2019

Leveraging disparate data sources to understand the role of the Australian private health insurance sector in supporting the care of high-needs patients

Joanna Khoo

Follow this and additional works at: https://ro.uow.edu.au/theses1

University of Wollongong

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Recommended Citation

Khoo, Joanna, Leveraging disparate data sources to understand the role of the Australian private health insurance sector in supporting the care of high-needs patients, Doctor of Philosophy thesis, School of Management, Marketing and Operations, University of Wollongong, 2019. https://ro.uow.edu.au/theses1/597

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au
Leveraging disparate data sources to understand the role of the Australian private health insurance sector in supporting the care of high-needs patients

Joanna Khoo

Supervisors:
Senior Professor Kathy Eagar and Professor Helen Hasan

This thesis is presented as part of the requirement for the conferral of the degree:
Doctor of Philosophy

The University of Wollongong
School of Management, Marketing and Operations

February 2019
Abstract

Introduction

Australia has a dual public and private health insurance system in which private health insurance plays a supplementary role in financing health care. The traditional role of the private health insurance sector in Australia has been to cover a defined set of healthcare services largely delivered in private hospitals. However, following legislative changes in 2007, private health insurance funds can now cover a broader range of chronic disease management services. This emerging role of the private health insurance sector in chronic disease management in the last decade has not been well studied and is the focus of the research presented in this thesis. Specifically, the research presented in this thesis examines the role of insurers in supporting the care of high-needs patients, particularly those patients with chronic conditions.

Methods

The five studies presented in this thesis use quantitative and qualitative research methods to examine the research topic. Multiple data sources are used including insurance claims data, health service records and interviews with private health insurance executives. The research examines health service use for high-needs patients claimed on private health insurance and investigates the approach taken by private health insurers to design and implement strategies to support high-needs patients and people with chronic conditions more broadly. A methodological contribution of the research is a novel data linkage study using insurance claims data and hospital records linked for the first time, allowing analysis of additional public hospital activity of the insured population that is not claimed on private health insurance.

Results

Using three different measures of resource utilisation to identify and compare the demographic and clinical characteristics of high-needs patients, the findings suggest that high-needs patients account for a large proportion of total hospital utilisation for a narrow range of health conditions – primarily related to mental health, cancer, rehabilitation and dialysis. Further examination of claims for mental health services reveals information on the type, the organisation and the frequency of services accessed using private health insurance, but this represents a limited picture
of the insured population’s service utilisation. These findings demonstrate the importance of quality, comprehensive health information to inform chronic disease management strategies and a further study develops a conceptual framework, a theoretical contribution of this thesis, which identifies four domains to consider when developing information systems for chronic disease management using multiple data sources.

The data linkage study, designed using the conceptual framework, investigates the relative contribution of private health insurance to funding hospital care for a privately insured cohort. Although more than 70% of admissions are claimed on private health insurance, a large proportion of this care, particularly for high-needs patients, occurs in public hospitals. There are distinct patterns in the use of private health insurance for overnight hospital admissions for different types of services. Medical and mental health-related services that more often occur in public hospitals are less likely to be claimed on private health insurance than surgical services that more often occur in private hospitals. The final study, using qualitative methods, analyses the perspectives of private health insurance representatives on the sector’s role in chronic disease management. The study finds there is optimism for increasing the future role of the private health insurance sector in supporting patients to manage chronic conditions, particularly for high-needs patients, but challenges exist in relation to targeting and evaluating interventions.

Discussion
This research describes the services used by high-need patients that are claimed on private health insurance and investigates how health information held by insurers can be used to inform chronic disease management strategies. The research also explores the broader policy and operational factors affecting the support provided by the private health insurance sector for high-needs patients. Taken together, the research findings demonstrate that the primary role of Australian private health insurers in supporting high-needs patients is paying benefits for a narrow range of hospital-based services. Although there has been some changes to the role of the private health insurance sector in the last decade, the process of change has been slow and private health insurers face challenges in expanding their role in chronic disease management due to regulatory constraints, data availability and relationships with both patients and healthcare providers.
Acknowledgments

The research presented in this thesis would not have been possible without the support of a number of people and organisations. My supervisors, Senior Professor Kathy Eagar and Professor Helen Hasan provided great personal and professional guidance throughout my doctoral studies. Our supervision meetings were a highlight of my candidature and taught me a great deal about both scientific research and health policy.

I was fortunate to receive a scholarship through the Health Market Quality Program of the Capital Markets Cooperative Research Centre to allow me to undertake my doctoral studies. Being part of this program allowed me to be part of a multidisciplinary cohort of students from diverse research backgrounds including economics, mathematics and computer science, from whom I learnt a great deal. I would particularly like to thank Dr Uma Srinivasan for her mentoring and support and Associate Professor Federico Girosi for facilitating the opportunity to undertake a PhD.

I am grateful to those people who provided support to me in conducting this research including staff at the Australian Health Services Research Institute and the Illawarra Shoalhaven Local Health District, in particular, Associate Professor Judy Mullan, Dave Webster, Brendan McAlister, Dr Luise Lago, Dr Victoria Westley-Wise, Dr Jenny McNamee, Nicolas Fenwick, Xanthe Barker and Niki Cirillo. I also thank the members of the HAMBS Steering Committee who provided resources and feedback to support this research and the participants who took part in interviews as part of this research. I would particularly like to thank Dr Melinda Williams, Murad Safadi and Tara Holloway from PeopleCare for their contributions.

Thanks also to my friends and family who supported me throughout time of my PhD candidature, especially my husband Jerrem, who provided constant support and encouragement. This task was made more challenging by the fact that we were residing in different countries for almost half of my candidature.
Certification

I, Joanna Khoo, declare that this thesis submitted in fulfilment of the requirements for the conferral of the degree Doctor of Philosophy, from the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. This document has not been submitted for qualifications at any other academic institution.

Joanna Khoo
26 February 2019
Publications and contributions arising from work presented in this thesis

Published Articles

Khoo J, Hasan H, Eagar K (2018), Examining the high users of hospital resources: Implications of a profile developed from Australian health insurance claims data. *Australian Health Review*, vol. 42, no. 5, pp. 600-606 (Chapter 4).


Articles Under Review

Khoo J, Hasan H, Eagar K. Private versus public? Examining hospital use of a privately insured population in New South Wales, Australia using data linkage. (Manuscript under review) (Chapter 7)

Conference Presentations

“Health services utilisation in the public and private hospital sector for a privately insured cohort: Which factors influence the health care setting?” World Congress on Public Health, April 2017, Melbourne, Australia (oral presentation).

“Understanding the mix of hospital and community-based mental health services funded by private health insurance in Australia: A person-level profile,” 10th Health Services and Policy Research Conference, November 2017, Gold Coast, Australia (oral presentation).

“The role of private health insurance in supporting the care needs of people with chronic illness,” Emerging Trends in Digital Health Conference, May 2017, Sydney, Australia (poster presentation).

List of Abbreviations

ACCD   Australian Consortium for Classification Development
AHSRI  Australian Health Services Research Institute
AIHW   Australian Institute of Health and Welfare
AR-DRG Australian Refined Diagnosis Related Groups
APRA   Australian Prudential Regulation Authority
CDM    Chronic disease management
GP     General Practitioner
HCP    Hospital Casemix Protocol
ICD-10-AM International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
IHIP   Illawarra Health Information Platform
IHPA   Independent Hospital Pricing Authority
ISLHD  Illawarra Shoalhaven Local Health District
LHD    Local Health District
OECD   Organisation for Economic Co-operation and Development
NCCC   National Casemix and Classification Centre
NHMRC  National Health and Medical Research Council
PHI    Private health insurance
Glossary

**Administrative data**: Data sources collected for administrative purposes without specific research goals defined at the time of collection (Benchimol 2015). In the health sector, this refers to records collected during healthcare interactions such as hospital admissions as well as payment data such as insurance claims. Administrative data are also commonly referred to as routinely collected data.

**Australian Refined Diagnosis Related Groups (AR-DRG)**: An admitted patient classification system that provides a clinically meaningful way of relating the number and type of acute care patients treated in a hospital to the resources required by the hospital (Australian Institute of Health and Welfare (AIHW) 2018a). The AR-DRG coding system uses the International Classification of Diseases (see below) as their basis.

**Broader health cover**: A suite of services, focussed on disease management and health and wellness programs, that private health insurance (PHI) funds in Australia can cover following reforms introduced in the *Private Health Insurance Act 2007* (Biggs 2013).

**Chronic conditions**: Long lasting and persistent health conditions, across the spectrum of illness, including mental illness, trauma, disability and genetic disorders (Australian Health Ministers’ Advisory Council 2017). The terms “chronic condition” and “chronic disease” are used interchangeably throughout this thesis.

**Chronic disease management (CDM)**: Interventions that are designed to manage or prevent a chronic condition using a systematic approach to care and potentially employing multiple treatment modalities (Weingarten et al. 2002).

**Community rating**: A feature of the PHI system in Australian requiring that everyone pays the same premium for their health insurance and health funds cannot discriminate against members based on health status, age or claims history (Private Healthcare Australia 2018a).

**Data linkage**: Data linkage refers to methods to bring together information about individuals from different sources in a way that protects individual privacy for the purposes of research and analysis (Population Health Research Network 2011).

**De-identified data**: Data sources that have undergone specific processes to remove direct identifiers and alter other information that identifies an individual or is reasonably likely to identify an individual (Office of the Information Commissioner 2018). De-identified data are also commonly referred to as anonymised data.
Admission: In this study, an admission refers to a period of patient care in a hospital setting from the time of admission to discharge. Admissions may be overnight, in which admission and discharge occur on different days, or same-day, in which admission and discharge occur on the same day. Same-day admissions are also referred to as same-day visits. Admission is used interchangeably with the term, hospitalisation, in this study.

General practitioner (GP): Medical practitioners practicing in community settings (outside hospitals) that are often the first point of contact for personal health matters. In some countries such as the United States, general practitioners are preferred to as family medicine physicians (The Royal Australian College of General Practitioners 2018).

General treatment insurance policy: An insurance policy covering a range of dental and allied health services including optical, physiotherapy and psychology services (Australian Government Private Health Insurance Ombudsman 2018a).

High-needs patients: Patients with the highest level of need for health care as measured by total accrued healthcare cost, intensity of care used over a period of time or functional limitations (Long et al. 2017).

Hospital Casemix Protocol (HCP): A standardised data collection that the Australian Government requires hospitals to collect for privately insured admitted patient services including clinical, demographic and financial information (Department of Health 2018a).

Hospital insurance policy: An insurance policy to cover costs as a private patient in hospital, including hospital accommodation and medical treatment (Private Health Insurance Ombudsman 2018a).

International Classification of Diseases (ICD): The international standard for reporting diseases and health conditions, which defines the universe of diseases, disorders, injuries and other related health conditions (World Health Organisation 2018). The full name of the coding system used in this thesis is the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM).

Managed care: A type of health insurance that enrols individuals and assumes costs for health care for a pre-paid fee. Insurers providing managed care plans attempt to manage the healthcare utilisation of insured individuals through a variety of controls including contracts with selected providers and hospitals and requiring authorisation for hospital admissions (Marcus 2000).
Medicare: Australia’s tax-financed, government-operated health insurance scheme that provides access to free or subsidised treatment by a range of health professionals in hospitals and community settings (Healthdirect 2018).

Medicare Benefits Schedule: A listing of health services that are subsidised by the Australian Government under Medicare.

Patient: A person receiving or registered to receive medical care.

Primary care: Healthcare services provided to non-admitted patients in community settings including general practice and allied health services (Department of Health 2015).

Private health insurance (PHI): Coverage of a defined set of health services financed through premiums paid to a non-governmental insuring entity. The contract between the insured individual and the insuring entity sets out the terms and conditions for payment or reimbursement of health services (Colombo & Tapay 2003, p. 7).

Private health insurance fund members: Private health insurance organisations are often referred to as funds and those people holding a fund’s insurance policy are referred to as fund members.

Private hospital: Hospitals licensed by the government as a private hospital and operated by private (non-government) bodies including both commercial and charitable organisations (Private Health Insurance Ombudsman 2018b).

Principal diagnosis: The diagnosis established to be chiefly responsible for occasioning a patient’s episode of care in hospital (AIHW 2018b). Other diagnoses that may be affecting the patient are called additional diagnoses.

Public hospital: A hospital funded by the Government and recognised as public for the purposes of the Medicare Benefits Schedule, the Pharmaceutical Benefits Scheme and private health insurance arrangements (Private Health Insurance Ombudsman 2018b). In Australia, some privately-operated hospitals are recognised through legislation as public hospitals (for example, hospitals identified under Schedule 3 of the New South Wales Health Services Act 1997).

Risk equalisation: As PHI funds in Australia cannot charge differential premiums according to health risk (see Community Rating above), the risk equalisation scheme compensates insurers with a riskier demographic profile by re-distributing money from those insurers paying less than average benefits to those paying higher than average benefits. In Australia, the Australian
Prudential Regulation Authority (APRA) administers this scheme (Private Healthcare Australia 2018b).

**Risk stratification**: A process of identifying target groups within a defined population for interventions based on indicators of health risk such as age, health status and levels of health service use. Interventions are then implemented for different target groups that are appropriate to the level of health risk (Hewner et al. 2014).
# Table of Contents

Abstract .......................................................................................................................................................... 1  
Acknowledgments ........................................................................................................................................ 3  
Certification ................................................................................................................................................ 4  
Publications and contributions arising from work presented in this thesis ............................................. 5  
List of Abbreviations ................................................................................................................................. 6  
Glossary ........................................................................................................................................................ 7  
Table of Contents ...................................................................................................................................... 12  
List of Tables .............................................................................................................................................. 15  
List of Figures ............................................................................................................................................ 16  

Chapter 1: Introduction and scope of thesis ............................................................................................. 17  
1.1 Background ......................................................................................................................................... 18  
1.2 Research context ................................................................................................................................. 19  
1.3 Scope of thesis ..................................................................................................................................... 20  
1.3.1 Research questions ......................................................................................................................... 20  
1.3.2 Organisation of thesis ..................................................................................................................... 21  

Chapter 2: Literature review .................................................................................................................. 23  
2.1 The Australian healthcare system ..................................................................................................... 23  
2.2 Economic models of healthcare financing ......................................................................................... 24  
2.3 PHI in Australia ................................................................................................................................. 25  
2.4 Policy reforms affecting the role of the PHI sector, 1973-2006 ....................................................... 28  
2.5 PHI reforms following the Private Health Insurance Act 2007 ..................................................... 29  
2.6 Brief synthesis of research conducted on the Australia PHI sector .............................................. 32  
2.7 Who are high-needs patients? ............................................................................................................ 34  
2.8 Features of models of care for high-needs patients ......................................................................... 35  
2.9 Using health information to target high-needs patients .................................................................. 37  
2.10 Conclusion ......................................................................................................................................... 39  

Chapter 3: Research methodology and design ....................................................................................... 40  
3.1 Research methodology ....................................................................................................................... 40  
3.2 Outline of mixed-methods design and rationale ............................................................................. 41  
3.3 Selection of data sources ................................................................................................................... 44  
3.4 Ethical considerations related to research design ............................................................................. 46  
3.5 Conclusion ......................................................................................................................................... 47  

Chapter 4: Examining hospital utilisation patterns of high-needs patients using PHI claims data.. 48  
4.1 Study background ............................................................................................................................... 48  
4.2 Methods ............................................................................................................................................ 49  
4.2.1 Data sources ................................................................................................................................. 49  
4.2.2 Cohort selection ............................................................................................................................. 50  
4.2.3 Data limitations ............................................................................................................................. 51  
4.2.4 Statistical analysis ......................................................................................................................... 51  
4.3 Results .............................................................................................................................................. 52  
4.3.1. Demographic and hospital admission profile of high-needs cohorts .................................... 52  
4.3.2 Clinical profile of high-needs cohorts ......................................................................................... 54  
4.3.3 The contribution of high-needs cohorts to overall resource utilisation .................................... 55  
4.3.4 The relationship between the three measures of high resource utilisation ............................... 55  
4.4 Discussion ......................................................................................................................................... 57  
4.5 Conclusion ......................................................................................................................................... 60
Chapter 5: Utilisation patterns of mental health services claimed on PHI ................................................. 61
  5.1 Study background ......................................................................................................................... 61
  5.2 Methods ................................................................................................................................. 64
    5.2.1 Data sources and study population .................................................................................. 64
    5.2.2 Dataset preparation: Establishing the population with a hospital claim for mental health services within the insured population ................................................................. 65
    5.2.3 Demographic and hospitalisation characteristics of patients with mental health-related hospital claims ...................................................................................................................... 65
    5.2.4 Differences in service use for patients with mental health-related hospital claims .......... 66
  5.3 Results ..................................................................................................................................... 67
    5.3.1 Mental health-related claims within the insured population ........................................ 67
    5.3.2 Demographic and hospitalisation characteristics of patients with mental health-related hospital claims ..................................................................................................................... 68
    5.3.3 Differences in service use for patients with mental health-related hospital claims .......... 70
  5.4 Discussion .............................................................................................................................. 73
    5.4.1 Implications of study findings for research and planning ............................................... 73
    5.4.2 Caveats of analysis .......................................................................................................... 76
  5.5 Conclusion .............................................................................................................................. 76

Chapter 6: Analysing data and information system requirements for CDM programs of health insurers ................................................................. 78
  6.1 Study background ..................................................................................................................... 78
  6.2 Study design ............................................................................................................................ 79
  6.3 Stage 1: Selecting chronic disease groups using insurance claims data ................................ 80
    6.3.1 Methods: Data sources and analysis .............................................................................. 81
    6.3.2 Results of data analysis ................................................................................................ 83
    6.3.3 Implications of data analysis ........................................................................................ 86
  6.4 Stage 2: Key domains for developing information systems for CDM using multiple data sources ............................................................................................................................. 87
    6.4.1 Defining information requirements ............................................................................... 89
    6.4.2 Assessing potential data sources .................................................................................. 90
    6.4.3 Ensuring quality data collections .................................................................................. 91
    6.4.4 Integrating systems and analytics ................................................................................ 93
  6.5 Stage 3: A framework for developing information systems for CDM using multiple data sources ............................................................................................................................. 94
    6.5.1 Defining information requirements ............................................................................... 95
    6.5.2 Assessing potential data sources .................................................................................. 96
    6.5.3 Ensuring quality data collections .................................................................................. 97
    6.5.4 Integrating systems and analytics ................................................................................ 98
    6.5.5 Caveats of framework development .............................................................................. 98
  6.6 Discussion: Feasibility and policy implications of framework implementation ............... 95
    6.6.1 Defining information requirements ............................................................................... 95
    6.6.2 Assessing potential data sources .................................................................................. 96
    6.6.3 Ensuring quality data collections .................................................................................. 97
    6.6.4 Integrating systems and analytics ................................................................................ 98
    6.6.5 Caveats of framework development .............................................................................. 98
  6.7 Conclusion .............................................................................................................................. 99

Chapter 7: Data linkage to understand the hospital utilisation of a privately insured cohort .......... 100
  7.1 Study background .................................................................................................................... 100
    7.1.1 Study rationale .............................................................................................................. 100
    7.1.2 Applying the framework for developing information systems for CDM using multiple data sources ............................................................................................................................. 102
    7.1.3 Methods of linking health data sources to preserve privacy ....................................... 104
    7.1.4 Linked data infrastructure used in this study .............................................................. 105
  7.2 Process of linking insurance claims and health district records ............................................. 106
    7.2.1 Stage 1: Creating a project-specific identifier key ....................................................... 106
    7.2.2 Stage 2: Extraction of health and claims data ............................................................ 107
    7.2.3 Stage 3: Linkage of de-identified datasets .................................................................... 108
  7.3 Methods ................................................................................................................................. 108
    7.3.1 Insured individuals’ use of public and private hospitals ............................................ 109
    7.3.2 Insured individuals’ use of public and private hospitals by admission service category ... 111
    7.3.3 High-need patients’ demographic and service utilisation characteristics .................... 112
  7.4 Results ..................................................................................................................................... 113
    7.4.1 Insured individuals’ use of public and private hospitals ............................................ 113
    7.4.2 Insured individuals’ use of public and private hospitals by admission service category ... 116
Appendices

References

Chapter 9: Discussion and Conclusions .......................................................... 127
7.6 Conclusion .................................................................................................. 131

Chapter 8: The emerging role of the Australian PHI sector in providing CDM programs: Current activities, challenges and constraints ........................................... 132
8.1 Study background ...................................................................................... 132
8.2 Methods ..................................................................................................... 134
  8.2.1 Participant sample ............................................................................... 135
  8.2.2 Interviewing procedure ....................................................................... 135
  8.2.3 Interview schedule ............................................................................. 135
  8.2.4 Data analysis ....................................................................................... 136
8.3 Results ........................................................................................................ 137
  8.3.1 Sample characteristics ....................................................................... 137
  8.3.2 Current strategy of PHI funds to support members with chronic conditions and high healthcare needs ................................................................. 138
  8.3.3 Support for mental health conditions are perceived to be different to other chronic conditions ................................................................. 141
  8.3.4 Data and information requirements for planning and implementing CDM programs ................................................................. 142
  8.3.5 Policy constraints and other challenges affecting the role of insurers in CDM ................................................................. 143
8.4 Discussion .................................................................................................. 145
8.5 Conclusion .................................................................................................. 147

Chapter 9: Discussion and Conclusions .......................................................... 148
9.1 Summary of research findings and implications ........................................... 149
9.2 Contributions of thesis ............................................................................. 156
9.3 Observations and recommendations for future policy and practice ............... 156
9.4 Future research directions ......................................................................... 162
9.5 Generalisability ......................................................................................... 163
9.6 Research limitations ............................................................................... 164
9.7 Conclusions ............................................................................................... 165

References ........................................................................................................ 167

Appendices ........................................................................................................ 176
Appendix 1 ...................................................................................................... 176
  1. AR-DRG version 6.0x (short description) .................................................. 176
Appendix 2 ...................................................................................................... 188
  2. Variables used in data linkage study ........................................................... 188
Appendix 3 ...................................................................................................... 190
  3. Participant email for telephone interviews .................................................. 190
Appendix 4 ...................................................................................................... 191
  4. Interview questions: Perspectives of private health insurance funds on the factors influencing the design and implementation of strategies to support people with chronic illness ........................................ 191
List of Tables

Table 2.1. Comparison of government-funded and PHI-funded services in Australia (page 26)

Table 3.1. Summary of data sources used in research (page 45)

Table 4.1 Selection criteria for high-needs cohorts (page 50)

Table 4.2 Demographic and hospital admission characteristics of high-needs cohorts and full study population (page 53)

Table 5.1 Descriptive statistics for patients with and without mental health-related hospitalisations (page 68)

Table 5.2 Descriptive statistics for patients with mental health-related hospitalisations, with and without other types of hospitalisations (page 71)

Table 6.1 Disease codes used to identify target chronic condition populations and disease risk and social factors (page 82)

Table 6.2 Number of admissions and individuals identified with chronic conditions in 2013-14 using diagnosis codes (ICD-10-AM or AR-DRG) (page 83)

Table 6.3. Number of hospital admissions with disease risk codes listed in 2013-15 (page 85)

Table 6.4 Top five social risk codes listed in hospital admissions in 2013-15 and top five principal diagnosis of admissions related to top five social codes (page 86)

Table 6.5 Summary of data collection methods and sources used in Stage 2 (page 88)

Table 7.1 Study design considerations for the four domains of the Conceptual Framework (page 104)

Table 7.2 AR-DRG criteria used to assign admission service categories (page 112)

Table 7.3 Demographic and resource utilisation characteristics of private only, public only and private and public hospital users, 2010-2015 (page 116)

Table 7.4 Overnight hospital utilisation measures by service categories for private only, public only and private and public hospital users, 2010-2015 (page 119)

Table 7.5 Demographic and resource utilisation characteristics of high-needs and non-high-needs patients, 2010-2015 (page 125)

Table 7.6 Overnight hospital admissions by service categories of high-needs and non-high-needs cohorts, 2010-2015 (page 126)

Table 8.1 Participant and insurance fund characteristics (page 138)

Table 8.2 CDM services offered by participant funds showing the number of funds offering a service by mode of delivery and provider type (page 139)
List of Figures

Figure 1.1 Overview of research design and questions (page 21)

Figure 3.1 Diagram of research design, phases and studies (page 42)

Figure 4.1 Top five principal diagnosis categories for each high-needs cohort and total study population for private hospital admissions (page 54)

Figure 4.2 Individuals in each high-needs cohort as a proportion of the total number of individuals in the three high-needs cohorts (page 56)

Figure 5.1 Study population with hospitalisations for 2014-2016 showing patients with mental health-related hospitalisations (page 67)

Figure 5.2 Service claims within 28 days after discharge from first overnight hospital admission (page 72)

Figure 6.1 Diagram of research stages and methods for mixed-methods study (page 80)

Figure 6.2 Percentage of individuals selected with a chronic condition in 2013-14 with hospitalisations in 2014-15 for the same condition or for any condition (page 84)

Figure 6.3 Conceptual framework for developing information systems for CDM using multiple data sources (page 95)

Figure 7.1 Process of separating personal identifiers and health data when linking datasets to preserve privacy (page 105)

Figure 7.2 Linkage process of insurance claims and public hospital data sources including number of individuals for each data source (page 108)

Figure 7.3 Insured individuals’ use of public and private hospital services (page 114)

Figure 7.4 Proportion of patients in each hospital use group by service category (page 122)

Figure 7.5 Boxplots of admission case weights for patients with only private hospital use, only public hospital use and both public and private hospital use, by service category (page 123)

Figure 7.6 Proportion of admissions claimed on PHI and proportion of admissions that occurred in private hospitals for high-need patients, by service category (page 127)
Chapter 1: Introduction and scope of thesis

As the population is living longer and the burden of disease is changing, the health system is under pressure to provide services that better respond to the needs of people with chronic conditions. The focus of healthcare interactions is increasingly shifting from curing illness to managing risk factors and symptoms of chronic conditions and preventing health deterioration that may result in more intensive, costly care. In Australia, the private health insurance (PHI) sector is taking a more proactive role in chronic disease management (CDM) through targeted education, risk assessment and programs. This is a departure from their traditional role as an insurer paying benefits for a defined set of health services, primarily provided in hospital. This thesis examines the current and potential role of the Australian PHI sector in supporting the care of high-needs patients. The research analyses data held by insurers and other related datasets to determine what information can be used to identify areas of greatest need among the insured population and better target CDM interventions.

