DATA COLLECTION SHEET

Please ask for patient informed consent and if obtained, fill in the following for any patient **aged 16 or older**, presenting at the emergency department for intentional self-poisoning (ISP): intentional ingestion of/exposure to more than prescribed amount of any drug, excess alcohol, recreational drug, or non-ingestible substance for self-harm purposes, regardless of whether there is evidence of intent to die or not. This would involve ICD-10 clinical codes X60-X69 (intentional self-poisoning). ***PLEASE DO NOT ENTER THE PATIENT NAME, ADDRESS, OR NHI NUMBER ON THIS FORM.***

If you have any questions about filling in these forms, please contact Ms Eeva-Katri Kumpula (mobile: XXX XXX XXX, work: 03 XXX XXX, eeva-katri.kumpula@otago.xx). The Principal Investigators on site are Dr Bruce Lambie (Dunedin Hospital), Dr Martin Watts (Southland Hospital), and Dr Paul Quigley (Wellington Regional Hospital).

If the patient chose not to participate in the study, please do not record anything but tick here and put the form in a folder marked "Declined": DECLINED TO PARTICIPATE [ ]

PATIENT CHARACTERISTICS

STUDY NUMBER XXX	**Age:**	**Sex:** M [ ] F [ ]	**Residence**: Rural [ ] Urban [ ] Refused to say [ ]
Self-identified ethnicity (please ask patient/family/whānau, and tick all applicable): NZ Māori [ ] Pacific Island/Pasifika [ ] Asian [ ] NZ European/Pākehā [ ] Other [ ]			

Mode of arrival to ED:	**Referred to ED by:**
Ambulance [ ] Private vehicle [ ] Police [ ] Walk-in [ ] Other: _____ _	Self-referral [ ] After Hours Service [ ] General Practitioner [ ] Mental Health Services [ ] Other: _____
Marital status: Refused to say [ ] Married [ ] Never married [ ] Living with partner [ ] Widowed/separated/divorced [ ]	**Employment status:** Employed [ ] Student/home maker etc. [ ] Unemployed [ ] Retired/pensioner [ ] Refused to say [ ]
Medical comorbidities:	

ISP PRESENTATION DETAILS ***(no dates to be recorded please)***

ED presentation time:	**Day of the week of presentation**:	**Triage level** (1-5):	**ISP ICD-10 diagnosis code(s)** (X60-X69):
At what time was the patient discharged from ED:	**Length of stay at ED** (hours, or specify):	**Depart destination from ED**: ICU [ ] Other _____ Ward [ ] Home [ ] Emergency Psych Service [ ] Community Mental Health [ ]	
Psychiatric referral made: YES / NO (circle)			

SUBSTANCES AND SOURCES

Which substance(s) had the patient taken? (please list as many as known – trade names are fine)	**NAME (product)**	**DOSE (strength)**	**AMOUNT TAKEN (# of tablets etc.)**

ALCOHOL CONSUMED	**YES / NO**	Amount consumed? (# of bottles etc.)	
Blood alcohol level?	[ ] mmol/l OR % (cg/g) Not measured [ ]		**Toxicology screen done: YES / NO**
Timeline of ingestion/ exposure?	[ ] Alcohol taken first; how long before other(s)? _____ [ ] Substance(s) in order of exposure (please indicate times (before presentation) if known): [ ] Unknown		
Where did the patient obtain the substance(s) from?	Own medications [ ] Stockpiled[1]? Yes [ ] No [ ] Unknown [ ] OTC pharmacy medication [ ] Convenience etc. store [ ] Relative or friend [ ] Strangers [ ] Refused to answer [ ] Other: _____		
How did the patient obtain the substance(s)?	Prescribed [ ] Self purchased [ ] Refused to answer [ ] Accumulated from prior prescriptions [ ] Bought/obtained without prescription [ ] Stolen [ ] Other: _____		

1 Has the patient deliberately stockpiled the medication for self-harm.

University of Otago Human Ethics Committee (Health) Approval number: H16/043