The research begins with an analysis of data held by PHI funds to identify the clinical and demographic characteristics of the highest need groups within the insured population and how insurer data can inform CDM program design and implementation. A conceptual framework is developed that identifies the key factors in developing information systems for CDM using multiple data sources. The framework is applied to the current information systems of the PHI sector and tested through a pioneering linkage project using insurance claims data from a PHI fund linked to a large dataset of public hospital records from a local health district (LHD) in New South Wales. Analysis from this study reveals insights into the relationship between the public and private hospital use, and the use of PHI, for the insured cohort and articulates the challenges and benefits of linking such databases for health research, analysis and planning. In the final part of the research, findings from the earlier studies are fed back to representatives from the PHI sector through interviews for comment and reflection. The data collected from the interviews complement earlier findings with detailed descriptions of the current approaches and challenges for insurers providing CDM programs.

In this introductory chapter, a brief background and context to the research is provided, followed
by a description of the scope of the research, its aims and research questions and an overview of the organisation of the thesis.

1.1 Background

PHI plays a supplementary role in Australia’s healthcare financing system. Australia has a universal, tax-financed health insurance scheme, Medicare, that covers a range of hospital and primary care services. PHI is a voluntary scheme, although the Australian Government introduced a number of financial incentives in the late 1990s to encourage people to take out PHI policies (Butler 2002). Australia’s mixed public and private model of financing and delivering health services attempts to balance two goals — universal access to health care and a degree of patient choice (Johnston & Sadiq 2011; Podger 2007). The Australian Government closely regulates the role of PHI including the scope of health services that insurers can cover and subsidises the industry through tax rebates paid to individuals holding PHI that cost the government A$6 billion per year (Commonwealth of Australia 2017). As a result, PHI remains a frequent topic of policy debate.

Traditionally, the primary role of the Australian PHI sector has been to cover (in whole or in part) a defined set of hospital services, primarily provided by private hospitals. However, following changes to the Private Health Insurance Act (2007), PHI funds have expanded the range of services they cover in the area of CDM and hospital substitution programs (Biggs 2013). The evolving role of the PHI sector in CDM has not been well studied and is the focus of the research presented in this thesis, specifically the role of insurers in supporting the care of high-needs patients.

Providing appropriate care for high-needs patients, particularly those people with chronic and complex conditions, requires more than the efforts of individual healthcare providers but also system level changes to support coordinated care and health improvements such as new payment models, enhanced data sharing and patient-focussed quality measures (Bodenheimer 2008; DuGoff et al. 2013; Long et al. 2017). Initiatives that respond to multiple domains are considered more likely to improve patient outcomes and overall system-level performance (Kodner 2009).
For the PHI sector to have an effective role in supporting high-needs patients, it requires more than simply funding one-off CDM services. However, the extent to which the PHI sector is driving system-level changes in CDM and the extent of changes in the broader health system, to facilitate insurers’ role in supporting high-needs patients, has not been investigated.

This research explores the role of the PHI sector in supporting the care of high-needs patients. The research investigates clinical and service utilisation characteristics of high-needs patients and factors influencing how insurers fund, and in some cases deliver, services to support high-needs patients, given the PHI sector’s regulated role in Australia’s health system. Previous research on the PHI sector has focused on the differences in access to services between insured and uninsured populations, particularly for surgical procedures (Banks et al. 2009; Brameld et al. 2006; Hindle & McAuley 2004). There has been little attention given to understanding sub-groups within the privately insured population or the approaches insurers are taking to design and implement strategies to support high-needs patients, including the use of health information to target and evaluate interventions. It is the focus on these issues that distinguishes the research presented in this thesis from previously published studies.

1.2 Research context

The research presented in this thesis was supported by a scholarship from the Health Market Quality Program of the Capital Markets Cooperative Research Centre. The Cooperative Research Centres Program is a program of the Australian Government designed to support collaborative research partnerships between industry, researchers and the community (Department of Industry, Innovation and Science 2018). The industry partner for this project is the Hospital and Medical Benefits System (HAMBS), a company that offers technology solutions to 23 non-profit, PHI funds in Australia. The industry partner contributed to the research by providing de-identified insurance claims data for analysis and participating in a Steering Committee that met quarterly for research updates. The industry partner was not otherwise involved in the design or conduct of the research.
1.3 Scope of thesis

The overarching aim of this research is to contribute new knowledge on the role of the Australian PHI sector in supporting the care of high-needs patients.

1.3.1 Research questions

The specific research questions are:

1. What are the demographic, service utilisation and clinical characteristics of high-needs patients with PHI? (Chapter 4)

2. How suitable are current PHI data sources for informing strategies for better supporting high-needs patients? (Chapter 5 and 6)

3. For PHI funds to play a more proactive role in CDM, what factors need to be considered when collecting data and developing information systems to support high-needs patients? (Chapter 6)

4. What is the relative contribution of a PHI fund to paying for hospital services for an insured population, relative to publicly funded hospital services? (Chapter 7)

5. What strategies are PHI funds taking to support CDM, especially for high-needs patients, and what are the factors influencing the design and implementation of strategies? (Chapter 8)

To address these research questions, a series of five studies were conducted as depicted in Figure 1.1 below. The five studies use a mix of quantitative and qualitative research methods and use data that allow for analysis of current patterns of service use claimed on PHI and exploration of future strategies to support high-needs patients. Further discussion of the research design is provided in Chapter 3.
1.3.2 Organisation of thesis

The chapters in this thesis are organised as follows:

Chapter 2 presents a review of literature relevant to the thesis topic. This review covers four areas: economic models of financing health care; the Australian healthcare system and analysis of the operation of the PHI sector; key findings from previous research focussing on how PHI in Australia affects health service utilisation, and definitional issues related to high-needs patients and features of models of care for high-needs patients.

Chapter 3 describes the research methodology and design. This chapter describes the rationale for the mixed-methods research design and explicates the links between the five studies.

Chapter 4 presents the demographic, clinical and service use characteristics of the highest service users in a privately insured cohort, examining three different methods to measure high-needs.

Chapter 5 investigates the utilisation of privately funded mental health services as one of the top conditions for which high-needs patients seek care. Analysis focuses on the type, organisation and frequency of services accessed and the extent of information provided by insurance claims data.
about mental health service utilisation.

Chapter 6 examines methods for selecting target groups for CDM from PHI claims data and reviews factors influencing the development of information systems using multiple data sources to inform CDM interventions and support for high-needs patients. A conceptual framework is developed that further explains the key factors identified in the review – information requirements, data sources, data quality and integrating systems and analytics. The study concludes by assessing the feasibility of PHI funds implementing the framework within their current operational context.

Chapter 7 uses the conceptual framework developed in Chapter 6 to conduct an innovative study linking PHI claims data and hospital records from the public hospital sector for the first time. The study examines hospital utilisation across both public and private hospitals, and use of PHI, to understand the relative contribution of PHI to funding hospital care for an insured population.

Chapter 8 explores industry perspectives on the role of PHI in supporting high-needs patients and the factors influencing the design and implementation of strategies to support this group. The study gathers data using interviews with PHI sector representatives to reflect on the findings of the earlier studies and examine current and future approaches to supporting high-needs patients and CDM more broadly.

Chapter 9 discusses and synthesises findings from the five studies in relation to the original aim and research questions. This chapter highlights the contributions of the research, outlines policy and practice recommendations stemming from this research, limitations of the research and directions for future research.
Chapter 2: Literature review

To provide context to the research presented in this thesis, this chapter reviews relevant literature in four major areas:

- Economic models of healthcare financing;
- Analysis of the policy context that affects the functioning of the PHI sector in Australia’s health system;
- An overview of major findings from previous research focused on how PHI affects health services utilisation in Australia; and
- A discussion of definitional issues related to high-needs patients and features of best-practice models of care for high-needs patients.

As the research presented in this thesis consists of a series of studies using mixed methods and multiple data sources, additional literature that is relevant to each specific study is discussed in subsequent chapters.

2.1 The Australian healthcare system

Australia has a universal, national health insurance scheme, Medicare, that covers the whole population. Medicare is accompanied by a voluntary, government-supported PHI sector that pays for additional services not covered by Medicare. Additionally, PHI covers access as a private patient to a range of elective, or non-emergency, hospital services that often significantly reduces waiting periods for a patient (Shmueli & Savage 2014). The government funds a majority of health expenditure in Australia. Of the 68.7% of health funding provided by government in 2016-17, 41.3% came from the Australian Government and 27.4% from states, territory and local governments. Individuals and PHI funds fund 16.5% and 8.8% respectively of total health expenditure (Australian Institute of Health and Welfare (AIHW) 2018c). As noted by the Organisation for Economic Co-operation and Development (OECD), although it makes up a relatively small proportion of the overall funding of health expenditure, the PHI sector has been an ongoing focus of health policy in Australia and is a significant funder of services, particularly those provided by private hospitals (Colombo & Tapay 2003, p.8).
In Australia, hospitals are operated by both public and private entities. Public hospitals are primarily owned and operated by state and territory governments. Private hospitals are owned and managed by private organisations, which may operate on a for-profit or not-for-profit basis. Public hospitals account for more than half of all hospitalisations (59%) but provide a greater proportion of overnight hospitalisations compared to private hospitals so public hospitals account for two thirds of bed days (67%) (AIHW 2016).

Although PHI is closely associated with private hospital use, PHI can be used in both public and private hospitals. In Australia’s mixed system of health funding, there are both demand and supply-side drivers promoting use of the private health system. On the demand side, patients can access certain services, particularly non-emergency elective surgery, more quickly as a private patient in both public and private hospitals (Shmeuli & Savage 2014). Additionally, on the supply-side, because many specialist medical practitioners work in both the public and the private hospital systems, there are perverse financial incentives for specialists to choose to provide more care in private hospitals settings as they receive more income treating private patients compared to public patients. However, limited coverage of PHI policies may lead patients to choose to access services as a public patient despite having PHI due to additional co-payments and out-of-pocket costs that would be incurred by accessing services as a private patient. The issue of variation in PHI coverage is discussed further in Section 2.3 on page 27.

### 2.2 Economic models of healthcare financing

Unlike traditional economic markets, in which the supply of goods is dictated by consumer demand, governments intervene in most healthcare markets around the world. In Australia like most countries around the world, government revenues are the predominant funding source for healthcare expenditure (Savedoff 2004, p. 2). Key reasons why the market for health care differs from the market for other types of goods and services include the high degree of uncertainty in demand for medical care and the asymmetries in knowledge about medical care between the patient and provider that affect both the supply of, and the demand for, health services (Arrow 1963; Rice 1998).
In a traditional economic market, the individual has control of three functions related to receiving a good or service – receiving the benefit from the good or service, bearing the cost of the good or service and making the decision on whether or not to purchase the good or service. However, in the healthcare market, the individual is not in control of these three functions with decision-making to purchase largely delegated to the provider and with much cost-bearing being taken up by a third party such as the government or an insurance provider (Mooney 1998, p. 10). Due to the unpredictability of expenditure in healthcare markets (as for other economic markets such as vehicles), health insurance schemes exist to support the costs of health care.

Insurance is intended to provide individuals exposed to certain risks with financial protection against the consequences of specified events (OECD 2003). Offering health insurance schemes involves managing the demand for health services across the insured population and the supply of services by providers. There is a trade off in the scope of coverage of insurance policies between risk spreading and incentives. By increasing the generosity of insurance, an insurer can spread the risk among more people, so that the costs of the unwell are offset by the premiums paid of the relatively healthy. However, there is also the risk of increasing the demand for unnecessary services (Cutler & Zeckhauser 1999, p. 16). As a result, most health insurance plans, even those provided by government, incorporate a mix of controls such as patient co-payments, benefit limits or service exclusions to manage supply and demand factors from patients and providers in an effort to optimise use of health services, in an economic sense (Cutler & Zeckhauser 1999, pp. 40-2). Government health insurance schemes often pay for a base level of services for the general population that are either free or subsidised at the point of care with expenditure for additional services met by private contributions paid through PHI or patient contributions.

2.3 PHI in Australia

Australia’s hybrid insurance system attempts to strike a balance between universal healthcare access for necessary services funded by Medicare and support for consumer choice in service access through the availability of PHI (Johnston & Sadiq 2011, p. 636). This dual healthcare financing system has resulted in complex regulatory arrangements for PHI coverage, which are summarised in Table 2.1. As noted by Colombo and Tapay (2003, p. 15), PHI both duplicates
Medicare (in the case of public hospital care) and complements Medicare by funding health services such as dental and allied health services that are not funded by Medicare for most of the population. Both Medicare and PHI can cover hospital-based care but there are differences in coverage for health care provided in community settings. A key difference is that PHI funds are prevented by legislation from paying benefits for consultations provided by general practitioners and specialist medical physicians outside of hospital. PHI can also not cover pharmaceuticals that are listed on the Pharmaceutical Benefits Scheme (PBS) and subsidised by the Australian government.

**Table 2.1 Comparison of government-funded and PHI-funded services in Australia**

<table>
<thead>
<tr>
<th></th>
<th>Government</th>
<th>Private health insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Hospital-based care</strong></td>
<td>✓ Public patients in public hospitals</td>
<td>✓ Private patients in public and private hospitals</td>
</tr>
<tr>
<td><strong>2. Community-based care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) General practitioners &amp; specialist physicians</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>b) Dental</td>
<td>X Limited public dental scheme for general population</td>
<td>✓</td>
</tr>
<tr>
<td>c) Diagnostic services (e.g., pathology)</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>c) Allied health services (e.g., physiotherapy &amp; psychology)</td>
<td>✓ Limited cover through general practitioner (GP)-managed plans, and public hospital community health centre and outpatient departments</td>
<td>✓</td>
</tr>
<tr>
<td>d) Chronic disease management programs</td>
<td>✓ Limited cover through GP-managed plans</td>
<td>✓</td>
</tr>
<tr>
<td><strong>3. Medications</strong></td>
<td>✓ Through Pharmaceutical Benefits Scheme (PBS)</td>
<td>✓ Limited cover of non-PBS medications</td>
</tr>
</tbody>
</table>

PHI policies in Australia are divided into two major categories – hospital and general treatment policies. For both types of policies, there are different levels of cover ranging from comprehensive.
to basic (Private Health Insurance Ombudsman 2018c). The majority of PHI benefits (75%) are paid for hospital services, with hospital insurance policies held by 46% of the Australian population (Australian Prudential Regulation Authority (APRA) 2018). An increasing number of hospital policies offered by PHI funds have exclusions for certain health conditions or procedures and/or require co-payments by the patient (Thomas 2012, pp. 273-4). The rise in PHI hospital policies with exclusions and restrictions has resulted in a high degree of variation in coverage of PHI coverage with estimates that there are more than 40,000 different PHI policies that exist for less than 40 PHI funds (Davey 2017). The Commonwealth Ombudsman notes that complaints related to PHI have increased significantly over the past decade and that complaints most commonly relate to unexpected exclusions and restrictions in hospital insurance policies for services that many consumers assume are covered by PHI (Private Health Insurance Ombudsman 2018d).

From 1 April 2019, the Australian Government will introduce a system of three tiers of hospital product categories in an attempt to standardise coverage levels across different PHI funds. Additional reforms introduced at the same time also aim to lessen the variation in access to private hospital services as a result of geographical location as people living in rural and regional areas often have no, or little, choice of private services without significant self-funded travel costs (Department of Health 2018b). The PHI sector is funding an increasing proportion of hospital admissions in Australia. In 2015-16, PHI contributed funding to 42% of all hospitalisations, up from 36% of all hospitalisations a decade earlier in 2006-07 (AIHW 2017, p.18). Given hospital care is the health service most frequently funded by PHI and is the most costly form of treatment, it is the focus of analysis in this research.

General treatment insurance policies cover both necessary health services such as dental care, physiotherapy, podiatry and psychology but also discretionary or complementary health services that have little evidence of clinical effectiveness such as massage and acupuncture, provided by practitioners that are not regulated under the National Registration and Accreditation Scheme for health practitioners (Australian Health Practitioner Regulation Agency 2018). In the research presented in this thesis, claims for services covered by general treatment policies are excluded.
from analysis with the exception of psychology services in the study presented in Chapter 5 on the utilisation patterns of mental health services claimed on PHI.

2.4 Policy reforms affecting the role of the PHI sector, 1973-2006

While healthcare financing arrangements in Australia have been fairly stable for the past three decades, the current arrangements with Medicare and PHI are a relatively recent development in Australia’s history. Medicare, Australia’s public insurer, was introduced in 1984 and, following its introduction, the role of PHI was reduced as Medicare offered free public hospital care and subsidised GP and specialist medical services. Individuals could still take out PHI to be treated as a private patient in either a private or a public hospital, but insurers were no longer subsidised by government and there was a steady decline in PHI membership (Martins 2009, p. 16). A short-lived precursor to Medicare was Medibank introduced in 1973. Medibank was introduced by the Labor Government, and was similar to Medicare, but it did not have bipartisan support and was progressively dismantled before been formally abolished by the Liberal-National Government in 1981 before Medicare was introduced by a subsequent Labor government in 1984 (Palmer & Short 2010, pp. 62-3).

By 1996, PHI membership had fallen to approximately one third of the population and the Liberal-National Government, elected in 1996, took measures to halt the decline. Policy reforms with the aim of encouraging individuals to take out PHI introduced both financial incentives and penalties, described as a ‘carrot and stick’ approach (Ellis & Savage 2008, p. 262). Reforms to PHI in Australia have tried to reduce demand for public hospitals by increasing incentives for individuals to take out PHI, indirectly supporting greater private hospital use (Colombo & Tapay 2003, p. 9).

The series of reforms undoubtedly had the effect of raising the proportion of the Australian population with PHI for hospital treatment, from 32% in 1996 to almost 45% in 2006 (Martins 2009, p. 17), a proportion that has remained stable to the present time. However, this increase in the proportion of people with PHI has come at substantial recurrent cost for the Australian Government with government expenditure on the PHI rebate costing over $6 billion annually, representing 9% of the total health budget (Commonwealth of Australia 2017, p.6-21).
This history of government policy reforms is important for understanding the current role of PHI in financing health care in Australia. Reforms to health insurance arrangements in Australia, particularly the introduction of first Medibank and then Medicare, were layered on top of existing insurance arrangements (Boxall & Gillespie 2013, p. 182). As a result, the role of the PHI sector in Australia is not clearly defined, as it both duplicates and supplements Medicare for different types of health services.

The composition of the PHI sector has changed markedly over the last two decades with a marked consolidation across the sector. The number of PHI funds registered in Australia dropped from 59 funds in 1990 to 33 in 2016. Market concentration in the PHI sector is high with the two largest insurers, Medibank Private and Bupa accounting for more than 50% of all policies held in Australia. Although approximately 70% of the sector operates as non-profit funds, the for-profit market share was 68.5% in 2015 (Private Health Insurance Administration Council 2015).

Due to Australia’s dual health insurance system and the existence of Medicare, PHI does not provide comprehensive coverage across both hospital and community-based health services. However, additional reforms have been introduced to broaden PHI coverage in the area of CDM. These reforms give the PHI sector a broader remit in supporting the health and health care of the insured population but also introduce new challenges.

2.5 PHI reforms following the Private Health Insurance Act 2007

The regulation of the PHI sector remained fairly stable after the reforms of the late 1990s until 2007 when the Private Health Insurance Act 2007 was introduced. This new legislation consolidated previous legislation regulating the PHI sector into one Act and introduced new regulations for the sector. One of the major changes in the new Act was the introduction of “broader health cover” provisions that allow PHI funds to cover a wider range of out-of-hospital healthcare services. These services include programs to manage or prevent chronic diseases and provide clinically appropriate alternatives to hospital treatment such as home-based wound care and home nursing (Private Health Insurance Ombudsman 2018e). “Broader health cover” is not
specifically defined in the *Private Health Insurance Act 2007* but importantly, it excludes coverage of services where a Medicare benefit is already payable such as GP consultations (Biggs 2013, p. 3).

These reforms to the scope of coverage of PHI were expected to improve the management of chronic conditions resulting in health improvements and subsequent reductions in hospital claims (Biggs 2013, p. 1). Although these programs provide the PHI sector with a mechanism to increase its remit as an insurer, PHI funds were initially slow to offer CDM programs. The number of individuals enrolled in programs has grown in recent years but these programs still make up a small proportion of insured services in terms of benefits paid (Biggs 2013, pp. 7-8). Only $54 million in benefits were paid for CDM programs by PHI funds for the 12 month period up to March 2018, compared to $14.9 billion for hospital services and $5.1 billion for general treatment services including dental and physiotherapy for the same period (APRA 2018). Factors influencing the approach of insurers in providing CDM programs are explored in the study presented in Chapter 8.

Australia is not unique in having a PHI sector offering CDM programs. Insurers in other countries have offered these programs for a number of years, including in the United States (McCall & Cromwell 2011) and Germany (Hamar et al. 2010). Further information of the activities included in CDM programs is provided in Section 2.8 on page 35.

The PHI sector has recently gone through another period of policy review and reform. Following the establishment of a Private Health Ministerial Advisory Committee in 2016, the Australian Government introduced a range of policy reforms in October 2017 with a staged implementation timeline (Department of Health 2018c). These reform efforts attempt to clarify, and improve the transparency of, PHI policies for consumers through standardising policy categories across insurance funds and improving access to privately insured health care for certain population groups (people living with mental health conditions and people living in rural and regional areas). The reforms do not include any specific provisions to enhance the role of insurers in CDM or change existing restrictions related to insurers funding primary care services that attract a
Medicare rebate.

There are two additional issues related to current healthcare financing arrangements that may affect the role of the PHI sector in supporting high-needs patients, particularly those with chronic conditions. First, due to the limited scope of coverage of PHI, insurers only have a partial view of the health service use of insured individuals, primarily relating to hospital use as a private patient. As discussed further in Section 2.9 on page 37, comprehensive health information is an important component of CDM care models that emphasise proactive, preventive interventions and community-based care, rather than hospital-based care (Wagner et al. 2001; Wagner et al. 1996b). The extent to which insurance claims information provides useful information for informing the design and implementation of services to support high-needs patients with chronic conditions is examined in the studies presented in Chapters 5 and 6.

Second, a risk equalisation scheme operates in the PHI sector in Australia due to the principle of community rating enshrined in PHI legislation. The purpose of the scheme is to help protect funds that may be exposed to high levels of financial risk based on the demographic composition and health status of their membership. The scheme has an age-based pool for people aged 55 years and over and a high-cost claimants pool (Connelly et al. 2010, p. 7). A consequence of the risk equalisation scheme in Australia is a lack of financial incentive for funds to improve the health of high-need members because they are paid retrospectively for costs incurred for older and high-claiming individuals (Colombo & Tapay 2003, p. 32).

Additionally, although the PHI sector is tightly regulated, government performance metrics for the PHI sector focus on levels of PHI membership and benefits paid rather than the quality, efficiency and effectiveness of services covered. Few mechanisms currently exist for insurers to hold providers to account for the quality and value of services providers to members (Podger 2016, p. 34).

Policy reforms for the PHI sector in the last decade have not addressed this issue and reforms in the area of CDM have potentially exacerbated this issue and increased the lack of clarity of the
role of the PHI sector in Australia’s health system. Insurers cannot only pay benefits for a wider range of “broader health cover” services, but many also now directly provide CDM services, aiming to more proactively support members to manage their health. The extent to which insurers have transitioned into this new role is examined in Chapter 8. The next section reviews relevant research conducted on the PHI sector in Australia to date.

2.6 Brief synthesis of research conducted on the Australia PHI sector

Research on the PHI sector in Australia has been conducted from a number of disciplinary perspectives including epidemiology, economics and sociology. This reflects the interdisciplinary nature of health services research (Lohr & Steinwachs 2002, p. 8). Epidemiological research has focussed on differences in service use between people with and without PHI. People with PHI have been found to have higher levels of health service use compared to those without PHI, particularly related to surgical procedures (Brameld et al. 2006, p. 97; Hindle & McAuley 2004, p. 121). Moorin and Holman (2006b) found condition-specific differences in health services utilisation for privately insured patients. For patients in the final stages of life, admission as a private patient did not consistently affect healthcare utilisation for five common conditions. Healthcare utilisation rates were significantly higher for private patients with colorectal cancer and cerebrovascular disease compared to public patients but utilisation rates for private patients were not significantly higher for heart disease, lung cancer and breast cancer.

Health economics research has focussed on assessing the effects of changes in health policy, such as the efficiency of resource allocation via the PHI rebate (Duckett 2005; Eckermann et al. 2016; Ellis & Savage 2008). Research has also investigated differences in hospital use funded by PHI versus services funded by government sources. Research into the movement between private and public patient categories based on hospital admissions has found a relatively low level of movement between public and private categories, and unsurprisingly, those people that do move tend to have PHI. Gu and Johar (2017) profiled patients admitted for nervous, respiratory and circulatory conditions according to public and private hospital usage. For the three conditions, they found patients most commonly used either a public or a private hospital almost exclusively.
Patients tended to be admitted to the hospital sector they had used in the past, however, there was a patient type that used both public and private hospitals making up between 10-20% of the population. Moorin and Holman (2006a, p. 293) investigated a patient’s movement between private and public patient status and found that the shorter the duration between hospital episodes, the less likely patients were to switch between public and private patient categories. This is an important finding given that those with a higher burden of disease tend to have a shorter duration between hospital episodes. Cheng and colleagues (2014) found that patients using a mix of public and private hospital care tend to have higher average hospital utilisation than those that used exclusively public or private care. Possible explanations for this finding offered by the authors are that a mixed system makes continuity of care difficult to maintain and may result in duplication of diagnostic tests and investigations.

Epidemiological and health economics research has been complemented by qualitative studies conducted from a sociological perspective. These studies add an important consumer perspective on factors affecting both take up and use of PHI policies (Natalier & Willis 2008; Willis et al. 2016) and patients’ perspectives on the use of public and private hospital services (Meyer 2015). These studies have not focussed specifically on patients with high healthcare needs, although Jeon and colleagues (2012) did examine the perspectives of older Australians with multiple chronic conditions in relation to PHI. Despite financial pressures as a result of having PHI, participants in this study believed PHI provided benefits in relation to timely access to, and choice of, healthcare providers.

Qualitative research reporting the perspective of the PHI sector is limited, although Willcox (2005) interviewed PHI representatives in a study examining the evolution of insurer approaches to health services purchasing. Wilcox found that among insurers, innovation in healthcare payment models was limited and insurers faced a complex web of regulation, some of which appeared to impede more efficient purchasing.

A range of factors, beyond financing mechanisms, influences the utilisation of health services. The Behavioural Model of Health Service Use is an important model that organises these individual
and contextual factors affecting health service use (Aday & Andersen 1974; Andersen 1995; Andersen et al. 2014). The influence of contextual, enabling factors identified in the Model such as the policies, financing and organisation of the health system that affect access to health care frames the analysis and measurement of utilisation patterns in the research presented in this thesis. Other factors, referred to as predisposing factors, such as social characteristics and health beliefs also influence service use but are not the focus of this research.

The research presented in this thesis builds on the body of prior research on the Australian PHI sector that has been reviewed in this section. The research presents five studies that together comprise a mixed-methods, interdisciplinary investigation into the role of the Australian PHI sector in supporting the care of high-needs patients. Quantitative, epidemiological analysis is conducted using PHI claims data that have rarely been used in published Australian research, with the exception of Xie and colleagues (2015) in a study predicting hospital stays using claims data, and Hamar and colleagues (2017; 2015) reporting on health service utilisation changes as part of an evaluation of an insurer-supported CDM program.

To complement the claims data analysis, a study using linked insurance claims data and public hospital records is conducted to investigate the relative contribution of PHI to funding hospital use of an insured cohort compared with government funding. Additionally, two qualitative studies examine data and information requirements to support planning and delivering services to high-needs patients and the perspectives of insurers on their current approaches to designing CDM programs and supporting high-needs patients. A more detailed description of the research methodology and design is provided in Chapter 3. Before moving to this chapter, the concept of high-needs patients and models of care to support this patient group is reviewed.

2.7 Who are high-needs patients?

International studies, primarily from North America, have found that a small proportion of the population represent a disproportionately large amount of health service utilisation and spending (Cohen 2014; Mitchell 2016; Roos et al. 2003). This population of high-needs patients also report greater levels of cost-related access issues compared to the general population (Sarnak & Ryan
These findings have led to a focus in both research and policymaking on healthcare delivery and funding for high-needs patients. A recent report from the National Academy of Medicine in the United States noted that there is not a consistent definition of high-needs patients. This report identified three criteria commonly used for defining high-needs patients – total accrued healthcare cost, intensity of care used over a period of time and functional limitations in completing activities of daily living such as bathing or dressing (Long et al. 2017, p. 2). Other reports have defined “high-need” more precisely with specific reference to chronic conditions. For example, a recent international comparative study defined “high-need” as having three or more chronic conditions or a functional limitation (Sarnak & Ryan 2016, p. 10). The research presented in this thesis uses two of the National Academy of Medicine criteria, namely healthcare cost and service utilisation, to identify the high-needs population due to the availability of information on these measures in the data sources used in this research (Chapter 3 provides further detail on the data sources used).

Although the term “chronic disease management programs,” was used to describe some of the activities that can be covered by PHI funds in the Private Health Insurance Act 2007, the adequacy of characterising illness disease-by-disease has been challenged because evidence suggests that health resource use is most strongly impacted by comorbidity, that is, the number of different types of conditions, rather than the specific disease that a person has (Charlson et al. 2007; Starfield 2011, pp. 471-2). Consistent with these findings, rather than focus on specific chronic diseases, this research focuses on characterising the health services utilisation of high-need patients and strategies implemented by PHI funds to support this group. To further define the high-needs patient population in this research, the first study presented in Chapter 4 develops a profile of high-needs patients using three measures to better understand the demographics and service use characteristics of the population with high needs.

### 2.8 Features of models of care for high-needs patients

Models of care for high-needs patients with the best evidence of effectiveness include common elements such as accounting for patient heterogeneity or differences, centring interventions around relationships and enhancing primary care (Chokshi 2017). These elements challenge the
traditional organisation of the healthcare delivery system that allocates the greatest amount of
resources to hospital-based care but now needs to take a greater role in prevention, coordinating
care between providers and educating individuals on strategies to better manage their health
(Jacobson & Teutsch 2008, pp. 9-10).

Approaches to account for patient heterogeneity shift attention from individual patients to the
health status of the broader population. These approaches generally involve categorising a
population and identifying cohorts based on health risk (a process known as risk stratification),
and then using different care management pathways that are appropriate to the level of risk
(Hewner et al. 2014, p. 251). The Kaiser Permanente Medical Group in the United States was one
of the first organisations to introduce risk stratification methods (Garfield 1970). The original
Kaiser method categorised people into three groups based on their anticipated healthcare needs
and tailored interventions to each group – high-need, at-risk and generally healthy. The high-needs
group require active care coordination and case management to monitor and manage disease
symptoms. The Kaiser method has been the model for approaches introduced in a number of other
countries including Australia and the United Kingdom (Agency for Clinical Innovation 2015, p.
16; Ham 2010, p. 80).

One of the most widely cited models outlining the key elements of a system of care for people
with chronic and complex needs is the Chronic Care Model (Wagner et al. 2001; Wagner et al.
1996a). The Chronic Care Model identifies six areas that need to be addressed to encourage and
enable productive interactions between the patients and the care team: healthcare organisation,
community resources, self-management support, delivery system design, decision support and
clinical information systems. As recognised by the authors of the model, the Chronic Care Model
is not an explanatory theory, it is a synthesis of the best available evidence (Wagner et al. 2001, p.
69). While the model’s strengths include general clinical consensus around the core elements of
care, it lacks specificity in terms of implementing system redesign and addressing unexpected
consequences of the redesign process (Martin et al. 2011, p. 573).

Various terms are used to describe intervention approaches to providing care for high-needs
patients including CDM and integrated care. These two terms have been described as two ends of a spectrum of approaches that ultimately “aim to ensure cost-effective quality care for service users with varied needs” (Nolte & McKee 2008, p. 65). Although, CDM programs traditionally targeted single diseases, more recent approaches have taken a broader view and become more population-based (Nolte & McKee 2008, p. 69). As a result, there is now considerable overlap between the concepts of CDM and integrated care. CDM, defined as “interventions designed to manage or prevent a chronic condition using a systematic approach to care and potentially employing multiple treatment modalities” (Weingarten et al. 2002, p. 926), is used in this thesis to refer to care that supports people with chronic conditions, including high-needs patients, due to the term’s reference in the Private Health Insurance Act 2007.

CDM activities can be targeted at people diagnosed with, or at risk of, developing chronic conditions and includes activities such as the development of customised care plans, support for care coordination and health coaching to teach behaviour change techniques. CDM activities can also be targeted at broader population groups regardless of disease status such as the distribution of educational resources and questionnaires to assess health status (Mays et al. 2007, p. 1685). Central to both risk stratification approaches and the specific activities that form part of CDM programs is comprehensive information on an individual’s health status, risk factors and health service use.

2.9 Using health information to target high-needs patients

The need for high quality information has been recognised as a key feature of models of care for people with chronic conditions and high needs. As described above in Section 2.8, clinical information systems and decision support are two of the six system-level factors that need to be considered in supporting people in the Chronic Care Model (Wagner et al. 2001; Wagner et al. 1996a).

High quality information requires access to, and analysis of, data. Although, the terms “data”, “knowledge” and “information” are often used interchangeably, they each have a distinct and precise definition in informatics research and it is important to clarify the difference between each
term. “Data” consist of facts that are observations or measurements about the world, while “knowledge” defines the relationships between data. “Information” is obtained by the application of knowledge to data (Coiera 2003, p. 13). In this respect, data can be considered as the building blocks of information.

There is considerable excitement presently over the ability of data to transform healthcare delivery especially for people with chronic conditions and high needs (Rumsfeld et al. 2016, pp. 351-2). This has resulted in increased efforts to use administrative data for research, analysis and planning purposes. Administrative data refer to data sources collected for administrative purposes without specific research goals defined at the time of collection, which for the health sector includes medical records and insurance claims data (Benchimol 2015). However, the accumulation and availability of administrative data alone are not sufficient to inform healthcare approaches. Administrative data need to be transformed into accurate and reliable information to be reliably used to improve the delivery of health services including CDM programs. Features of administrative data and the original purpose for which data are collected are important considerations that influence data quality and the appropriateness of using a data source for secondary purposes (Curtis et al. 2014, p. 1183). Further review of the literature related to assessing data quality for use in health analytics is provided in Chapter 6.

Additionally, effectively using data collected in service delivery to inform health policy and planning often requires linking records from disparate data sources at the individual level, which builds a more comprehensive picture of a person’s health and healthcare journey (Weber et al. 2014, p. 2479). An increasing health system focus on CDM directs specific attention to the detailed processes of collecting, managing and sharing data across organisations and providers (Solberg et al. 2016, p. 495). Linking data sources are particularly pertinent for the PHI sector as they do not generate health data or have direct access to clinical information but instead, rely on both patients and healthcare providers to share data with them (Kohli & Tan 2016, p. 556). Issues pertaining to linking data in the healthcare sector is examined in more detail in the background to the data linkage study presented in Chapter 7. While the research in this thesis seeks to examine the role of the PHI sector in supporting the care of high-needs patients, it also analyses factors
influencing PHI funds in fulfilling their stated goals in CDM, specifically the challenges posed by the availability of quality health information.

2.10 Conclusion

Australia has a dual health insurance system, with a universal public insurance system existing alongside a regulated PHI system. A series of policy reforms have modified the role of the PHI sector in the Australian health system to encourage more people to take out PHI and also broaden the remit of insurers in the area of CDM. Best practice CDM models emphasise the importance of primary care, coordinating services and ensuring interventions are well targeted through effective use of data. These elements of best practice models challenge the Australian PHI sector due to its complementary role in funding health care alongside Medicare and the strict regulations on PHI coverage. As a result, the current and potential role of PHI in supporting the care of high-needs patients requires further examination. The next chapter outlines the mixed-method research design developed to explore this topic.
Chapter 3: Research methodology and design

The research presented in this thesis incorporates five studies conducted using both quantitative and qualitative research methods to analyse diverse data sources. This chapter introduces and provides the rationale for the research design, describing how the five studies fit together and complement each other in responding to the overarching research aim. Commencing with a methodological discussion, the chapter then provides an overview of the research design, the selection of data sources and ethical considerations in undertaking the research.

3.1 Research methodology

The research was designed with a genuine curiosity to understand the PHI sector’s current role in supporting high-needs patients in Australia’s health system as relatively little research has been conducted on this topic. After reviewing relevant international and Australian literature and discussing the current policy and operational context of the PHI sector with representatives working in the sector, it became apparent that many PHI funds were attempting to do more than simply pay benefits for a defined set of health services (the traditional function of insurers). Insurers are also attempting to more actively support members with chronic conditions to manage and improve their health with the aim of reducing utilisation of more costly health services, such as hospital admissions. This context influenced the approach taken to designing this research. Rather than simply looking at the insurer’s role from the perspective of insurance benefits paid, the research was designed to:

- Examine health service use for high-needs patients claimed on PHI;
- Investigate the approach taken by PHI funds to design and implement CDM strategies to support high-needs patients, and;
- Explore broader policy and contextual factors affecting the support provided by the PHI sector to high-needs patients such as the availability of health information on the insured population.

This research falls within the discipline of health services research that, “studies how social
factors, financing systems, organisational structures and processes, health technologies, and personal behaviours affect access to health care, the quality and cost of health care, and ultimately our health and wellbeing” (Lohr & Steinwachs 2002, p. 8). Consistent with the multi-disciplinary nature of health services research, this research draws on methods from epidemiology, information systems research and health policy and management research.

A mixed-methods research design was selected to comprehensively investigate the research topic using both quantitative and qualitative research methods in the research stages of data collection, analysis and interpretation. The research was designed with multiple data sources and methods to triangulate findings to more comprehensively understand the research problem (Creswell et al. 2004, p. 11). The research process combined exploratory and descriptive data analysis using quantitative data sources and qualitative methods of interviews and targeted literature reviews to complement and add depth to the quantitative research. The use of mixed-methods designs has gained popularity in health services research, due to the difficulty of fully answering a research question using one method (Creswell 2015; Guetterman et al. 2015). Based on the mixed-methods research categories developed by Creswell (2015), the research presented in this thesis most closely aligns with an explanatory sequential design. This type of research design commences with quantitative methods and is then followed by qualitative methods, which are used to help explain the quantitative results in more depth (Creswell 2015, p. 5).

3.2 Outline of mixed-methods design and rationale

The research design has three phases with five studies presented sequentially in Chapters 4 to 8 as depicted in Figure 3.1 below.
The first phase of the research seeks to understand health service utilisation patterns and clinical characteristics of high-needs patients through the analysis of insurance claims data. This research phase investigates the quality and comprehensiveness of insurance claims data for informing strategies to better support high-needs patients (Research questions 1 and 2, see Section 1.3.1 on page 20). The first study (reported in Chapter 4) was conducted to identify the demographic, admission and clinical characteristics of patients with the highest levels of hospital resource utilisation. The findings of this first study led to the selection of mental health conditions as the focus of analysis in the second study (reported in Chapter 5) as hospitalisations related to mental health conditions accounted for a large proportion of hospital use for high-need patients. The second study examines differences in service utilisation within this high-needs patient population and how insurers may use trends identified through claims data analysis to better understand and target interventions for specific groups.

At the end of the first research phase, it became apparent that limitations in PHI data sources could have an important impact on insurer decision-making in relation to CDM programs. Insurance
claims data do not provide information on hospital services not claimed on PHI or on most aspects of members’ non-hospital service utilisation. Additionally, analysis of hospital claims data found that diagnosis information was incomplete for many admissions to public hospitals. Public hospital admissions account for approximately 16% of all hospital admissions and a greater proportion of overnight admissions. This consideration triggered the second research phase.

The second research phase consists of the third study (reported in Chapter 6) that reviews the considerations for developing information systems for CDM to support high-needs patients. The study has a mixed methods design incorporating further analysis of insurance claims data for selected disease risk factors, a literature and policy review and group interviews. The study develops a conceptual framework of the key domains to consider in transforming data into useful information for CDM programs (Research question 3, see Section 1.3.1 on page 20). This framework is a key theoretical contribution of the thesis.

The third research phase comprises two studies that are strongly informed by, and expand upon, the earlier research phases. The conceptual framework developed in the third study (reported in Chapter 6) is used in the research design of the study presented in Chapter 7. In this study, insurance claims data from one PHI fund are combined with public hospital records from a LHD to examine the relative contribution of the PHI fund to funding hospital services for insured individuals, including high-needs patients (Research question 4, see Section 1.3.1 on page 20). This study provides a different perspective on the health services utilisation of a privately insured population compared to the earlier analysis using only insurance claims data. The analysis in the study reveals the extent of hospital care funded by PHI and by other government sources. This study describes the process, challenges and analytic results of combining multiple data sources to develop a more comprehensive understanding of health service use across the public and private sectors. This study is a methodological contribution of the thesis as it is the first time in Australia that a study has analysed the health service utilisation of a privately insured cohort with data linked from a PHI fund and a LHD.

The final study in Chapter 8 uses qualitative methods to explore insurer perspectives on their role
in supporting the care of high-needs patients. The study presents findings of earlier studies to insurer representatives including the hospitalisation patterns of high-needs patients and the limitations of insurance claims data for understanding the health status of the insured population. Study participants discuss and reflect on the impact of findings for both their insurance operations and the design of CDM programs. This study complements the findings of earlier studies through detailed examination of the approaches that insurers are taking to designing and implementing CDM programs and the factors influencing the design and implementation of these programs (Research question 5, see Section 1.3.1 on page 20).

3.3 Selection of data sources

The research presented in this thesis is situated in the operational context of the PHI sector. The research uses real-world administrative data and examines the benefits and challenges of using these data for research purposes. The use of administrative data for secondary purposes has many benefits including gaining access to data on a large population that would be infeasible to study using other research data collection methods.

However, there are also potential data limitations and the need to consider that breadth of data may come at the expense of depth or detail (Weber et al. 2014, p. 2479). Throughout the research process, the capabilities and limitations of using insurance claims data for the secondary purposes of informing health services policy and planning were investigated. Documenting the strengths, limitations and associated biases of individual data sources has been noted as a gap in the expanding field of research using administrative health data (Benchimol et al. 2015, p. 2).

The first phase of research sought to understand the health services use of a privately-insured high-needs patient population. Insurance claims data were selected as the primary data source analysed in the first research phase. Claims data contain administrative information relating to a hospital admission and clinical information including the diagnosis for which they sought care. These data are also the primary source of data used by PHI funds to identify target populations for CDM programs.
From a health system perspective, the role of the PHI sector also requires understanding broader health service utilisation of an insured population including when PHI is not used. A novel data linkage study was conducted that combined PHI claims and LHD hospital records for an insured population (Chapter 7). To complement administrative data analysis and expand on findings from earlier studies, interviews were conducted to gather information on the emerging role of insurers in supporting CDM programs (Chapter 8).

A description of the three data sources used in this research, and justification for their selection, is included in Table 3.1. Further information on data sources is provided in the methods section for each study presented in subsequent chapters.

### Table 3.1 Summary of data sources used in research

<table>
<thead>
<tr>
<th>Data source</th>
<th>Justification for selection</th>
<th>Data source characteristics</th>
<th>Limitations</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI claims data</td>
<td>Analyse hospital use of high-needs patients claimed on PHI and assess suitability of claims data for identifying high-needs patients</td>
<td>De-identified insurance claims data from 13 PHI funds for the period of 2009-2015</td>
<td>Only captures health service use claimed on PHI. Data are not completely recorded for some variables such as diagnosis.</td>
<td>Chapters 4, 5 &amp; 6</td>
</tr>
<tr>
<td>Linked PHI claims and public hospital data</td>
<td>Investigate the relative contribution of insurers to funding hospital use of high-needs patients</td>
<td>Linked, de-identified dataset containing public and private hospital use of an insured cohort from one PHI fund for the period 2010-2016</td>
<td>Only captures data relating to one PHI fund and one LHD. Does not capture public hospital use outside the LHD (estimated to be small)</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>Interview data</td>
<td>Explore perspectives of PHI funds on their role in supporting high-needs patients</td>
<td>Qualitative data collected via eight semi-structured telephone interviews</td>
<td>Relatively small sample size. Primarily, presents the perspective of smaller, non-profit PHI funds.</td>
<td>Chapter 8</td>
</tr>
</tbody>
</table>
3.4 Ethical considerations related to research design

The research reported in Chapters 4, 5 and 6 received ethics approval from the University of Wollongong and Illawarra Shoalhaven Local Health District (ISLHD) Health and Medical Human Research Ethics Committee (No: HE16/211). The ethics and research approval processes for the study presented in Chapter 7 were more complex and is described in Chapter 7. The study protocol for the research presented in Chapter 8 was reviewed by the University Institute that the PhD researcher is affiliated with, the Australian Health Services Research Institute (AHSRI). The study was deemed to be negligible risk research and thus exempted from ethical review.

In addition to specific ethics approvals for the research conducted, there are two broader ethical issues relating to the research design that deserve discussion and clarification. The first issue relates to the sensitivity of the data analysed. The research involves analyses of administrative data relating to a large population that did not provide specific consent for involvement in the research. A number of risk mitigation methods were implemented to address potential issues related to the sensitivity of the data analysed. First, datasets were de-identified and stripped of identifying information such as names, addresses and exact date of birth before researcher access was granted. Second, all analyses of administrative data were carried out in a secure access environment in which research outputs were vetted by an authorised individual before being released. Third, results presented in this thesis and submitted for journal publications were reviewed to ensure that there is no risk of individual re-identification, such as through the presentation of tables with small cell frequencies. Cell sizes less than five are not reported as per frequency rules for managing statistical disclosure risks (Australian Bureau of Statistics 2017). Fourth, for the linked data study, strict protocols were followed in the development of the linked dataset to protect individual privacy, described in Chapter 7.

The second ethical issue relates to the use and interpretation of the research findings by the project’s industry partner that works closely with a number of PHI funds. The risk that findings may be used to restrict insured individuals’ use of services or limit benefits paid is mitigated through industry regulation and the agreed topic of the research. The PHI industry operates under the principle of community rating that is enshrined in the Private Health Insurance Act 2007.
Community rating does not allow insurers to discriminate between individuals based on a range of characteristics including age, presence of chronic conditions and the frequency of hospital treatment. This includes charging differential premiums or restricting access to services for individuals with specific health characteristics.

Although there is legislation that mitigates the risk for individuals with PHI, there is the possibility that the research findings may be used to modify the inclusion or exclusion of benefits for certain services in insurance policies that may affect subgroups within the insured population. The actuarial process of health insurance policy development considers many different factors including the health profile and health services use of the insured membership. When designing the research and reporting on study findings, the researcher focussed on results relevant to the agreed topic of the research. The agreed topic was to better understand the role of the PHI sector in supporting the care of high-needs patients and identify groups within the privately insured population that may be better served by improved targeting or alignment of services. In relation to this risk, it should be noted that all PHI funds associated with the industry partner of this research are not-for-profit companies. They are not publicly listed companies with shareholders that may expect dividends to be paid from company profits.

3.5 Conclusion

This chapter provides context to the studies presented in the subsequent chapters by describing the methodology and the approach taken to designing the research. The chapter provides the rationale for the five studies and explains the links between the studies and how they contribute to responding to the overall research aim. This research project is designed to take advantage of available administrative data sources but seeks to assess the quality of these data sources for analysis for secondary purposes. Analysis of administrative data is complemented with additional studies using qualitative data sources. Finally, the context of this research has some distinct ethical issues that have been considered in the design and conduct of the research to ensure that the risk of indirect harm to individuals as a result of the research is minimised.
Chapter 4: Examining hospital utilisation patterns of high-needs patients using PHI claims data

The study presented in this chapter describes the demographic, hospital admission and clinical characteristics for high-needs patients based on three measures of resource utilisation. This study is part of the first phase of research described in Section 3.2 and Figure 3.1 on page 42. Using PHI claims data described in Table 3.1 on page 45, the top 1% of hospital users in this dataset were selected and compared based on three measures of resource utilisation – number of admissions, total bed days and total insurance benefits paid. The study is foundational to the further studies presented in this thesis and its findings improve knowledge on the subgroup within the insured population with the highest healthcare needs including the frequency, duration and reasons for seeking hospital care.

4.1 Study background

As described in Chapter 2, previous Australian research has compared the health services utilisation of people with and without PHI for a range of conditions and interventions. People with PHI have been found to have higher levels of health service utilisation than those without PHI, particularly for surgical procedures (Brameld et al. 2006, p. 96; Hindle & McAuley 2004, p. 121).

Although critiques of government policies that provide financial subsidies to the PHI industry are plentiful (Butler 2002; Duckett & Jackson 2000; Eckermann et al. 2016; Thomas 2012), there has been surprisingly little research that details the patterns of hospital utilisation associated with PHI, and none that looks at the demographic, hospital admission and clinical characteristics associated with the highest use of hospital resources among the insured population.

International research on CDM programs suggests that targeting those most at risk is an important implementation strategy to ensure that programs are most effective, from both a health outcomes and cost perspective (Aljutaili et al. 2014, p. 1; Russell 2009, p. 45). Although PHI funds in Australia generally do not have detailed health and medical information on their members, they do have information on hospital admissions used for the payment of insurance claims. By
investigating the patterns of hospital resource utilisation among the insured population, results could inform CDM and other support strategies by identifying the group of individuals that has the highest level of resource utilisation and the conditions for which people are seeking care.

To create a profile of the high-needs population within the insured population, this study selected and compared three top-1% samples using three different measures of resource utilisation — number of admissions, total bed days and total benefits paid. These three measures are commonly used as proxy measures to identify high-needs patients (Long et al. 2017, p. 2). These measures have been used in a range of studies in both Australia and internationally to measure resource utilisation but have generally not been used together (Cheng et al. 2014; Harris et al. 2016; Roos et al. 2003; Wodchis et al. 2016).

4.2 Methods

4.2.1 Data sources

This study used insurance claims data from 13 Australian PHI funds. The dataset covered a period of more than five years, with the earliest hospital discharge date being 1 September 2009 and the latest date being 2 June 2015. The dataset contained 1,387,173 admissions relating to 405,428 individuals. The claims dataset is primarily comprised of information provided by hospitals to facilitate the payment of insurance claims such as admission date, length of stay and clinical services provided. Diagnostic and clinical information are generated by hospital clinical coders based on medical records. Insurer records may be supplemented by medical practitioners, allied health professionals and patients who provide details on services provided and billing information.

The dataset included items at three levels relating to the individual patient, hospital admission and insurance claim. The data were de-identified prior to researcher analysis with original identifiers removed from the dataset and replaced with encrypted identifiers to protect the privacy of individuals, PHI funds and hospitals. The variables used in the analysis were:

- **Individual patient information**: person identifier, fund identifier, year of birth, sex
- **Admission administrative information**: admission identifier, date of admission, date of
separation, hospital type, same-day status

- **Admission clinical information**: diagnosis, code index (code index of 1 used to indicate principal diagnosis)
- **Claims information**: benefits paid (used to derive total insurer benefits paid per person).

The level of insurance cover held by each individual was not available so the precise impact of different types of PHI policies on the services claimed is not known. However, there is no reason to suspect that the level of insurance cover would result in systematic bias in the analysis conducted in this study.

### 4.2.2 Cohort selection

From the full study population, three cohorts were identified as the top 1% of users based on hospital resource utilisation defined by total number of admissions, total bed days or total benefits paid. Table 4.1 provides further information on the method of calculation and selection criteria for each of the high-needs cohorts. As 405,428 people had a hospital admission in the study period, a 1% sample is 4,054 people. Due to the number of people that shared cut-off values for admissions and length of stay, the three cohort sizes vary in size. The cohort sizes are included in Table 4.2.

#### Table 4.1 Selection criteria for high-needs cohorts

<table>
<thead>
<tr>
<th>High-needs cohort</th>
<th>Method of calculation</th>
<th>Selection criteria for inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-admissions</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Sum the total number of admissions per individual</td>
<td>Individuals with &gt;28 admissions in the study period</td>
</tr>
<tr>
<td><strong>High-bed-days</strong></td>
<td>Calculate length of stay for each admission using admission and separation data&lt;sup&gt;1&lt;/sup&gt;. Create total bed days for each individual by summing length of stay for each admission</td>
<td>Individuals with &gt;98 bed days in the study period</td>
</tr>
<tr>
<td><strong>High-cost</strong></td>
<td>Sum all benefits paid for each individual with a hospital admission</td>
<td>Individuals with total benefits paid &gt;A$87,623 in the study period</td>
</tr>
</tbody>
</table>

<sup>1</sup>A hospital admission in which the admission and separation date occurred on the same day was allocated a length of stay of one day. This is consistent with methods used by the AIHW for hospital statistics (AIHW 2016).
4.2.3 Data limitations

A limitation of the dataset used for this analysis is the completeness of clinical information on diagnosis, particularly relating to public hospital admissions. The analysis uses insurance claims data sent to PHI funds as part of the Hospital Casemix Protocol (HCP) collection. The HCP is the national standard for information on privately insured patients admitted to hospital, provided by hospitals to both PHI funds and the Australian Government. Historically, public hospitals have only been required to provide information used to pay the insurance claim rather than the complete set of HCP data to insurers. This arrangement has been modified from 1 July 2018 with public hospitals being required to provide the full set of HCP for privately insured admissions to PHI funds (Department of Health 2018a). However, this limitation on HCP data on public hospital admissions still applies to the insurance claims data analysed in this research and this issue has been noted by other researchers using data obtained directly from another Australian PHI fund (Xie et al. 2015, p. 1226). Although admission administrative information for public hospitals was complete, admission clinical information was only 48% complete. As a result, public hospital information was excluded from the analysis of clinical information and the results presented on the most common diagnosis categories for the study population only relate to admissions to private hospitals.

4.2.4 Statistical analysis

After cohort selection, descriptive statistics were generated to profile the three high-needs cohorts and the full study population. For demographic statistics, sex and age distribution of the cohorts were analysed. Hospital admissions were analysed by hospital type (public hospital or private hospital, including private day hospitals) and by same-day or overnight admission status. Where data were available, the principal diagnosis of each private hospital admission was investigated (principal diagnosis data were available for 95.9% of private hospital admissions). The percentage of hospital admissions included in the clinical profile is detailed in Table 4.2.

The principal diagnosis for each admission was grouped according to the 21 chapters of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision,
Australian Modification (ICD-10-AM) (Australian Consortium for Classification Development (ACCD 2018a). For all cohorts, Chapter 21 (Factors affecting health status and contact with health services) had the highest proportion of admissions. Due to the heterogeneous nature of this ICD-10-AM chapter, specific ICD-10-AM codes for principal diagnosis for this chapter were further investigated. It was found that three ICD-10-AM codes (Z509: care involving use of rehabilitation procedure, unspecified, Z511: pharmacotherapy session for neoplasm, Z491: extracorporeal dialysis) made up the majority of Chapter 21 entries (more than 90% for the three high-needs cohorts). Although these codes do not represent specific health conditions, there are circumstances in which the Australian coding standards require specific therapies or interventions to be coded as the principal diagnosis, rather than a health condition (National Casemix and Classification Centre (NCCC) 2013). The coding of these three items represents three such circumstances. These three codes were treated as their own diagnosis grouping in the clinical profile analysis due to the large proportion of admissions in which they were listed as the principal diagnosis.

The resource utilisation statistics for each high-needs cohort were then compared with those of the full study population. Finally, overlap in individual membership of the three cohorts was investigated by identifying the common individuals that appeared in each high-needs cohort based on assigned person identifiers. All statistical analysis was performed using R version 3.2.2 (The R Foundation, 2018).

4.3 Results

4.3.1. Demographic and hospital admission profile of high-needs cohorts

Table 4.2 summarises key demographic and hospital admission characteristics of each of the three high-needs cohorts and the full study population. As may be expected, the high-needs cohorts are older than the full study population with approximately double the proportion of individuals aged 65 years and over (high-needs cohorts ranged from 60-72% of individuals aged 65 years and over compared with 32% for the full study population). The high-cost cohort has the highest proportion of individuals aged 65 years and over at 72%. There are a greater proportion of females in the high-admissions and high-bed-days cohorts compared to the full study population.
Each of the high-needs cohorts has a higher proportion of admissions to public hospitals compared to the full study population (16% of all admissions). For the high-bed-days and high-cost cohorts, public hospital admissions as a proportion of total hospital admissions represent approximately one-quarter of all admissions (27% and 24% respectively). The proportion of same-day admissions for the high-needs cohorts is higher than the total study population. The highest proportion of same-day admissions is for the high-admission cohort, with 80% of their admissions being same-day.

Table 4.2 Demographic and hospital admission characteristics of high-needs cohorts and full study population

<table>
<thead>
<tr>
<th></th>
<th>Full study population</th>
<th>High-admissions</th>
<th>High-bed-days</th>
<th>High-cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort size</td>
<td>405,428</td>
<td>4,225</td>
<td>4,098</td>
<td>4,055</td>
</tr>
<tr>
<td>Median age (mean)</td>
<td>56 years (51.3)</td>
<td>68 years (65.1)</td>
<td>72 years (67.9)</td>
<td>73 years (70.0)</td>
</tr>
<tr>
<td>Proportion aged 65 years and over</td>
<td>31.6%</td>
<td>59.5%</td>
<td>64.9%</td>
<td>72.3%</td>
</tr>
<tr>
<td>Proportion female</td>
<td>55.4%</td>
<td>57.6%</td>
<td>58.2%</td>
<td>49.8%</td>
</tr>
<tr>
<td><strong>Hospital admission characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of hospital admissions</td>
<td>1,387,173</td>
<td>263,322</td>
<td>187,407</td>
<td>158,865</td>
</tr>
<tr>
<td>Proportion public hospital</td>
<td>16.0%</td>
<td>20.5%</td>
<td>27.4%</td>
<td>24.0%</td>
</tr>
<tr>
<td>Proportion same-day admissions</td>
<td>60.4%</td>
<td>80.3%</td>
<td>70.7%</td>
<td>67.1%</td>
</tr>
<tr>
<td>Number of hospital admissions used in clinical profile (% of total)¹</td>
<td>1,109,154 (80.0%)</td>
<td>185,514 (70.5%)</td>
<td>116,800 (62.3%)</td>
<td>115,032 (72.4%)</td>
</tr>
</tbody>
</table>

¹ Public hospital information was excluded from the analysis of clinical information.
4.3.2 Clinical profile of high-needs cohorts

Figure 4.1 shows the top five principal diagnosis categories for hospital admissions to a private facility for each of the high-needs cohorts and the total study population where data were available.

Figure 4.1 Top five principal diagnosis categories for each high-needs cohort and total study population for private hospital admissions (based on ICD-10-AM chapters (ACCD 2018a)).

The same five categories account for the top principal diagnoses for admissions in all three high-needs cohorts – mental health, dialysis, rehabilitation, pharmacotherapy for neoplasms, and neoplasms (principal diagnosis other than pharmacotherapy for neoplasms). With the exception of mental health and dialysis, the same principal diagnosis categories are also represented in the top five categories for the total study population. Mental-health-related conditions account for the highest proportion of admissions in all high-needs cohorts, but if the categories of pharmacotherapy for neoplasms and neoplasms are combined then cancer-related diagnoses are responsible for the highest proportion of admissions for the high-admission and high-cost cohorts.
Although there are 21 ICD-10-AM chapters, the top five principal diagnosis categories, from only three chapters, make up a remarkably high proportion of all admissions in the high-needs cohorts – 67.8% for high-cost, 74.4% for high-admission and 78.1% for high-bed-days.

4.3.3 The contribution of high-needs cohorts to overall resource utilisation

The high-needs cohorts represent the top 1% of individuals using the most hospital resources however measured, but they account for much more than 1% of total resource utilisation. The highest proportion overall is for bed days, with the high-bed-days cohort representing 21.2% of total bed days. The high-admission cohort represents 19.0% of total admissions and the high-cost cohort represents 13.3% of total costs paid by the insurers.

4.3.4 The relationship between the three measures of high resource utilisation

Figure 4.2 depicts the relationship between each of the three high-needs cohorts and the degree of overlapping membership of the three cohorts. Within the three high-needs cohorts, there are 8,199 unique individuals. Thirteen percent of individuals are represented in all three high-needs cohorts \( (n = 1,106) \) and 24% of individuals are represented in two of the three cohorts \( (n = 1,965) \). There is greater overlap in membership of the high-cost and high-bed-days cohorts with 15% of the individuals represented in both cohorts, compared to only 7% of individuals in both the high-cost and high-admission cohorts and only 2% of individuals in both the high-bed-days and the high-admission cohorts. Almost one third of people (29%) are only represented in the high-admissions cohort \( (n = 2,359) \). This finding may reflect a greater number of same-day visits for the high-admission cohort that have the shortest length of stay and are less resource-intensive resulting in less overlap among group members with the high-bed-days and high-cost cohorts.

Figure 4.2 demonstrates a high degree of variation in resource utilisation even within the top 1% cohorts. The 13% of individuals who are represented in all three high-needs cohorts have an average of 103 hospital admissions in the study period, more than 10 times the number of admissions of those individuals that are represented only in the high-cost cohort (average of 12
admissions) or only in the high-bed-days cohorts (average of 11 admissions).

Similarly, the subgroup of individuals represented in all three high-needs cohorts has an average of 238 bed days in the study period, which is four times the number of bed days of those individuals represented only in the high-admission cohort (average of 59 bed days) or only in the high-cost cohort (average of 53 bed days).

With respect to benefits paid, the average amount of benefits paid for the group represented in all three high-needs cohorts was highest at $159,832 (Australian dollars). This is almost four times the average benefits paid for individuals in the high-admission cohort only ($41,864) and two and half times more than the average for the individuals represented in the high-bed-days cohort only ($61,513).

Figure 4.2 Individuals in each high-needs cohort as a proportion of the total number of individuals in the three high-needs cohorts (Number of individuals (n), mean admissions, benefits (A$) and bed days for specific subgroups included).
4.4 Discussion

This study examines the demographic, hospital admission and clinical characteristics associated with the highest levels of hospital resource utilisation among a large privately insured cohort. Despite some differences in the demographic and admission characteristics of the three high-needs cohorts, the same top five principal diagnosis categories are found for each cohort and for each cohort, they account for more than two thirds of hospital admissions.

The study results suggest that the highest users of hospital resources have a distinct profile. The highest levels of resources are being used for a narrow range of health conditions and use is highly concentrated within a small group of individuals accounting for a large proportion of the total resource utilisation. These results are consistent with research on a Victorian public health organisation in which it was found that 20% of costs are spent by 3% of the population (Heslop et al. 2005, p. 232). Mental health conditions were strongly represented among the high-needs groups in this study and were selected as the condition for detailed analysis of patterns of service utilisation. This analysis is presented in Chapter 5. The coverage of mental health treatment by PHI funds has received both policy and media attention with government reforms for the PHI sector announced in October 2017 including several measures related specifically to mental health (Department of Health 2018d).

Although previous studies have examined differences in demographic and hospitalisation characteristics between those with and without PHI in Australia, the differences within the privately insured population has not been explored in detail. As might be expected, those with the highest levels of hospital resource utilisation are, on average, older than the general insured population. They also have a higher rate of admissions to public hospitals and a higher rate of same-day admissions.

The higher rate of public hospital admissions may be influenced by several factors including a higher rate of admission via emergency department presentations (which are located primarily in public hospitals); previous selection of PHI in a public hospital making it more likely that the payment category is selected on a subsequent admission; or the location in which services were
provided, such as rural and regional areas that have less private hospitals.

Few studies have compared the three measures of hospital resource utilisation used in this study. Similar to the present study but for a different outcome of interest, a recent study by Cheng and colleagues (2014) also found that using different hospital resource utilisation measures – admission numbers, bed days and costs – produced similar results in relation to public and private hospital utilisation for heart disease patients. The degree of cohort membership overlap between the different high-needs cohorts may explain the similar results between resource utilisation measures.

The profile reported in this study complements national hospitalisation statistics that analyse the use of PHI for hospital admissions in Australia (AIHW 2017). This study focuses on the top 1% of patients with PHI and the conditions that patients are seeking treatment for in the private sector. A notable finding in this study is that the proportion of same-day admissions for each of the high-needs cohorts is higher than the rate for the full study population. Although this in part reflects the frequency with which some services need to be delivered (for example, dialysis several times per week), it also reflects the high proportion of people requiring frequent, but usually time-limited, same-day services such as mental health programs, rehabilitation and chemotherapy. Although the clinical profile is based on admissions to private hospitals, which have higher rates of surgical procedures compared to public hospitals (AIHW 2016), the top five categories for the high-needs cohorts represent conditions requiring primarily non-surgical interventions.

There is a strong focus within the Australian health sector at present on reducing potentially preventable hospitalisations and moving care for certain chronic conditions outside of hospitals to the community (AIHW 2018d). Although the results of both insurer- and government-funded CDM programs in Australia have been mixed (Billot et al. 2016; Hamar et al. 2015; Morello et al. 2016), the findings of the present study indicate that the highest users of hospital resources are seeking services for a narrow range of conditions that are not the target of traditional CDM programs. However, frequent hospital admissions are often a key selection criterion used by PHI funds to target individuals for CDM enrolment. The findings of this study highlight the difference
between potentially preventable hospitalisations and potentially preventable conditions. The major reasons for accessing health services in the top 1% of privately insured hospital users in this study – including chemotherapy, dialysis and most rehabilitation – are not preventable. However, the mode of treatment may be modified, for example from overnight to same-day or from same-day to outpatient care.

The majority of hospital admissions for the high-needs cohorts are on a same-day basis, which raises questions as to how, and if, admissions could be further reduced or made more efficient. Although only a narrow set of health conditions account for the majority of hospital admissions among high-needs groups, these conditions relate to a diverse set of care needs so different strategies will likely be required. This is similar to the conclusion drawn by Wodchis and colleagues in a recent study of high health costs in Canada (Wodchis et al. 2016, p. 187). Insurer approaches to designing and evaluating CDM programs and support strategies for high-needs patients are further examined in Chapter 8.

A caveat of this study is that it used insurance claims data from a group of PHI funds so was not able to investigate hospital admissions for the cohort as a public patient and there were gaps in the clinical information available for public hospital admissions claimed on PHI. The study presented in Chapter 7 examines hospital utilisation using linked insurance claims and public hospital data sources to capture missing information on public hospital use for a smaller insured cohort.

The variation in coverage of PHI policies, described in section 2.3 on page 27 should be considered in the interpretation of results of this study. In an effort to manage costs, an increasing proportion of PHI policies have exclusions or limits on the levels of services covered. This has been noted as a particular issue for mental health services. Although under the Private Health Insurance Act 2007, PHI funds are required to pay a minimum benefit for psychiatric services, benefits may be restricted for outpatient consultations following hospital discharge and outreach services in community setting (Royal Australian and New Zealand College of Psychiatrists 2017).

Another limitation of this study relates to the completeness of clinical information. It is worth
noting that the insurance claims data used for this study are the main source of data available to PHI funds for the purposes of understanding and targeting health interventions for their members. The fact that a substantial proportion of claims records have missing clinical information is an important finding, particularly as many insurers seek to offer CDM services to high-needs population groups. The implications of these information gaps and further exploration of mechanisms to incorporate additional information to inform CDM strategies are examined in Chapter 6.

4.5 Conclusion

Examining the profile of high-needs patients is an important first step in understanding differences in the health services utilisation and care needs of people with PHI. The study findings show that the high-needs patient groups have a narrow demographic and clinical profile. Four conditions, mental health, cancers, rehabilitation and dialysis, account for more than two thirds of hospital admissions in the high-needs groups. These conditions are not the target of traditional CDM programs and are less amenable to preventive measures. Using claims data to identify individuals with conditions that are the target of traditional CDM programs is the focus of the first part of the study presented in Chapter 6. The findings suggest that different strategies may be required to target the high-needs patients identified in this study. The study presented in the next chapter builds on the findings of the study presented in this chapter by investigating detailed service use patterns for one high-needs group, individuals with mental health-related treatment claimed on PHI.
Chapter 5: Utilisation patterns of mental health services claimed on PHI

The study presented in this chapter analyses insurance claims data to examine the type, the organisation and the frequency of mental health services accessed by patients and claimed on PHI. Mental health conditions were selected as the focus condition because they were found to be one of the top conditions for which high-needs patients sought hospital treatment claimed on PHI in Chapter 4. This chapter presents the second study of Phase 2 (see Section 3.2 and Figure 3.1 on page 42). The study also assesses data quality including the challenges in analysing and interpreting insurance claims data to better understand mental health service utilisation.

5.1 Study background

The term “mental health condition” refers to a diverse spectrum of disorders including anxiety, depression, substance use disorders and schizophrenia. These conditions vary in their severity, duration and prevalence in the general population. Some people living with a mental health condition require care over a long period of time provided by health professionals in both hospital and community settings, due to the chronic and persistent nature of many mental health conditions.

In Australia’s mixed public-private health insurance and service delivery system, mental health care is funded by both government and private sources through PHI and patient contributions. Although Australia dedicates a greater level of resources to mental health care than many other countries (Saxena et al. 2007), national figures report only 65% of people with a mental health disorder classified as severe accessed health services for the issue in the previous 12 months (Department of Health 2013). As characterised by the model of health service use described in Section 2.6 on page 33, a range of factors influences the utilisation of health services (Aday & Andersen 1974; Andersen et al. 2014). The influence of contextual factors such as the policies, financing and organisation of the health system that enable or impede access to care frames the analysis and measurement of utilisation patterns in this study.
Mental health services funded by PHI fall into two categories – hospital-based services (both overnight and same-day admissions) and general services such as psychologist consultations. Due to regulatory arrangements, there are a number of mental health services that PHI cannot cover including medical services provided by psychiatrists and GPs outside of hospitals. Additionally, costs for medication to manage mental health conditions are not paid by PHI due to the existence of the Pharmaceutical Benefits Scheme as shown in Table 2.1 on page 26 that compares government-funded and PHI-funded health services.

Achieving more integrated planning and delivery of mental health care is a national priority but currently, there is relatively little known about mental health services delivered in the Australian private hospital sector (Department of Health 2017). Significant work has been done on standardising the collection and reporting of information on mental health care provided in Australia’s public sector through the development of the Australian Mental Health Care Classification (Independent Hospital Pricing Authority (IHPA) 2018) and the Key Performance Indicators for Australian Public Mental Health Services that measure the average length of admissions, delivery of follow-up care and readmission rates for services provided in the public sector (AIHW 2018e). The private sector does not publish this information and is lagging behind, despite growing activity in the sector. Mental health services delivered in the private sector need to be better understood, particularly hospital-based services, as private expenditure has increased steadily in recent years (AIHW 2018f) and PHI sector reforms introduced in October 2017 by the Australian Government may exacerbate the incentive for consumers to access hospital-based services. Regulation changes now allow people to upgrade their insurance policies for mental health treatment in hospitals without waiting periods, but there have been no changes to improve access to community-based mental health care (Rosenberg 2017).

PHI claims are a potential data source to provide information on private, hospital-based mental health service use. Under the Private Health Insurance Act 2007, hospital insurance policies must include a minimum benefit for mental health care. PHI funds cover 88% of private hospital activity for mental health conditions (AIHW 2017). Insurance claims data can also be used to analyse utilisation patterns over time at the patient-level, information that has not previously been
reported for patients accessing mental health care in private hospitals.

Building on the high-needs profile developed in Chapter 4, this study further investigates utilisation of mental health services of a privately insured cohort, focussing on the type and frequency of services accessed. Utilisation patterns are presented for hospital-based services, examining the demographic characteristics of patients accessing services and the average level of service utilisation per patient in terms of number of overnight admissions and same-day visits, length of stay per admission and insurer costs. This study compares:

1. **Demographic and hospitalisation characteristics of patients with mental health-related hospital claims:** The number of patients with mental health-related claims are identified and the characteristics of people with mental health-related hospital claims are compared to insured patients with other types of hospital claims.

2. **Differences in service utilisation patterns for patients with mental health-related hospital claims:** Trends in hospital claims for the group of patients with mental health-related hospitalisations are examined in relation to:
   a) Mental health-related and non-mental health-related hospital claims,
   b) Combinations of care for mental health-related hospitalisations, and;
   c) Mental health claims in the 28 days following an overnight admission discharge.

Following analysis, the implications of the profile findings and the appropriateness of using insurance claims data for analysing mental health service use, not only for research, but also for policy and planning decisions are considered. Assessing the appropriateness of using insurance claims data for the secondary purpose of understanding mental health service use is an important contribution of this study. Insurance claims data are appealing data sources for research and analysis because of their large size, their longitudinal perspective, and their episode-based information (Smeets et al. 2011, p. 428). However, inadequate attention is often given to the quality of administrative data sources, such as claims data, and the challenges to reliably use the data (Benchimol et al. 2013, p. 703).
5.2 Methods

5.2.1 Data sources and study population

De-identified hospital and general treatment insurance claims data from a group of 13 Australian PHI funds were analysed. PHI funds can pay benefits for services provided by psychologists outside of hospital settings as part of general treatment policies. Psychology claims were included in the analysis examining mental health-related claims following discharge from an overnight hospital admission (see (c) in Section 5.2.4). The insurance claims data extract used for this study was different to the data extract used in the study presented in Chapter 4 due to the need to have a common identifier to link hospital and general treatment claims datasets. The final dataset analysed included 236,910 patients with at least one hospital admission (574,589 admissions in total). The claims data related to individuals residing in all Australian states and territories for services received between 1 May 2014 and 30 April 2016 in more than 60 private hospitals. Each person and hospital admission had a unique identifier.

In this study, a “patient” is defined as a person accessing privately funded mental health services from a hospital during the study period. Privately funded services are those for which PHI funds pay a benefit. Overnight admissions and same-day visits are used to distinguish between the two main types of hospital services provided based on length of stay. In this study, mental health services include services treating people with drug and alcohol use disorders.

When referring to all hospital services, both overnight admissions and same-day visits, the term “mental health hospitalisation” is used. Same-day visits cover a range of services including individual consultations and group programs that may be provided, and classified, as outpatient or ambulatory services in the public hospital sector in Australia and in other countries (AIHW 2018g). Only private hospital utilisation was included to examine mental health service utilisation (see (b) in Section 5.2.4) due to differences in coding same-day visits in private and public hospitals. As shown in Figure 5.1, the majority of patients (97.8% or 3,137 patients) accessed mental health services in a private hospital.
5.2.2 Dataset preparation: Establishing the population with a hospital claim for mental health services within the insured population

Insurance claims were analysed using both cross-sectional and longitudinal analysis methods. Data analysis occurred in multiple stages described below. All statistical analysis was conducted using R version 3.2.2 (The R Foundation 2018).

Patient classification codes were used as the primary method to categorise the group of patients with a mental health-related hospitalisation. Claims records coded as “PY” denote a mental health-related (or psychiatric) hospitalisation. Although mental health diagnosis information recorded by Australian Refined Diagnosis Related Groups (AR-DRG) was included for some claims records (ACCD 2018b), this information was not consistently available for all claims records, so the analysis could not examine differences in utilisation patterns based on the type of mental health condition. AR-DRG information, where available, was used to check for missing mental health-related hospitalisations. Two additional hospitalisations were found by searching codes relating to mental health or drug and alcohol use, U40-U68: Mental diseases and disorders and V60-V64: Alcohol and drug use (ACCD 2018b). A full list of AR-DRG codes is included as Appendix 1. All patients with at least one overnight admission or same-day visit not categorised as mental health-related were included in the comparison group of patients without a mental health-related hospitalisation.

5.2.3 Demographic and hospitalisation characteristics of patients with mental health-related hospital claims

The demographic and hospital resource utilisation characteristics of the two groups were compared. The demographic variables analysed were sex, age and location of residence. Hospital resource utilisation was measured by the following indicators: number of same-day visits and overnight admissions per patient, average length of stay per admission and hospital costs paid by the insurer per patient. Same-day visits, where hospital admission and separation dates occur on the same day, were allocated a length of stay of one day consistent with methods for calculating national hospital statistics (AIHW 2016). A measure of bed days was calculated by summing the length of stay for overnight admissions for each patient. Annual measures for resource utilisation
were obtained by halving total results for the two-year study period. Pearson Chi-square (χ2) tests were used to compare categorical variables and Wilcoxon rank-sum (Mann-Whitney) tests were used for continuous variables, as variables were not normally distributed.

5.2.4 Differences in service use for patients with mental health-related hospital claims

a) Mental health-related and non-mental health-related claims

Hospital use for the group with at least one mental health-related hospital claim was analysed. Two groups were formed based on whether or not a patient had any non-mental health related hospitalisations in the study period. Demographic and hospitalisation characteristics were compared using the same statistical methods described in 5.2.3.

b) Combinations of care for mental health-related hospitalisations

Hospital use for the mental health group was further analysed with three groups formed according to whether a person claimed for only same-day visits, only overnight admissions or a combination of same-day visits and overnight hospital admissions in the study period. For the two groups with overnight admissions, hospital utilisation characteristics were compared using the same statistical methods described in 5.2.3. For the group with both overnight admissions and same-day visits, analysis was completed on the proportion of patients with their first hospitalisation in the study period as an overnight admission followed by a same-day visit versus patients with their first hospitalisation as a same-day visit followed by an overnight admission.

c) Mental health claims in the 28 days following an overnight admission discharge

To investigate claims following an overnight hospital admission, each patient’s first claim in the study period was investigated, recognising that the dataset covered a two-year period and patients may have multiple hospital claims during the study period. For patients with an overnight hospitalisation as their first admission in the dataset (n = 2,101, 67% of patients with a mental health-related hospitalisation), the type and timing of the next mental health-related claim was analysed, specifically whether the claim occurred within 28 days after discharge. Patients who were discharged from their first overnight admission within 28 days of the end of the study period
were excluded from analysis. Overnight admissions, same-day visits and community-based psychology services claimed on PHI general treatment policies were included in the analysis.

### 5.3 Results

**5.3.1 Mental health-related claims within the insured population**

Figure 5.1 shows the number of insured patients with a hospital claim and further categorises the group with mental health-related hospitalisations according to the type of services accessed. Only a small proportion (1.4%) of patients have a mental health-related hospitalisation, overwhelmingly in private hospitals. The majority of patients only claim for overnight admissions in the study period. Differences in patients’ use of privately funded mental health services are further described in Section 5.3.2, b) Combinations of care for mental health-related hospitalisations.

![Diagram of hospital claims categories](image)

**Figure 5.1 Study population with hospitalisations for 2014-2016 showing patients with mental health-related hospitalisations**
### 5.3.2 Demographic and hospitalisation characteristics of patients with mental health-related hospital claims

Table 5.1 compares demographic and hospital resource utilisation statistics for the group of patients with a mental health-related hospital claim (n = 3,209) and the comparison group with other types of hospital claims (n = 233,701).

Table 5.1 Descriptive statistics for patients with and without mental health-related hospitalisations

<table>
<thead>
<tr>
<th></th>
<th>Mental health hospitalisation (n = 3,209)</th>
<th>No mental health hospitalisation (n = 233,701)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>1,990 (62.0)</td>
<td>130,432 (55.8)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-24, n (%)</td>
<td>380 (11.8)</td>
<td>29,925 (12.8)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>25-34, n (%)</td>
<td>627 (19.5)</td>
<td>20,269 (8.7)</td>
<td></td>
</tr>
<tr>
<td>35-44, n (%)</td>
<td>587 (18.3)</td>
<td>24,015 (10.3)</td>
<td></td>
</tr>
<tr>
<td>45-54, n (%)</td>
<td>568 (17.7)</td>
<td>25,935 (11.1)</td>
<td></td>
</tr>
<tr>
<td>55-64, n (%)</td>
<td>559 (17.4)</td>
<td>47,501 (20.3)</td>
<td></td>
</tr>
<tr>
<td>65-74, n (%)</td>
<td>343 (10.7)</td>
<td>50,959 (21.8)</td>
<td></td>
</tr>
<tr>
<td>75+, n (%)</td>
<td>145 (4.5)</td>
<td>35,097 (15.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Location of residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New South Wales, n (%)</td>
<td>1,343 (41.9)</td>
<td>85,564 (36.6)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Victoria, n (%)</td>
<td>1,024 (31.9)</td>
<td>70,500 (30.2)</td>
<td></td>
</tr>
<tr>
<td>Queensland, n (%)</td>
<td>592 (18.4)</td>
<td>45,228 (19.4)</td>
<td></td>
</tr>
<tr>
<td>All other states and territories, n (%)</td>
<td>250 (7.8)</td>
<td>32,409 (13.9)</td>
<td></td>
</tr>
</tbody>
</table>
1b) Hospital resource utilisation characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mental health hospitalisation (n = 3,209)</th>
<th>No mental health hospitalisation (n = 233,701)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hospitalisations (two years), n</td>
<td>33,134</td>
<td>541,455</td>
<td></td>
</tr>
<tr>
<td>Overnight admissions, n (% total)</td>
<td>7,321 (22.1)</td>
<td>181,516 (33.5)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Same-day visits, n (% total)</td>
<td>25,813 (77.9)</td>
<td>359,939 (66.5)</td>
<td></td>
</tr>
<tr>
<td>Mean annual overnight admissions per patient, n (SD)</td>
<td>1.3 (1.2)</td>
<td>0.8 (0.6)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Mean annual same-day visits per patient, n (SD)</td>
<td>6.4 (8.9)</td>
<td>1.1 (3.6)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Mean length of stay for overnight admissions, days (SD)</td>
<td>15.0 (14.1)</td>
<td>4.6 (7.3)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Mean annual bed days for overnight admissions, days (SD)</td>
<td>19.7 (20.3)</td>
<td>3.6 (7.2)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Mean annual hospital costs paid by insurer, A$ (SD)</td>
<td>$13,192 (13,457)</td>
<td>$2,065 (4,346)</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

Abbreviations: SD: standard deviation.  

* a Pearson Chi-square (χ2) test used to compare categorical and proportional variables.  
  b Wilcoxon rank-sum (Mann-Whitney) test used to compare means of continuous variables.  
  c Mean calculated based on patients with an overnight admission (2,795 patients with mental health-related admissions and 115,910 patients with other admissions).  
  d Mean calculated based on patients with a same-day visit (2,021 patients with mental health-related visits and 162,907 patients with other visits).

The group with mental health-related hospital utilisation has a greater proportion of females and are also significantly younger. Only 32.6% of the group with a mental health-related hospital utilisation are aged 55 years and over compared to 57.1% of the group with other types of hospitalisations. Geographically, there are relatively more patients with a mental health-related hospital claim in New South Wales compared to other types of hospital claims, and relatively fewer patients from states and territories other than New South Wales, Victoria and Queensland with a mental health-related hospital claim compared to other types of hospital claims.

The mental health group has a significantly higher level of hospital use for all utilisation measures – number of admissions, length of stay per admission and costs to the insurer. Although the mental health group has a lower proportion of overnight admissions as a proportion of total admissions.
hospitalisation (22.1% compared to 33.5% for the group with other types of hospitalisations), the mental health group has significantly more overnight admissions in the study period than the group with other types of hospitalisations (an average of 1.3 overnight admissions per year compared to 0.8 admissions per year for the group with other types of hospitalisations). The mental health group has an annual average of 6.4 same-day visits compared to 1.1 for the group with other types of hospitalisations. The mental health group has an average length of stay for overnight admissions of 15.0 days compared to 4.6 days for the group with other types of hospitalisations. Additionally, on average, the annual number of bed days for overnight admissions for the mental health group is 19.7 days compared to 3.6 days for the group with other types of hospitalisations. Finally, mean annual hospital costs paid by the insurer are six times higher for the mental health group.

5.3.3 Differences in service use for patients with mental health-related hospital claims

a) Mental health-related and non-mental health-related claims

Table 5.2 compares demographic and hospital resource utilisation within the mental health group for two groups – patients with only mental health-related hospitalisations and patients with mental health-related and other hospitalisations. Just over half of the mental health group (1,633 patients, 51%) only claim for mental health-related hospitalisations. The group with only mental health-related hospitalisations are significantly younger and less likely to be female. Although the group with only mental health-related hospitalisations has a significantly longer length of stay per overnight admission and higher average annual number of same-day visits, the group with mental health-related and other hospitalisations has a significantly higher average number of overnight admissions per year, higher average number of bed days per year for overnight admissions and significantly higher average hospital costs paid by insurers per year. Overall, 64% of hospitalisations for the group with both mental health-related and other types of hospitalisations are mental health-related.
Table 5.2 Descriptive statistics for patients with mental health-related hospitalisations, with and without other types of hospitalisations

<table>
<thead>
<tr>
<th></th>
<th>Only mental health hospitalisations</th>
<th>Mental health and other hospitalisations</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 1,633)</td>
<td>(n = 1,576)</td>
<td></td>
</tr>
<tr>
<td>Femalea, n (%)</td>
<td>963 (59)</td>
<td>1,024 (65)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Mean ageb, years (SD)</td>
<td>42.2 (15.6)</td>
<td>49.1 (17.2)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Total hospitalisations (two years), n</td>
<td>12,473</td>
<td>20,661</td>
<td></td>
</tr>
<tr>
<td>Overnight admissions, n (% total)</td>
<td>2,288 (18)</td>
<td>5,031 (24)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Same-day visits, n (% total)</td>
<td>10,185 (82)</td>
<td>15,630 (76)</td>
<td></td>
</tr>
<tr>
<td>Mean annual overnight admissions per patient, n (SD)</td>
<td>0.9 (0.8)</td>
<td>1.7 (1.4)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mean annual same-day visits per patient, n (SD)</td>
<td>6.6 (7.7)</td>
<td>6.3 (9.6)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mean length of stay for overnight admissions, days (SD)</td>
<td>18.7 (13.5)</td>
<td>13.3 (14.1)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mean annual bed days for overnight admissions per patient, days (SD)</td>
<td>16.2 (15.5)</td>
<td>22.8 (23.3)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mean annual hospital costs paid by insurer, $ (SD)</td>
<td>$10,071 (10,599)</td>
<td>$16,425 (15,228)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Abbreviations: SD: standard deviation
a Pearson Chi-square (χ²) test used to compare categorical and proportional variables
b Wilcoxon rank-sum (Mann-Whitney) test used to compare means of continuous variables
c Mean calculated based on patients with an overnight admission (774 patients with only mental health-related hospitalisations and 1,248 patients with mental health-related and other hospitalisations)
d Mean calculated based on patients with a same-day visit (1,322 patients with only mental health-related hospitalisations and 1,472 patients with mental health-related and other hospitalisations).

b) Combinations of care for mental health-related hospitalisations

Categorising patients admitted to private hospitals according to the type of mental health-related hospitalisation claimed during the study period shows the majority of patients (52.6%) only claim for overnight admissions, 30.4% of patients claim for both same-day visits and overnight admissions and 17.0% of patients only claim for same-day visits. The number of patients for the three groups is shown in Figure 5.1. Eighty percent of all hospitalisations are same-day visits. For
the two groups with overnight admissions in the study period, the group of patients with both overnight admissions and same-day visits have significantly higher levels of service use with an average of 1.2 admissions per year (SD = 1.1) and an average of 20.1 days per overnight admission (SD = 14.1), compared to 0.9 admissions per year (SD = 0.9, p<0.01) and 17.8 days per overnight admission (SD = 13.9, p<0.01) for the overnight-only group.

For the 952 patients with both overnight admissions and same-day visits, 78% have an overnight admission occur first in the study period followed by a same-day visits and 22% have a same-day visit first followed by an overnight admission.

c) Mental health claims following an overnight admission discharge

Of the 2,101 patients with an overnight admission as their first hospitalisation during the study period, Figure 5.2 shows the majority of patients (68%) do not claim for additional mental health-related services on their PHI in the 28 days following discharge. Nineteen percent of patients claim for a same-day visit within 28 days and 12% of patients claim for another overnight admission. Only 1% of patients claim for a psychology consultation as their first claim after a hospital discharge within 28 days.

Figure 5.2 Service claims within 28 days after discharge from first overnight hospital admission

72
5.4 Discussion

In this privately insured population, the group of patients with mental health-related hospital claims only account for 1.4% of all patients with a hospital claim but have significantly higher levels of hospital utilisation compared to the group of patients with claims for other types of hospitalisations. Consistent with the findings of a recent study among patients in Tasmanian public hospitals that patients with a comorbidity of mental illness have a significantly longer length of stay for admissions related to five chronic conditions (Siddiqui et al. 2018), patients with both mental health-related and non-mental health-related hospitalisations have significantly higher levels of hospital utilisation in this study. Access to, and use of, appropriate ambulatory care targeting mental health and other presenting health conditions should be encouraged for this group.

The type of mental health-related services accessed varies across the insured population. Rather than most patients accessing both overnight admissions and same-day visits as would be expected if same-day visits were primarily provided as follow-up care in conjunction with treatment provided during overnight admissions, this study finds three distinct groups of service users – same-day visits only, overnight admissions only and a combination of same-day visits and overnight admissions. More than half of the patients with a mental health-related hospitalisation only claim for overnight admissions in the two-year study period and only one third of patients make an additional mental health-related PHI claim within 28 days after discharge from their first overnight admission in the study period.

5.4.1 Implications of study findings for research and planning

The findings from Chapter 4 identified mental health conditions as one of the top reasons for hospital claims among high-needs patients. Further analysis of mental health-related claims presented in this chapter reveals demographic and service utilisation differences within the group of patients with mental health-related hospitalisations that may inform intervention strategies. The groups with the highest levels of utilisation:

- Have both mental health and non-mental health-related hospital claims
• Claim for both overnight and same-day mental health-related hospitalisations.

The study findings report measures of utilisation including the type, combination and frequency of mental health services accessed by patients with PHI. It is more challenging to understand the specific factors associated with the utilisation patterns observed and the outcomes of the care received in private hospitals as discussed further in the next section, which focuses on the implications for research and planning.

*Interpreting factors contributing to observed service use patterns is challenging*

The study reveals information on the demographic characteristics of patients accessing private mental health services and patterns of mental health service use in private hospitals in Australia. The organisation of mental health service delivery in the private sector and the regulation of the PHI sector seem to affect utilisation of services but the specific influence of clinical, organisation and policy factors that may affect the use of mental health services cannot be ascertained due to limitations in the data collected by insurers. For example, the mix of claims for overnight and same-day hospitalisations, specifically the high proportion of patients with only overnight admission claims, may be affected by a number of different factors outlined in the Behavioural Model of Health Service Use – patient need, insurance policy coverage, hospital treatment policies or service availability (Aday & Andersen 1974; Andersen et al. 2014). All of these factors may be important contributors to mental health service use but the influence of these different factors on service utilisation cannot be distinguished using the claims data analysed.

*The fragmented funding of mental health care is reflected in the type of services claimed on PHI*

The data analysed reveals only a limited picture of the care journey of patients with mental health conditions. The limitations observed in this study reflect the complex financing mechanisms that people with a mental health condition and their carers have to navigate to access different forms of mental health care. The finding that only one third of patients made a mental health-related claim within 28 days after discharge is important. However, it cannot be interpreted that patients are not receiving any mental health services, just that they are not claimed on PHI. This is because the extent of Medicare-funded mental health care that privately insured people access is not known.
Ideally, patients would be connected with community-based support as part of hospital discharge regardless of funding arrangements, consistent with stepped care models (Cross & Hickie 2017), but the extent of this care coordination in practice cannot be assessed using PHI claims data alone.

A more comprehensive picture of mental health treatment could be built through analysing linked PHI and Medicare Benefits Schedule data. This analysis would capture community-based psychiatry services and mental health services funded through the government-funded Better Access scheme that funds a limited amount of GP-referred psychological care (Department of Health 2012). The feasibility and results of a pilot study linking insurance claims data and health data from a public sector organisation are reported in Chapter 7.

Claims data provide little information on the outcomes of mental health care

Monitoring care received following hospital discharge is difficult using claims data. There are no indicators of other outcomes of mental health care in claims data, despite the fact measures are collected for the private sector via the Australian Private Hospitals Association Private Psychiatric Hospitals Data Reporting and Analysis Service (known as PPHDRAS). The standardised measures of patients’ clinical status collected include the Health of the Nation Outcome Scale (HoNOS) administered by clinicians and the Mental Health Questionnaire-14 completed by consumers (Burgess et al. 2015). However, reports on these outcome measures for the private sector are released to the public irregularly and participation by private hospitals is voluntary (Australian Private Hospitals Association 2018). There is an opportunity to better understand outcomes of mental health care delivered in private hospitals through the longitudinal analysis of this data collection, although as for insurance claims data, data quality needs to be assessed.

Based on analyses using insurance claims data, PHI funds have little visibility of the mental health care that patients receive following hospital discharge. It is encouraging that a number of insurers have started to introduce mental health support programs for patients leaving hospital such as the MindStep program (Remedy Healthcare 2018). However, determining participant eligibility, assessing individual care needs and ensuring alignment with a patient’s other mental health care providers are important considerations for insurers offering these programs. Additionally, these
mental health support programs are generally short-term (lasting 6-12 weeks) so programs need to be evaluated to assess their impact on health outcomes and service use.

5.4.2 Caveats of analysis

This study has a number of limitations. This study used two years of insurance claims data (2014-2016) but does not account for service utilisation before or after that period. Additionally, clinical diagnoses were not consistently recorded in the claims dataset analysed so differences in patterns of service utilisation of patients with different types of mental health conditions could not be analysed. Research examining longitudinal service utilisation accessed by patients with mental health-related hospitalisations over a longer time period, differences in service use based on the type of mental health conditions for which care is sought and the factors influencing access to care would be valuable areas of future research.

5.5 Conclusion

Despite mental health conditions being one of the top reasons for hospital use among high-needs patients, detailed information on utilisation patterns of mental health services claimed on PHI is lacking. Analysing insurance claims reveals information on mental health-related hospitalisations but information on community-based care is not available due to the regulated role of the PHI sector in Australia. Examining insurance claims data from a sample of Australian PHI funds shows that the proportion of the insured population claiming for mental health-related hospital services is small but hospital resource utilisation for this group is much higher than for people with insurance claims for other types of hospitalisations.

Investigating the potential factors contributing to patterns of mental health-related hospital claims, such as the large proportion of patients that only claim for overnight admissions, is challenging due to the scope of claims data. The factors contributing to trends in mental health service utilisation claimed on PHI, and the performance and outcomes of care, needs to be better understood given the high levels of hospital resource utilisation. Linking multiple data sources on service use and outcomes is required as insurance claims data only provide information on a
limited part of service utilisation. The study presented in the next chapter picks up on this topic.

The study examines considerations for developing information systems using multiple data sources to support people with chronic conditions and high healthcare needs.
Chapter 6: Analysing data and information system requirements for CDM programs of health insurers

This chapter presents a mixed-methods study that examines methods for selecting chronic disease groups from PHI claims data and reviews the requirements for developing information systems using multiple data sources to inform CDM interventions. This chapter presents the second phase of research described in Section 3.2 and Figure 3.1 on page 42. As a key theoretical contribution of this thesis, a conceptual framework is developed in this study and the feasibility of applying the framework to the Australian PHI sector is discussed.

6.1 Study background

The findings of the studies presented in Chapters 4 and 5 reveal limitations in using PHI claims data to understand the health service utilisation of high-needs patients, providing only a partial view of a patient’s health service journey due to the regulated scope of insurance coverage. The PHI sector is increasingly offering new CDM services targeted at high-need patients and people with, or at risk of developing, chronic conditions. However, evidence suggests that comprehensive and high quality health information is crucial for CDM interventions. Implementing CDM programs typically involves using risk categorisation, or stratification, which targets individuals, based on their care needs, with different levels of support. Risk stratification is an important implementation strategy to ensure that CDM programs are effective, from both a health outcomes and cost perspective (Aljutaili et al. 2014; Russell 2009).

Administrative health data are increasingly used to identify target populations for CDM programs. This method is already used among PHI funds in Australia due to the availability of hospital claims data (Hamar et al. 2015; Morello et al. 2016). The first phase of research in this chapter expands on the assessment of claims data from Chapters 4 and 5 relating to health service utilisation. The research examines the suitability of hospital claims data for selecting target groups for CDM programs.

Given that insurance claims data offer only a partial view of health service utilisation and people
at-risk of developing chronic conditions are unlikely to be identified through hospital claims records alone, the second phase of the research in this study considers the data and information system requirements for insurers seeking to provide CDM programs and build a more comprehensive profile of the health status of the insured population. For successful implementation, it is important to not only consider sources of data but also, how data sources can be meaningfully combined and analysed to inform CDM decisions.

This chapter is divided into three sections following the three research stages described in 6.2 below:

**Stage 1**: Selecting chronic disease groups using insurance claims data

**Stage 2**: Identifying the key domains in developing information systems for CDM using multiple data sources

**Stage 3**: Developing a framework for designing and implementing information systems for CDM using multiple data sources.

### 6.2 Study design

The study has a sequential, mixed methods design, as shown in Figure 6.1. The first research stage uses quantitative methods, examining methods of selecting target populations for CDM interventions from insurance claims data for three common chronic conditions – diabetes, cardiovascular disease and mental health conditions. The analysis assesses data quality features including how well selection methods predict future hospital use.

The second research stage uses qualitative methods including instructed interviews with PHI fund representatives and a targeted review of published and grey literature to identify key domains in assessing and using data sources for CDM decision-making. The third interpretive stage pulls together the four domains identified in the second research stage into a conceptual framework for developing information systems for CDM using multiple data sources. The third stage also considers implementation of the framework in the PHI sector to improve the quality of information available to inform CDM decisions.
6.3 Stage 1: Selecting chronic disease groups using insurance claims data

This stage assesses the suitability of using hospital claims data to select CDM groups. The three chronic conditions, diabetes, cardiovascular disease and mental health conditions, were selected because the systems of care and clinical symptoms for each condition differ so it was anticipated there could be differences in the classification of the three conditions in hospital claims data. Cardiovascular disease and diabetes are often the focus of CDM programs of PHI funds in Australia (Hamar et al. 2015, p. 2). However, the two chronic conditions typically require accessing different types of health care.

Unlike cardiovascular disease, diabetes is generally not the primary cause of a hospital admission but is associated with a range of health complications. In Australia, there were over 1 million diabetes-related hospitalisations in 2015-16 but in only 5% of cases was diabetes listed as the principal diagnosis (AIHW 2018h). In comparison, there were a similar number of hospitalisations related to cardiovascular disease in 2015-16 but cardiovascular disease was listed as the principal diagnosis in almost 50% of cases (AIHW 2018i).

Mental health conditions are treated differently to other chronic health conditions, with different risk assessment, treatment interventions and in some circumstances, entirely separate healthcare facilities. In Australia, mental health conditions have not traditionally been the target of CDM programs, although mental health conditions account for a large number of hospital claims among patients with the highest levels of hospital use, as shown in Chapters 4 and 5.
In addition to analysing diagnosis codes for specific chronic conditions in hospital claims data, many chronic conditions share common, preventable risk factors that include smoking, harmful alcohol use, poor nutrition and physical inactivity that lead to biomedical risk factors for the development of chronic conditions such as obesity, hypertension and high cholesterol levels (Moodie et al. 2016, p. 223). Clinical codes exist for these risk factors and they can be added as codes in hospital admission records if it is expected that the risk factors are affecting the health status of the patient. The extent to which codes for chronic disease risk factors are recorded in hospital claims records is not known. Previous research was conducted in the United States examining the utilisation of ICD diagnosis codes in hospital admission data to identify people with unmet social needs. This research found these codes were infrequently used (Torres et al. 2017).

6.3.1 Methods: Data sources and analysis

Hospital claims data for a two-year period between 1 May 2013 and 30 April 2015 were analysed, using a two-year subset of the data described in Chapter 4. The data subset contained 573,684 hospital admissions relating to 234,780 individuals, capturing both same-day and overnight hospitalisations. Eligible admissions were classified according to admission start date with admissions that commenced on or after 1 May 2013 and on or before 30 April 2015 included in the study dataset.

Disease diagnosis information is contained in two different variables – diagnosis payment code for each hospital admission (AR-DRG), and diagnosis of admission coded using ICD-10-AM (ACCD 2018a). The method used to select the three chronic condition groups used both diagnosis variables, searching for either relevant AR-DRG or ICD-10-AM codes (for principal and additional diagnoses) for each condition in hospital claims data.

In addition to diagnosis codes, Chapter 21 of ICD-10-AM (Factors affecting health status and contact with health services) includes specific sub-groupings that may provide indicators of disease risk. The broad grouping of codes investigated were Z55–Z65: persons with potential health hazards related to socioeconomic and psychosocial circumstances and Z70–Z76: persons
encountering health services in other circumstances. The specific codes used to identify each chronic condition and additional risk factors are listed in Table 6.1.

<table>
<thead>
<tr>
<th>Table 6.1 Disease codes used to identify target chronic condition populations and disease risk and social factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AR-DRG codes</strong></td>
</tr>
<tr>
<td><strong>Diabetes</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Mental health disorders</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Cardiovascular disease</strong></td>
</tr>
<tr>
<td><strong>Disease risk and social factors</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

¹ F00-F99 includes disorders related to alcohol and drug use

A one-year data sample (1 May 2013 - 30 April 2014) was used to calculate the number of hospital admissions and unique individuals identified for each chronic condition. To assess how well the selection method predicts future hospital use, the proportion of people identified in 2013-14 who were also hospitalised in 2014-15 was compared for the three conditions. For 2014-15, both disease-specific hospitalisations and all-cause hospitalisations were calculated.

For the analysis of disease risk and social factors, the full two-year sample of data was used to identify the number of admissions in which the five specific disease risk indicators and the broader social risk sub-grouping were coded in the hospital claims data provided to PHI funds. As the
disease risk and social factors are not the reason for hospitalisation, the principal diagnosis of admissions related to these factors was also examined.

6.3.2 Results of data analysis

The number of hospital admissions and unique individuals identified using 2013-14 hospital claims data is included in Table 6.2. Of the three chronic conditions investigated, cardiovascular disease was recorded most frequently in terms of number of hospital admissions and number of individuals with a hospitalisation. Although the number of hospital admissions listing mental health conditions as a diagnosis is higher than diabetes, almost double the number of individuals with diabetes are identified. This finding suggests that a greater number of people with mental health disorders had multiple hospital admissions in the study period, consistent with the utilisation findings reported in the study presented in Chapter 5.

Another factor to consider in the coding of hospital admissions is that national clinical coding rules require diabetes to be listed as an additional diagnosis where it is known for all individuals hospitalised. For other diagnoses, coding rules only require the listing of additional diagnoses if the condition has the potential to impact on care for the admission (NCCC 2013).

Table 6.2 Number of admissions and individuals identified with chronic conditions in 2013-14 using diagnosis codes (ICD-10-AM or AR-DRG)

<table>
<thead>
<tr>
<th></th>
<th>Admissions</th>
<th>Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>14,324</td>
<td>7,766</td>
</tr>
<tr>
<td>Mental health disorders</td>
<td>16,213</td>
<td>3,445</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>20,555</td>
<td>13,691</td>
</tr>
</tbody>
</table>

To assess data quality, the number of admissions in 2013-14 with complete AR-DRG and ICD-10-AM information was compared to the total number of hospital admissions. Of 227,786 admissions, only 77% of admissions have DRG information and 84% of admissions have ICD-10-AM information. As identified in Chapter 4, diagnosis information was missing for a greater proportion of admissions to public hospitals compared to private hospitals.
Further statistical analysis calculated the proportion of individuals identified in 2013-14 who were also admitted in 2014-15 for the same condition, or for any condition (all-cause hospitalisation). The results are shown in Figure 6.2. Thirty-seven percent of individuals identified with diabetes in 2013-14 had at least one subsequent admission in 2014-15 with diabetes listed, compared to 29% of individuals admitted for a mental health condition and 16% of individuals admitted for cardiovascular disease in 2014-15. Expanding the criteria to any hospital admission claimed in 2014-15 by an individual identified in 2013-14, the proportion of individuals admitted increases to 49% for diabetes, 46% cardiovascular disease and 51% for mental health conditions.

![Figure 6.2 Percentage of individuals selected with a chronic condition in 2013-14 with hospitalisations in 2014-15 for the same condition or for any condition](image)

Further, individuals with an admission for the same chronic condition in 2013-14 and 2014-15 account for only a minority of all patients admitted for the three conditions in 2014-15. For diabetes, the group of individuals identified in 2013-14 account for 33% of all individuals with an admission for diabetes in 2014-15, and only 23% and 15% of all individuals with admissions for a mental health condition and cardiovascular disease respectively.
In relation to the recording of codes related to disease risk and social factors in hospital claims data, results are shown in Table 6.3. With the exception of tobacco use, only a small proportion of admissions contained codes for the other four disease risk factors related to alcohol use, drug use, exercise and diet.

Table 6.3 Number of hospital admissions with disease risk codes listed in 2013-15

<table>
<thead>
<tr>
<th>Disease risk code and description</th>
<th>No. Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z72.0 Tobacco use</td>
<td>16,404 (2.8)</td>
</tr>
<tr>
<td>Z72.1 Alcohol use</td>
<td>113 (&lt;0.1)</td>
</tr>
<tr>
<td>Z72.2 Drug use</td>
<td>37 (&lt;0.1)</td>
</tr>
<tr>
<td>Z72.3 Lack of appropriate exercise</td>
<td>&lt;10 (&lt;0.1)</td>
</tr>
<tr>
<td>Z72.4 Inappropriate diet and eating habits</td>
<td>&lt;10 (&lt;0.1)</td>
</tr>
</tbody>
</table>

Total hospital admissions in 2013-2015 573,684

Table 6.4 shows the number of admissions with codes recorded for the broader set of social risk factors and also the top five principal diagnosis codes for admissions related to the top five social risk categories. Tobacco use is still the condition coded most frequently in the broader grouping of social risk factors. The remaining top five codes relate to mobility and relationship issues. Mental health conditions are strongly represented among the top conditions for which social risk factors are coded. The other conditions relate to conditions that have a high prevalence of hospital admissions such as rehabilitation, chemotherapy and cataract surgery. Overall, only 2.9% of hospital admissions include disease risk codes and only 3.8% of admissions included codes related to the broader social risk categories.
Table 6.4 Top five social risk codes listed in hospital admissions in 2013-15 and top five principal diagnosis of admissions related to top five social codes

<table>
<thead>
<tr>
<th>Social risk code</th>
<th>Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z72.0 Tobacco use</td>
<td>16,404</td>
</tr>
<tr>
<td>Z60.2 Living alone</td>
<td>1605</td>
</tr>
<tr>
<td>Z74.0 Need for assistance due to reduced mobility</td>
<td>483</td>
</tr>
<tr>
<td>Z63.0 Problems in relationship with spouse or partner</td>
<td>438</td>
</tr>
<tr>
<td>Z61.8 Other negative life events in childhood</td>
<td>293</td>
</tr>
</tbody>
</table>

Total number of admissions: 19,223

Principal diagnosis related to top five social codes

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z50.9 Care involving use of rehabilitation procedure, unspecified</td>
<td>944</td>
</tr>
<tr>
<td>F32.20 Severe depressive episode without psychotic symptoms, not specified</td>
<td>589</td>
</tr>
<tr>
<td>as arising in postnatal period</td>
<td></td>
</tr>
<tr>
<td>H23.9 Cataract, unspecified</td>
<td>466</td>
</tr>
<tr>
<td>F10.2 Mental and behavioural disorders due to use of alcohol: unspecified</td>
<td>424</td>
</tr>
<tr>
<td>mental and behavioural disorder</td>
<td></td>
</tr>
<tr>
<td>Z5.11 Chemotherapy session for neoplasm</td>
<td>370</td>
</tr>
</tbody>
</table>

Total number of admissions (% of all social risk coded admissions): 2,793 (15)

6.3.3 Implications of data analysis

Selecting target populations is the first step in implementing CDM programs but its importance is often overlooked. Hospital claims data are the most comprehensive data source available to insurers in Australia, but this data source only captures health status information on people with hospital claims, a minority of the insured population. Additionally, the number of people identified with each chronic condition using insurance claims data is affected by coding rules for the condition. There are rules in place for coding specific conditions such as diabetes but not for other chronic conditions.

Documentation (and thus coding) of disease risk and social factors in hospital admission data by medical and nursing practitioners was poor, with only 3.8% of admissions including these code
groupings, most often for mental health-related admissions. This is consistent with the findings of Torres and colleagues in the United States who also found that codes were most frequently listed for hospitalisations for mental health and substance use issues (Torres et al. 2017). These findings suggest that insurance claims data are not a comprehensive data source for identifying target groups for CDM programs. Previous research has critiqued the use of health service records as the sole method of chronic disease selection as it misses people at earlier risk stages and is reliant on coding practices of health service providers (Linden & Goldberg 2007, p. 949).

Examining how well selection methods predict future health service use for the three chronic conditions of interest show that only a minority of individuals hospitalised for the three chronic conditions in 2013-14, also made a claim for the same conditions in 2014-15. The group identified with a chronic condition in 2013-14 also made up only a minority of individuals (15-33%) admitted with the three chronic conditions in 2014-15. Although the methods used in this analysis focus on specific disease categories and could be refined to look for more complex chronic disease cases based on a combination of conditions or levels of hospitals use such as number of admissions per year or length of stay per admission, refining the method does not resolve the issue that hospital claims data only provide information on a small proportion of the insured population.

The findings of this analysis indicate it would be beneficial to use additional data sources in selecting target groups for CDM programs. Selecting which data sources to use, and how to most effectively combine and analyse multiple data sources to support CDM strategy requires careful consideration of a number of factors. The second research stage was conducted to identify the factors to consider for selecting and using multiple data sources to develop information systems for CDM.

6.4 Stage 2: Key domains for developing information systems for CDM using multiple data sources

The next stage of research in the study used multiple qualitative methods summarised in Table 6.5 to identify factors related to developing information systems for CDM including selecting and using data sources. Data were collected through a review of published and grey literature and via
group interviews conducted with representatives of three PHI funds. Interviews took place in a group setting with between two and five participants, with participating PHI funds chosen from the 13 funds that contributed to the dataset analysed in the first research stage. These group interviews took place prior to the individual interviews that are part of the study reported in Chapter 8. The purpose of the group interviews were to orient the researcher to the operations of the Australian PHI sector to test issues raised in the literature review for their Australian relevance, particularly issues related to designing information systems for CDM such as data sources used by the PHI sector and data analytics infrastructure and capabilities. A synthesis of the key domains identified in the qualitative review is described in the next section.

Table 6.5 Summary of data collection methods and sources used in Stage 2

<table>
<thead>
<tr>
<th>Data collection method</th>
<th>Description of specific sources</th>
</tr>
</thead>
</table>
| Literature review      | Targeted review focussed on three areas:  
  • Information systems literature on the use of routinely collected health data for secondary purposes  
  • Published evaluations of CDM programs implemented by health insurers in Australia and internationally  
  • Epidemiological research using Australian disease registries and cohorts with specific chronic conditions. |
| Group interviews conducted with representatives of three PHI funds |  
  • Interviews took place in a group setting with two to five participants.  
  • Questions focussed on the design of current CDM programs, current challenges in targeting relevant segments of the insured population and future directions for CDM strategy. |
| Appraisal of grey literature including websites, reports and policy documents | CDM program information published on websites of Australian PHI funds, media articles on PHI, company annual reports and government regulations for the PHI industry. |

Note. Data collection performed between May 2016 and July 2017.

Information systems have been recognised as an important element of effective CDM for almost two decades. As discussed in Section 2.8 on page 35, the influential Chronic Care Model, developed by Wagner and colleagues, includes both clinical information systems and decision support as two of the six key elements to improve the design of healthcare delivery systems for CDM (Coleman et al. 2009; Wagner 1998; Wagner et al. 2001). The model describes the need to establish patient registries that enable individuals to be monitored over time, across different types
of providers (Wagner et al. 1996b, p. 527), and to use individual and population-based information for care planning (Struckmann et al. 2018, p. 26), but does not specify the components of effective CDM information systems.

The development of the framework presented in this study was guided by the approach adopted by Embi and colleagues who developed a model that describes the data, information and knowledge management factors influencing the design and conduct of comparative effectiveness research in health care (Embi et al. 2013, p. s42). Their framework was developed after analysis of the informatics challenges related to aggregating different types of health data such as clinical data, health financing data and patient reported measures. Their research identified four domains related to the secondary use of data for research purposes: (1) data quality, (2) data preparation, (3) socio-technical factors, and (4) organisational factors.

The domains of the current framework are: (1) defining information requirements, (2) assessing potential data sources, (3) ensuring quality data collections, and (4) integrating systems and analytics. The domains identified through this review focus on linking multiple data sources for CDM service planning and delivery. Key considerations for each of these four domains are identified to explicate the conceptual framework.

### 6.4.1 Defining information requirements

Differences exist in the information needed for providing acute illness and chronic disease care (Clarke et al. 2017, p. 12). However, information requirements for CDM programs also vary according to the group that is being targeted – whether the target is the population at risk of developing a chronic condition or the group of people who already has a diagnosed chronic condition. To identify the at risk group, comprehensive information on risks for the entire population of interest including demographic, clinical and health service use is required (Haas et al. 2013, p. 730). A risk assessment is not useful for someone who already has a diagnosed chronic condition. However, clinical indicators collected over time are an important indicator of long-term health management for people living with chronic conditions. Records of health services use are also important information for this group because regular, coordinated care can prevent episodes
of ill health. Appropriate targeting of high-risk patients is one of the main attributes of successful programs for patients with complex, chronic needs (Anderson et al. 2015, p. e598).

The review identified three major areas to consider when defining information requirements for information systems to support CDM. The first area is demographic and social information such as age and lifestyle factors including diet, physical activity, tobacco use and alcohol consumption (Moodie et al. 2016). The second area is clinical indicators such as blood pressure, cholesterol level and levels of stress and anxiety (Luo et al. 2016) and the third area is information on health service use including the type of health professional seen, the date the service was received, and the treatment received (Martin et al. 2011).

6.4.2 Assessing potential data sources

Information is produced by making sense of data (Hersh et al. 2013, p. e35). A large amount of health-related data is routinely generated during healthcare activities but as health insurers operate outside these direct interactions, they are secondary recipients of data and rely on other parties to share these data (Kohli & Tan 2016, p. 556). The three main sources of data for the PHI sector with the potential to inform CDM are from patients (and increasingly from their digital devices), from healthcare providers and from researchers.

1. Patient-provided data

Private health insurers are seeking to increase health and social data supplied by patients. This information is provided on a voluntary basis through self-reported health risk assessments or invitations for free check-ups that collect information on clinical measures such as blood pressure and cholesterol. PHI funds are also taking advantage of advances in information technology, offering digital applications to their members to track health and activity levels (HCF 2018, Medibank 2018a).

2. Healthcare provider data

Private health insurers receive claims data from hospitals and allied health providers. There are opportunities to enhance data collected from these sources to improve data content and quality,
particularly for newly covered services that insurers now pay benefits for such as CDM programs. Provider data could supply additional information on early stage risk indicators of chronic disease including clinical measures or provide more comprehensive data on treatment plans for high-needs patients.

3. Research and quality improvement data

Data collected by researchers such as cohort studies and clinical and disease registries may inform CDM programs, particularly relating to health outcomes and disease risk factors. Cohort studies follow a group of people over time to investigate specific health issues. Some limited Australian cohort studies have already conducted research with PHI as a topic of interest (Banks et al. 2009; Herbert et al. 2010). Clinical and disease registries collect data on people diagnosed with a specific condition or receiving a specific type of treatment. Registries have been established to collect data relevant for CDM such as the Australasian Rehabilitation Outcomes Centre Dataset (Australian Health Services Research Institute 2017) and the Private Psychiatric Hospitals Data Reporting and Analysis Service (Australian Private Hospitals Association 2018).

6.4.3 Ensuring quality data collections

Private health insurers are reliant on data from different sources that are collected for a variety of reasons such as service payment or providing care. The original purpose for which data are collected influences data quality and how appropriate a data source is for secondary use (Curtis et al. 2014, pp. 1183-4). Data quality factors such as consistency in definitions between data sources and over time, and accuracy of data collected contribute to the utility of information that the data can provide. The information that a particular data source provides such as its relevance, completeness and timeliness often cannot be assessed until the data are used for a particular purpose. Data quality factors are important considerations in the use of data for secondary purposes. If the purpose of the original data collection is not well understood, or its quality for secondary use is not assessed, then use of the data may produce misleading insights (Clarke 2016; Shah et al. 2018). Furthermore, combining datasets of poor or uncertain quality may exacerbate problems in original datasets (Boyd & Crawford 2012, p. 670).
Another consideration of using data sources for secondary purposes, such as informing CDM interventions, is that the granularity of available data may not be sufficient for the proposed use (Hersh et al. 2013, p. s33). Health data are often subject to specific privacy and legal compliance requirements that restrict the way data can be shared and used (Ebad et al. 2016; Sherer et al. 2016). Due to this reason, data may only be available at an aggregated level. Aggregated data may be appropriate for some purposes such as informing program planning or some types of predictive modelling but are insufficient for tracking the patterns of health service use of individuals over time.

The final consideration is how frequently the data are collected. Some information is required on an ongoing basis, so data need to be regularly updated such as health service use and diet and physical activity levels. Other information only needs to be recorded once, or periodically updated, such as age and disease status. The impact of time delays in collection also needs to be considered, that is, whether data are available in real-time (or near real-time) or whether there is a time lag in receiving data following collection.

The review highlights three key considerations for developing quality data collections that are fit for purpose for CDM programs and planning. It is important to note that the availability of data does not guarantee high quality data to inform CDM programs. First, if routinely collected data are being used for secondary purposes, the original purpose of collection must be known as this may affect the utility of the data (based on factors such as original collection standards, data completeness and data accuracy). Second, the level of granularity of available data is also an important consideration. Whether or not data are available for individuals or only aggregated into groups will affect how the data can be used to design and tailor CDM services. Third, the time period when the data are available is also important as targeting programs depends on up-to-date knowledge of the health status and service use of the individuals within the target group. If there is a significant time lag in the collection of raw data and its processing for use in CDM programs, this may influence the targeting of programs.
6.4.4 Integrating systems and analytics

Due to the progressive and persistent nature of many chronic conditions, CDM information systems need to be able to track and monitor people over time and incorporate data from different sources. Creating a person-centred information system with an integrated view of a person’s health and social information relevant to CDM is a complex, technical task (Dixon et al. 2015; Dykes et al. 2014). Data are collected for different purposes so combining these data sources in a meaningful way is challenging. Previous research has documented specific barriers in relation to the exploitation of information systems and technology for business value in the health sector compared to other industries (Devaraj & Kohli 2000; Newell 2011).

CDM often involves the care of a multidisciplinary team, often operating in different settings (Wagner 2000). Although improvements have been made to improve data sharing such as the meaningful use provisions in the United States (Blumenthal & Tavenner 2010), a unified summary health record used across health settings is rare, with notable failed attempts (Mora 2012). Research involving data linked from different sources is a growing health research field (Ford et al. 2009; Kelman et al. 2002) but sharing and linking data among healthcare providers and payers is still limited by privacy and commercial considerations. From a technical perspective, for data sharing and linking to occur, information systems need to be interoperable with coordination of information technology architecture and data standards such as the type and form of the data collected (Gauld 2004, pp. 127-8).

Information technology advances now allow for the collection and storage of large amounts of data, but data availability does not directly lead to business value. Value is created from effective decision-making, which relies on the meaningful analysis of data (Sharma et al. 2014, p. 434). This process from data to value emphasises the importance of the quality of the original data. Advances in computer processing facilitate more sophisticated analyses but if the underlying data quality is poor, data analytics will not produce reliable results.

Once information requirements have been defined, appropriate data sources identified and assessed for quality, the data need to be bought together to allow for analysis. The review
identified that information systems for CDM need to be able to monitor people over time to understand changes in health status and interventions that support health management. Systems should have data available at the person level and ideally be linked from different data sources (reflecting a person’s comprehensive health journey). The establishment of such systems will allow for more accurate and tailored analytics to be conducted that reflect a population’s use of different health services over time.

6.5 Stage 3: A framework for developing information systems for CDM using multiple data sources

The qualitative review in Stage 2 identified four domains to consider in the development of information systems for CDM using multiple data sources: defining information requirements, assessing potential data sources, ensuring quality data collections and integrating systems and analytics. Each domain was associated with three key considerations.

Through further analysis, a conceptual framework depicting these domains and considerations was developed and is presented in Figure 6.3. A description of how the framework could be applied to the PHI sector, including feasibility and policy implications, is provided. Analysing each of the four domains of the conceptual framework when defining the information systems strategy for CDM introduces a structured process by which to identify, collect and use different data sources.

The CDM program goal is central and underpins all domains of the framework. The goal is the anticipated value or outcome that the program will have. In particular, information requirements and data sources will vary depending on the specific goal and target group of a program, which has flow-on implications for data quality features and the development of integrated information systems and analytics. The goal of CDM programs exists along a continuum from early identification of at-risk populations to improved case management of the chronically ill.
6.6 Discussion: Feasibility and policy implications of framework implementation

6.6.1 Defining information requirements

Information requirements for private health insurer systems incorporating multiple data sources are defined after first assessing the information available from existing data sources. For PHI funds, the main source of data to inform CDM are hospital claims, which provide information on hospital use claimed on insurance and diagnosed health conditions. Insurers also have basic demographic information related to age, sex and location of residence but lack broader social information, clinical indicators and comprehensive health service use (for all services used, not just those claimed on PHI). Once information gaps are identified, data sources can be prioritised for collection based on the CDM program goal. For programs with a broad goal across the chronic disease continuum, information across the insured population is important to identify and categorise people with a diagnosed chronic condition and people at-risk of developing a chronic condition. Although PHI funds in Australia traditionally have little experience in CDM, many funds have expanded their clinical expertise through employing staff with a clinical background such as nurses and dieticians and in some cases, setting up separate healthcare services (Medibank 2018b).
6.6.2 Assessing potential data sources

Hospitals, allied healthcare providers and patients are currently the main sources of data for health insurers. Although there are numerous potential sources of data, feasibility needs to be carefully assessed due to the nature of PHI funds as commercial businesses with a traditional role of paying for health services (although many smaller PHI funds in Australia operate on a not-for-profit basis).

Healthcare providers and patients view the primary function of insurers as health service payers. Insurers are often in negotiations with both providers and patients as a result of this payer role. Hospitals enter into contractual agreements with insurers to pay for services and may resist efforts by insurers to expand data collected without new incentives. Due to the increasing number of insurance policies with excess co-payments and exclusions (Butler 2002, p. 36), patients may be wary of insurer motives in trying to enhance data collected and unwilling to disclose additional information to insurers without incentives.

In relation to the breadth of health service data collected, particularly information on services provided outside of hospitals in primary healthcare settings, the regulated scope of the PHI sector in Australia limits the services for which benefits can be paid. It is unlikely that there will be significant changes to the regulated role of insurers in Australia in the near future as recent policy reforms for the PHI sector introduced in 2017 did little to expand the scope of insurers’ role to better support CDM (Department of Health 2018c). As a result, information on primary healthcare services will continue to be limited for insurers.

Research and quality data collections may only be available for analysis subject to ethical approval. As the ethics process requires careful assessment of the public interest nature of the research, the risk of harm to participants and the commercial interests of the data requestor, access to research data (particularly detailed, patient-level data) may be limited for private health insurers (National Health and Medical Research Council (NHMRC) 2015a).

The best opportunities for PHI funds to collect new data may be in building on existing data
collected. Insurers could introduce new data requirements for processing claims with existing healthcare providers, or patients may be offered new services such as access to medical check-ups or digital applications in exchange for providing data. Relationship and reputation factors are crucial for these initiatives, as insurers will need to negotiate and work more collaboratively with both providers and patients to improve and enhance the data supplied to them.

6.6.3 Ensuring quality data collections

When seeking to use data sources for CDM, understanding the original data provenance is important. The original purpose of the data collection, including data processing techniques and changes to the collection standards over time, needs to be understood. Otherwise there is a risk in misinterpreting the data or a risk that the data source will not provide the required information. The availability of detailed unit-record data, at the patient and/or service level, for PHI funds to use in planning CDM initiatives is limited but the possibility of using aggregated population statistics to complement existing information could be considered. Additionally, the timeliness of data collection for the specific secondary purposes needs to align with the intended use, as there are often time lags in insurers receiving data from healthcare providers.

The studies presented in Chapters 4 and 5 found numerous data quality issues that need to be addressed to increase the value that insurers derive from hospital claims data for CDM strategy. The quality of claims data could be enhanced through changes to the predominant fee-for-service payment model. Payment models that emphasise health outcomes or value resulting from care increase the amount of health information collected because changes to health status following treatment are directly linked to payment (Chernew et al. 2007; Porter & Lee 2013). Currently, private health insurers in Australia use a variety of payment models and in the past, have resisted moves to standardise claims payment models using AR-DRG (Willcox 2005). Efforts to enhance the quality of existing data sources may also introduce internal tensions for insurers. While teams responsible for insurance policy design may advocate restricting service coverage due to potential short-term financial benefits, this action limits the information that PHI funds collect on health service use over time. These commercial considerations need to be balanced with the priority of building information systems with quality data if insurers want to expand their CDM role.
6.6.4 Integrating systems and analytics

Information systems for CDM should be person-centred, providing information on patients accessing services from different providers over time. The process of information systems development needs to include a phase dedicated to determining how new and existing data sources are linked and how system components are integrated to produce meaningful information from analytics. Existing information systems could be modified, particularly if new data collections build on existing data sources such as enhanced claims data. However, if more fundamental changes to information systems are required then this may have large resource implications.

Legacy systems used by PHI funds are an important consideration. As the information systems of the PHI sector were originally designed for processing claims, reconfiguring or replacing these systems to enable enhanced chronic disease analytic capabilities requires technical, financial and human resources investment. Data collection and management activities require new skills, not only in analytic techniques but also a contextual understanding of the capacity and limits of these data, the genuine insights that can be derived from data for management decisions and where caution is needed in the interpretation of findings.

In relation to broader initiatives to improve data sharing and information exchange within the healthcare sector, initiatives in Australia tend to focus on providers and patients. Australia is in the process of rolling out a national personal health record system, My Health Record. The framework guiding the secondary use of My Health Record system data released in 2018 explicitly excludes insurance agencies from applying to access My Health Record data (Department of Health 2018e).

6.6.5 Caveats of framework development

While the research design of this study has strengths in relation to the application of both quantitative and qualitative methods to assessing data sources and information system requirements for CDM, there are also limitations. In relation to the framework development, a targeted, rather than a systematic, review of the literature was undertaken to assess the knowledge
base relevant to developing information systems for CDM and identify the key domains for the framework. To complement the literature review, interviews with PHI fund representatives were conducted to gain a more practice-focused and up-to-date context. Despite the dual methods employed, there may be other domains relevant to the framework developed in this study that were not identified.

### 6.7 Conclusion

Quality information systems are crucial to inform management decisions to deliver appropriate support for high-needs patients and people with chronic conditions. Analysis of claims data found that PHI funds currently have a limited view of health information required to select target groups for CDM interventions. There are opportunities to improve the quality of health information used by PHI funds in planning and implementing CDM programs. A conceptual framework is developed and presented with four domains that need to be considered when developing information systems for CDM using multiple data sources – information requirements, data sources, data quality and integrating systems and analytics. However, there are feasibility and policy implications that need to be addressed for implementation in the PHI sector. A clear goal for CDM programs underpins this framework.

The next chapter applies the framework developed in this chapter. The study links insurer and other data sources to enhance the information on health service utilisation and better understand the health service journey of insured individuals in Australia’s mixed public and private health system. Hospital claims data from one private health insurer are linked with health service records from one LHD. The qualitative study in Chapter 8 also builds on the study presented in this chapter seeking perspectives directly from insurers about their role in CDM and the factors influencing the design and implementation of CDM strategies, particularly in relation to data and information requirements.
Chapter 7: Data linkage to understand the hospital utilisation of a privately insured cohort

This chapter presents an implementation case study of the conceptual framework developed in Chapter 6. It is the first study in Phase 3 of this research (see Section 3.2 and Figure 3.1 on page 42). This novel study uses administrative data sources from a PHI fund and a LHD in New South Wales that were linked together for the first time. The study investigates hospital utilisation across public and private hospitals for a privately insured cohort and examines the relative contribution of PHI to funding hospital care for an insured population. The analysis in the studies presented in the previous chapters used insurance claims data that only contain records of hospital utilisation for which PHI pays a benefit. By linking and analysing data from multiple sources, this study builds a more comprehensive picture of hospital utilisation for a privately insured population.

The first section of the chapter outlines the study rationale and study design using linked administrative data sources. The process of designing the study is framed using the four domains of the conceptual framework presented in the previous chapter in Section 6.5 on page 94. The second section presents the methods and results of the analysis using the linked dataset. The analysis investigates two areas:

1. How an insured population accesses hospital services across hospital types (public and private) and insurance status (PHI or public patient);
2. Service utilisation of a subset of high-needs patients that relates back to the focus of previous studies presented in Chapters 4 and 5.

7.1 Study background

7.1.1 Study rationale

As discussed in Chapter 2 in Section 2.1 on page 23, the responsibility for funding and delivering health services in Australia is split between the public and private sectors. Public hospitals account for a greater proportion of hospitalisations (59%) than private hospitals in Australia. (AIHW 2016). As almost all emergency departments in Australia are located in public hospitals and ambulances are required to direct patients requiring medical attention to the nearest public hospital
(Healthdirect 2019), if people with PHI require urgent medical care, they are likely to be treated in a public hospital. The extent of public hospital utilisation of a privately insured population group is not known. Additionally, it is not known for public hospital use, the proportion of services accessed as a private or a public patient.

This study is unique in Australia as it involves linking data from private and public sector organisations, a PHI fund and a government-operated LHD, to capture hospital use of a privately insured cohort across public and private hospitals, funded by the public sector and by PHI. Although administrative data sources are regularly linked for research purposes across Australia (Tew et al. 2017), the linkage generally occurs with data sources that are managed by government custodians such as public hospitals, or with data sources that have collection rules mandated by government such as cancer registries. Most data linkage research occurs at a state or national level independently of the organisations providing or funding care. In contrast, the present study was designed as a regional study with the direct involvement of the two organisations that are contributing data to the study.

Differences in the types of hospital services claimed on PHI are investigated in this study to understand the relative contribution of a PHI fund to funding hospital care of its members and at a broader level, to examine the alignment of current health insurance policy arrangements and the organisation of delivery systems in Australia. As described in Section 2.4 on page 28, a series of policy reforms introduced in the late 1990s incentivises Australians over 30 years of age to hold PHI policies. The rationale provided for the government funding these financial incentives was that PHI would strengthen the health system overall by taking pressure off the public system through facilitating private hospital access for people with PHI (Colombo & Tapay 2003, p. 9; Elliot 2006, pp. 136-7).

Previous research has examined changes in the use of private and public hospitals following the introduction of the PHI rebate and accompanying policy measures to encourage uptake of PHI in the late 1990s. Findings report a broadening in the specialisation of private hospitals, although public hospitals still provide services for a broader range of conditions (Martins 2009). As PHI
and government funding duplicates public hospital admissions, privately insured individuals can elect whether or not to use their PHI when they access services in a public hospital. Recent national reports have noted a rise in admissions to public hospitals where patients elect to be a private patient (AIHW 2017; IHPA 2017). This study, focusing on the hospital utilisation of a privately insured cohort, provides an important contribution in understanding how this population accesses services across public and private hospitals and investigates differences in the use of PHI by type of service.

The second part of the analysis focuses specifically on the service utilisation of high-need patients. From the perspective of PHI funds, findings from the analysis presented in Chapter 4 on the characteristics of high-needs patients highlighted the dearth of information on public hospital admissions in insurance claims data. The study in Chapter 4 found that high-needs patients have a greater proportion of admissions to public hospitals than the general insured population with a hospital claim. However, due to missing data, the insurance claims data revealed little information about the specific conditions for which care was sought in public hospitals. The additional category of hospital use that insurers do not have any information on relates to admissions in public hospitals as a public patient. The linked data sources used in this study includes comprehensive information on public hospital admissions as both a public and a private patient.

7.1.2 Applying the framework for developing information systems for CDM using multiple data sources

The studies in Phase 1 of the research presented in this thesis identified that insurers have a limited view of hospital utilisation of the insured population. A number of gaps in health information for different targets groups such as high-need patients were identified in the studies. Using the conceptual framework developed in Phase 2 (see Figure 6.3 in Section 6.5 on page 95), this study was designed to provide information on hospital utilisation across the insured population in both public and private hospitals. Table 7.1 shows the study design considerations for each of the four domains of the framework.

Information required for the analysis included demographic, clinical and service use
characteristics. The data sources used for the study were PHI hospital claims data and LHD service records for hospital admissions and emergency department visits. Consideration of the original purpose of collection of the PHI hospital claims data and data quality issues identified in analyses presented in the previous chapters led to linking these data with LHD records. Linking these data sources filled in gaps in missing data for public hospital admissions in PHI claims data and added records for admissions not claimed on PHI. Patient-level data were available in each data source for a common period of 2010-2015. To maintain the person-centred nature of the data collection but maintain privacy, a unique identifier was assigned to each individual to replace personal information. A data linkage methodology linked the data to allow for meaningful analysis to be conducted.
Table 7.1 Study design considerations for the four domains of the Conceptual Framework

<table>
<thead>
<tr>
<th>Domain</th>
<th>Considerations influencing study design</th>
</tr>
</thead>
</table>
| Information requirements        | • Hospital utilisation information for public and private hospitals for a privately insured cohort covering:  
  ○ Patient demographics (age, sex)  
  ○ Service use information (dates for each hospital admission, hospital type and insurance status)  
  ○ Clinical diagnosis information                                                                 |
| Data sources                    | • PHI fund hospital claims data  
  • LHD service records: Admitted hospital data and emergency department records                                                                                           |
| Data quality                    | **Original purpose of collection**  
  • PHI fund: Payment of insurance claims for hospital use. Claims data capture required hospital utilisation information for services claimed on insurance although some information (e.g. clinical diagnosis) is not complete for all records  
  • LHD: Administrative record of hospital use. LHD data capture required hospital utilisation information for services provided by hospitals administered by the LHD for planning and reporting purposes  
  **Level of granularity**  
  • Individual, patient-level data (de-identified) available for each hospital admission  
  **Timespan of datasets**  
  • Datasets available for the same multi-year time period (2010-2015)                                                                                                       |
| Integrating systems and analytics| • Datasets can be linked so that each individual has the same identifier across both datasets  
  • Privacy considerations: Common identifier used to extract health data replacing personal information, see Figure 7.1  
  • Insurer and LHD collaborate and share data to develop the linked dataset. Analysis conducted on separate analytics infrastructure independent of either organisation |

7.1.3 Methods of linking health data sources to preserve privacy

Linking administrative data sources that are collected by different organisations is a complex process because sharing these data in their original format are generally subject to privacy legislation, which pertains to the collection, use and sharing of personal information. In Australia, both state and national privacy legislation exists. The national privacy legislation is the *Privacy Act 1988*, and in New South Wales, the state in which this research was conducted, there is also separate health privacy legislation, the *Health Records Information Privacy Act 2002*. Australian privacy laws have guidelines for using personal information for health and medical research.
purposes (NHMRC 2015b). Consistent with these guidelines, health service researchers have developed methods of data linkage that assign a common identifier to an individual across different datasets while removing identifying information such as name, address and date of birth to protect individual privacy (Kelman et al. 2002). Figure 7.1 presents a diagram of this process, which involves the separation of personal information such as names and addresses from health information such as service records dates and clinical information. The researcher only receives the health information with a common identifier across the different data sources, but the personal information is not shared.

![Figure 7.1 Process of separating personal identifiers and health data when linking datasets to preserve privacy](image)

**7.1.4 Linked data infrastructure used in this study**

Australia has established state and national level systems for linking administrative health data at the individual person level (Moore et al. 2016). However, data linkage at a regional level is a new endeavour that is being pioneered in the Illawarra Shoalhaven region of New South Wales. The
Illawarra Health Information Platform (IHIP) has been designed for the analysis of administrative health data sources for research purposes. IHIP consists of a databank with non-identifiable data and a health records linkage system. Due to the existence of a unique Medical Record Number used across public health facilities in the Illawarra Shoalhaven region since 1986, a longitudinal record of service use across both public hospitals and community health services has been generated in the region with records for almost 675,000. These individuals 675,000 individuals represent all patients attending any public health facility in the region (hospital or community health) over more than 30 years. The research databank does not contain personal identifiers and when linking health data, a separation of roles is implemented so there are different individuals responsible for handling personal identifiers in the first stage and extracting health data in the second stage, in accordance with the best practice process shown in Figure 7.1. The establishment of IHIP and the data linkage protocol received ethical approval from the University of Wollongong (UOW) and Illawarra Shoalhaven Local Health District (ISLHD) Health and Medical Human Research Ethics Committee (HREC) in 2016.

This is the first project in which data from an external data source (PHI claims data) were linked with data from the IHIP databank. As this study involved linking an additional data source with data from the IHIP databank, separate approval for this study was received from the UOW and ISLHD Health and Medical HREC (no. 2017/231) and from the IHIP data custodian (Centre for Health Research Illawarra Shoalhaven Population Executive Steering Committee).

7.2 Process of linking insurance claims and health district records

The development of the linked research data extract for this study involved a detailed process to match individuals within each data source. Data management personnel from the PHI fund and the LHD undertook the process. The linkage of datasets took place in a staged approach, to minimise privacy risks, depicted in Figure 7.2 and described below.

7.2.1 Stage 1: Creating a project-specific identifier key

In the first stage, the PHI fund data manager sent a file containing personal identifiers to IHIP data
management personnel to create a common set of project identifiers across the data sources used for the study. The file contained name, date of birth and address details to allow common individuals in the dataset to be matched and assigned a project-specific identifier. There was no health information exchanged at this stage.

In the dataset sent by the insurance fund, there were 22,555 unique individual identifiers representing each fund member living in the Illawarra Shoalhaven catchment area. In the LHD records, there were 674,456 unique individual identifiers. Following the data matching process, there were 14,276 unique identifier matches. The matching process involved nine ‘pass-throughs’ that examined the data using different data variable items such as name, address and date of birth. To ensure accuracy in the matching process, manual review was undertaken with 1,000 records (every 14th record). During the manual review process, less than five records were identified as incorrectly matched. Additionally, there were eight instances where one record number from the LHD file matched multiple identifiers in the insurance fund dataset. Multiple matching related to twins, duplicate records and name changes and these erroneous records were removed from the matched data file. Once the data matching process was complete, a project-specific identifier was assigned to each matched individual record replacing personal identifying information in the data extracts supplied to the researcher.

7.2.2 Stage 2: Extraction of health and claims data

In the next stage, the data file with the matched identifiers and the project-specific identifier key was sent back to the PHI fund and to the responsible data manager for IHIP health information. The common time period for which data were available for each data source was 1 January 2010 to 31 December 2015. Insurance claims and hospital admission data were extracted for the matched cohort. For the LHD, records came from data collections for admitted patient hospitalisations and emergency department attendances. More information on the variables used in the analysis from each data collection is included in Appendix 2. The number of linked individuals represented in each data collection for the study period is shown in Figure 7.2 that summarises the linkage process. The 14,276 matched individuals may be represented in 0, 1 or more than 1 of the data sources. The researcher only received records for individuals who accessed health services.
during the study period so demographic information for the full population with PHI was not available.

7.2.3 Stage 3: Linkage of de-identified datasets

Prior to the researcher gaining access to the research data extracts, additional checks and perturbation were applied to minimise privacy risks including grouping age into five-year age groups and perturbing the service data across the datasets by a random number between +/- two days. Records with the same individual identifier had the same time perturbation applied to ensure the pattern of health service utilisation was consistent for each individual.

Figure 7.2 Linkage process of insurance claims and LHD data sources including number of individuals for each data source

7.3 Methods

The first stage of analysis focussed on hospital utilisation of all insured patients with at least one hospital admission in the study period and the second stage focussed specifically on the hospital utilisation of high-needs patients as defined in Section 7.3.3. Patients with only emergency
department attendances (without a hospitalisation) in the study period were excluded from analysis.

### 7.3.1 Insured individuals’ use of public and private hospitals

The purpose of the analysis was to understand the insured cohort’s use of public and private hospital services as an admitted patient and the use of PHI for hospital admissions. Differences in hospital utilisation for different types of services categories were also investigated. During the study period, there were 9,004 unique patients with a same-day or overnight hospital admission. To examine hospital admissions across the entire study period for this cohort, three mutually exclusive groups were formed based on an individuals’s use of hospital services – patients with private hospital admissions only, patients with public hospital admissions only, and patients with both public and private hospital admissions.

Health insurance joining and termination dates were used to remove public hospital admissions that occurred when an individual did not hold a PHI policy. Public hospital admissions that occurred before an individual joined the fund or after termination of fund membership were removed. This process removed 1,439 admissions (5% of admissions during the study period). When preparing the linked dataset for analysis, some admissions records, for public hospital admissions claimed on PHI, appeared in both the insurance claims and LHD datasets. These records were de-duplicated in the dataset analysed.

Hospital utilisation and demographic characteristics were compared for the three groups. Due to the differences in coding same-day hospital admissions between public and private hospitals (discussed in Chapter 5), utilisation statistics and the service category analysis were undertaken using overnight hospital admissions only. Utilisation statistics calculated for each of the three hospital-use groups included the number of admissions per group, the mean number of admissions per patient and the mean length of stay per admission. Statistical tests were run using Pearson Chi-square tests for categorical variables and Kruskal-Wallis tests for continuous variables to check the significance in observed differences between the three groups.
Emergency department utilisation in the LHD for the insured population was also analysed. Analysis included all emergency department visits for the 9,004 patients with a hospitalisation (whether or not the emergency department visit resulted in an admission). The proportion of patients in each group with an emergency department visit and the proportion of their emergency department visits that resulted in an admission were calculated.

In addition to utilisation measures, differences in the casemix or complexity of overnight admissions in public and private hospitals were assessed by allocating a weight to each hospital admission based on the assigned AR-DRG. AR-DRG is a classification system that relates the number and types of patients treated in hospital to the resources required by the hospital to provide the treatment. In contrast to the previous studies in Chapters 4, 5 and 6 with missing clinical data for public hospital admissions, AR-DRG information was 95% complete for the overnight hospital admissions for the insured cohort in this study due to the linking of the two data sources. The weights assigned to overnight admissions to measure complexity were those developed for the purpose of public hospital funding through the National Hospital Cost Data Collection. In this study, weights were not used to assign costs to hospital admissions, as there are differences in both costing and pricing resources across public and private hospitals. Instead, weights were used to apply a consistent unit that is a proxy for admissions complexity across the datasets.

Cost weights for the National Hospital Cost Data Collection are developed using a sample of hospitals around Australia to assess the cost and mix of resources used to deliver patient care. The average admission weight is 1.0 and each AR-DRG is assigned a weight indicating whether on average, the resources required to deliver care for that AR-DRG is greater than the average (weight greater than 1.0) or less than the average (weight less than 1.0). The LHD data were coded using AR-DRG version 6 (ACCD 2018b) so AR-DRG weights from the National Hospital Cost Data Collection Round 17 (2012-13) developed using that AR-DRG version (IHPA 2013) were mapped to each admission in the LHD data.

Exploratory analysis found that the PHI claims data included AR-DRG information from different versions. To ensure valid comparison, insurance claims data were remapped using diagnosis
information (listed ICD-10-AM codes for principal and additional diagnosis) and demographic variables to AR-DRG version 6 using commercial DRG grouping software, 3M. There were 603 overnight admissions (5%) that could not be re-grouped due to missing AR-DRG information that were excluded from analysis of admission complexity. Admissions with missing AR-DRG information were public hospital admissions claimed on PHI. These admissions occurred in public hospitals located outside of the LHD for which admission data were available (and for which AR-DRG information was not provided to the health insurer).

7.3.2 Insured individuals’ use of public and private hospitals by admission service category

Following the examination of hospital utilisation trends for the insured population, analysis by admission service category was undertaken. The five categories used were childbirth, mental health, medical, surgical, and other\(^1\) hospital admissions, which are standard classification categories used nationally. The criteria for categorisation based on AR-DRG codes, with examples for each service category, are shown in Table 7.2 and a list of AR-DRGs from Version 6 is included as Appendix 1. The AIHW uses these categories, determined based on the AR-DRG assigned to each admission, to calculate national admitted patient statistics (AIHW 2016). Utilisation and admission complexity statistics were calculated for each service category based on the three hospital use groups – individuals with private hospital admissions only, individuals with public hospital admissions only and individuals with public and private hospital admissions for the service category.

\(^{1}\) The “other” category refers to hospital admissions involving use of devices, such as ventilator support, or procedures that are not categorised in the medical or surgical categories
Table 7.2 AR-DRG criteria used to assign admission service categories

| AR-DRG codes | Childbirth | Admissions with AR-DRG codes starting with O01, O02 or O60

Examples: O01A: Caesarean delivery with catastrophic complication or comorbidity; O60B: Vaginal delivery without catastrophic or severe complication or comorbidity

| Mental health | Admissions with AR-DRG codes starting with U or V (includes both mental health and drug and alcohol-related DRG codes)

Examples: U63B: Major affective disorders Age <70 without catastrophic or severe complication or comorbidity; V62B: Alcohol use and dependence, minor complexity

| Medical | Admissions (excluding child birth and mental health) with numeric values (2nd and 3rd values) between 60 and 99

Examples: E63Z: Sleep apnoea; F74Z: Chest pain

| Surgical | Admissions (excluding child birth and mental health) with numeric values (2nd and 3rd values) between 01 and 39

Examples: C16B: Lens Procedures, Sameday; I04B: Knee replacement without catastrophic or severe complication or comorbidity

| Other | Admissions (excluding child birth and mental health) with numeric values (2nd and 3rd values) between 40 and 59

Examples: B42A: Nervous System Diagnosis W Ventilator Support with catastrophic complication or comorbidity; G44C: Other Colonoscopy, Sameday

| Error | Admissions with AR-DRG codes starting with 8 or 9.

Examples: 801C: Operating room procedures unrelated to principal diagnosis without complication or comorbidity. 961Z: Unacceptable principal diagnosis

7.3.3 High-need patients’ demographic and service utilisation characteristics

Similar to the methods used in Chapter 4, resource utilisation measures were used to define the high-needs patient group in the second stage of analysis. However, there were some differences in the methods used in this study compared to those described in Chapter 4 due to different features of the data sources used.

Due to the smaller sample size, the high-needs population was selected using the top 5% of patients, rather than the top 1%. Analysis results are presented for the group with the highest
number of hospital bed days for overnight admissions during the study period (calculated by summing the length of stay of each admission for a patient). Characteristics of high-needs groups based on alternate measures of resource utilisation such as number of admissions or cost to insurer are not reported in this study because the findings in Chapter 4 reported similar results for all three high-needs measures. This was confirmed for the study population analysed in the research presented in this chapter with additional analysis conducted for the group with the highest number of overnight admissions. The selection criterion for the high-needs cohort in this study was patients with 39 or more bed days for overnight hospitalisations in the study period (n = 296 patients).

The demographic and hospital resource utilisation statistics were calculated using the same methods described in Section 7.3.1. In this research stage, Mann-Whitney Wilcoxon tests were used to test the significance of differences in utilisation between the two groups. The high-needs group was compared to the rest of the study population with an overnight hospital admission. Hospital utilisation for the high-needs group by service category were analysed. The number of patients in the high-needs group accessing emergency department services and the proportion of their emergency visits that resulted in an admission were also analysed.

7.4 Results

7.4.1 Insured individuals’ use of public and private hospitals

Figure 7.3 shows the breakdown of patients with an overnight and/or same-day hospital admission during the study period. A similar proportion of people have only private hospital admissions (42%) or only public hospital admissions (40%). Despite the study population holding PHI, the proportion of people that only use public hospitals during the study period is considerable.

A smaller proportion of patients (18%) have admissions to both public and private hospitals in the study period. However, this group with both public and private hospital admissions account for the highest proportion of hospital admissions of the three groups (39%) shown in Table 7.3.
Overall, 72% of all hospital admissions are claimed on PHI. When considering overnight admissions only, less than two thirds (62%) of admissions are claimed on PHI. Although 43% of all admissions occur in public hospitals, 62% of overnight admissions occur in public hospitals.

Figure 7.3 Insured individuals’ use of public and private hospital services

Table 7.3 shows demographic and resource utilisation characteristics of the three types of hospital user groups. Differences between the three groups are statistically significant for all characteristics, with the exception of sex. The cohort with both public and private hospital admissions are significantly older and have significantly higher levels of hospital utilisation (both mean number of overnight admissions and mean length of stay per admissions) than the group with only public hospital or only private hospital admissions.

The group of patients with only private hospital admission have the lowest proportion of overnight admissions (28%) compared to 41% for the public and private hospital use group and 65% for the group of patients with public hospital use only. For those with public hospital admissions, the proportion of overnight hospital admissions claimed on PHI is 88% of admissions for the group with both public and private hospital use and only 19% for the group of patients that only access public hospitals in the study period. The mean case complexity for the three groups is lowest for the group with only public hospital admissions. This finding may relate to the high proportion of elective surgery procedures that occur in private hospitals as surgical procedures tend to have higher average levels of resource utilisation compared to services provided during other types of hospital admissions. Admission complexity if further explored in the next section, 7.4.2, which analyses hospital utilisation by service category.
In addition to admitted hospital services, emergency department visits were also examined. The proportion of people with emergency department visits among the group of patients with only public hospital admissions and both public and private hospital admissions are high (80% and 88% of the group respectively), compared to 30% of individuals in the private hospital only group. Based on the group criteria, no emergency department visits of the group with private hospital use only resulting in admitted care in the LHD. As emergency departments in the LHD studied are only located in public hospitals, the proportion of emergency department visits that resulted in an admission was also of interest. Of 8,612 visits for the public hospital only group, 3,658 visits (42%) resulted in admitted patient care in the LHD. For the public and private hospital group, 2,221 of 4,313 visits (51%) resulted in admitted patient care in the LHD.
Table 7.3 Demographic and resource utilisation characteristics of private only, public only and private and public hospital users, 2010-2015

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n (% total)</td>
<td>3,778 (42)</td>
<td>3,628 (40)</td>
<td>1,598 (18)</td>
<td>9,004</td>
</tr>
<tr>
<td>Patients with overnight admission, n (% total)</td>
<td>1,658 (29)</td>
<td>2,702 (47)</td>
<td>1,395 (24)</td>
<td>5,754</td>
</tr>
<tr>
<td>Patients with emergency department visit, n (% total visits)</td>
<td>1,133 (30)</td>
<td>2,919 (80)</td>
<td>1,410 (88)</td>
<td>5,462</td>
</tr>
<tr>
<td>Female*, n (% group)</td>
<td>2,034*(54)</td>
<td>1,891*(52)</td>
<td>817*(51)</td>
<td>4742 (53)</td>
</tr>
<tr>
<td>Patients aged 55 years and over*, n (% group)</td>
<td>1,035** (27)</td>
<td>738** (20)</td>
<td>644** (40)</td>
<td>2,417 (27)</td>
</tr>
<tr>
<td>Hospital admissions, n (% total)</td>
<td>8,895 (34)</td>
<td>7,153 (27)</td>
<td>10,239 (39)</td>
<td>26,287</td>
</tr>
<tr>
<td>Overnight admissions, n (% group admissions)</td>
<td>2,493 (28)</td>
<td>4,665 (65)</td>
<td>4,233 (41)</td>
<td>11,391 (43)</td>
</tr>
<tr>
<td>Overnight admissions claimed on PHI, n (% admissions)</td>
<td>2,493 (100)</td>
<td>894 (19)</td>
<td>3,706 (88)</td>
<td>7,093 (62)</td>
</tr>
<tr>
<td>Mean overnight admissions per patientb,c, n (SD)</td>
<td>1.7** (1.9)</td>
<td>1.5** (0.9)</td>
<td>3.0**(3.0)</td>
<td>2.0 (2.1)</td>
</tr>
<tr>
<td>Mean length of stay per overnight admissionb, days (SD)</td>
<td>3.9** (4.8)</td>
<td>5.5** (14.2)</td>
<td>6.0** (10.0)</td>
<td>5.4 (11.2)</td>
</tr>
<tr>
<td>Mean case weight per overnight admissionb,d, n (SD)</td>
<td>1.6** (1.3)</td>
<td>1.4** (1.7)</td>
<td>1.6** (1.7)</td>
<td>1.5 (1.6)</td>
</tr>
</tbody>
</table>

Abbreviations. n: Number; SD: Standard deviation
a. Pearson Chi-square (χ2) test used to compare categorical variables
b. Kruskal-Wallis test used to compare means of continuous variables
c. Per patient means calculated based on patients with an overnight admission (n=5,754).
d. 244 admissions without AR-DRG information in public hospital only group and 359 admissions without AR-DRG information in public and private hospital group
*ns Not significant
** Significant at p < 0.01

7.4.2 Insured individuals’ use of public and private hospitals by admission service category

Of 11,391 overnight admissions for the insured population in the study period, medical admissions were the most numerous (47% of admissions), followed by surgical (30%), childbirth (10%),
mental health (4%) and other (3%). One percent of admissions were assigned error AR-DRG codes intended for atypical cases or errors in use of the AR-DRG classification system. As described in Section 7.3.1, 5% of admissions had no DRG information. Hospital utilisation statistics for each service category are presented in Table 7.4 with admissions for each category grouped according to the three types of hospital users – private hospital only, public hospital only and private and public hospital.

**Medical admissions**

The group with only public hospital admissions account for 70% of overnight medical admissions with only 30% of admissions for this group claimed on PHI. The group with both private and public hospital use has the longest average length of stay per overnight admission of 7.8 days compared to 4.8 days and 4.6 days for the public hospital use group and the private hospital use group respectively. The average admission case weight, used as a proxy measure of case complexity, for the private and public hospital use group is 1.1, compared with 1.0 and 0.8 for the public hospital use group and private hospital use group respectively.

**Surgical admissions**

The group with only private hospital admissions account for 66% of overnight surgical admissions while the group with public hospital use only group account for 28% of surgical admissions and the public and private use group account for only 6% of surgical admissions. Despite making up the highest proportion of overnight admissions, the average length of stay per overnight admission is lowest for the group with private hospital use only, with an average length of stay of 3.5 days compared with 5.4 days and 5.1 days for the private and public hospital use group and the public hospital use only group respectively. The average admission case weight for the group with private hospital use only is also the lowest for the three groups at 2.0 compared to 2.6 for both the public hospital use only and the public and private hospital use groups.

**Childbirth admissions**

The group with only private hospital admissions account for 50% of overnight childbirth admissions. The group with only public hospital admissions account for 48% of admissions and
the public and private hospital use group account for only 2% of admissions. For the group with only public hospital admissions, only 19% of admissions are claimed on PHI. Admission length of stay is longest for the group with only private hospital admissions (average of 5.6 days per overnight admission), followed by the group with public and private hospital admissions (average of 5.3 days) and the group with only public hospital admissions (average of 3.9 days). The average admission case weight is not significantly different for the three groups.

Mental health admissions

The group with only public hospital admissions account for 63% of overnight mental health admissions with only 10% of admissions for this group claimed on PHI. Admission length of stay is longest for the group with only private hospital admissions (average of 23.4 days per overnight admission), followed by the group with public and private hospital admissions (average of 18.0 days) and then the group with only public hospital admissions (average of 14.5 days). Although the average length of stay is longest for the group with only private hospital use, this group has the lowest average admission case weight (2.5) suggesting a lower average case complexity compared to admissions for the public hospital use only and private and public hospital use groups. The average admission case weight for the public hospital use group is highest at 3.0, followed by 2.8 for private and public hospital use group.

Other admissions

The group with only public hospital admissions account for 56% of overnight other admissions. The group with only private hospital admission account for 40% of admissions and the public and private hospital use group only account for 4% of admissions. For the group with only public hospital admission, 47% of admissions are claimed on PHI. The average length of stay for the public hospital use only group is 8.6 days with an average admission case weight of 2.1. The private hospital use only group has an average length of stay of only 1.3 days and average admission case weight of 1.3. For the small number of patients with both private and public hospital use (n = 14), average admission case weight is the highest at 2.4, with an average length of stay of 5.3 days.
Table 7.4 Overnight hospital utilisation measures by service categories for private only, public only and private and public hospital users, 2010-2015

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients, n (% medical patients)</td>
<td>496 (15)</td>
<td>2,402 (77)</td>
<td>238 (8)</td>
<td>3,136</td>
</tr>
<tr>
<td>Admissions, n (% medical admissions)</td>
<td>631 (12)</td>
<td>3,797 (70)</td>
<td>966 (18)</td>
<td>5,394</td>
</tr>
<tr>
<td>Admissions claimed on PHI, n (% admissions)</td>
<td>631 (100)</td>
<td>1153 (30)</td>
<td>813 (84)</td>
<td>2,597 (48)</td>
</tr>
<tr>
<td>Mean length of stay per admission, days (SD)</td>
<td>4.6 (5.6)**</td>
<td>4.8 (13.6)**</td>
<td>7.8 (11.2)**</td>
<td>5.3 (12.5)</td>
</tr>
<tr>
<td>Mean case weight per admission, n (SD)</td>
<td>0.8 (0.6)**</td>
<td>1.0 (0.7)**</td>
<td>1.1 (0.8)**</td>
<td>1.0 (0.7)</td>
</tr>
<tr>
<td><strong>Surgical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients, n (% surgical patients)</td>
<td>1,652 (65)</td>
<td>822 (32)</td>
<td>87 (3)</td>
<td>2,561</td>
</tr>
<tr>
<td>Admissions, n (% surgical admissions)</td>
<td>2,217 (66)</td>
<td>946 (28)</td>
<td>214 (6)</td>
<td>3,377</td>
</tr>
<tr>
<td>Admissions claimed on PHI, n (% admissions)</td>
<td>2,217 (100)</td>
<td>225 (24)</td>
<td>186 (87)</td>
<td>2,628 (78)</td>
</tr>
<tr>
<td>Mean length of stay per admission, days (SD)</td>
<td>2.9 (3.5)**</td>
<td>5.1 (8.4)**</td>
<td>5.4 (6.7)**</td>
<td>3.7 (5.6)</td>
</tr>
<tr>
<td>Mean case weight per admission, n (SD)</td>
<td>2.0 (1.6)**</td>
<td>2.6 (3.7)**</td>
<td>2.6 (2.0)**</td>
<td>2.2 (2.4)</td>
</tr>
<tr>
<td><strong>Childbirth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients, n (% childbirth patients)</td>
<td>447 (50)</td>
<td>424 (48)</td>
<td>21 (2)</td>
<td>892</td>
</tr>
<tr>
<td>Admissions, n (% childbirth admissions)</td>
<td>609 (51)</td>
<td>539 (45)</td>
<td>45 (4)</td>
<td>1,193</td>
</tr>
<tr>
<td>Admissions claimed on PHI, n (% admissions)</td>
<td>609 (100)</td>
<td>105 (19)</td>
<td>37 (82)</td>
<td>751 (63)</td>
</tr>
<tr>
<td>Mean length of stay per admission, days (SD)</td>
<td>5.6 (1.5)**</td>
<td>3.1 (1.8)**</td>
<td>5.0 (3.9)**</td>
<td>4.5 (2.2)</td>
</tr>
<tr>
<td>Mean case weight per admission, n (SD)</td>
<td>1.7 (0.7)*ns</td>
<td>1.5 (0.7)*ns</td>
<td>1.5 (0.6)*ns</td>
<td>1.6 (0.7)</td>
</tr>
</tbody>
</table>
### Mental health

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n (% mental health patients)</td>
<td>46 (26)</td>
<td>109 (63)</td>
<td>19 (11)</td>
<td>174</td>
</tr>
<tr>
<td>Admissions, n (% mental health admissions)</td>
<td>106 (27)</td>
<td>224 (57)</td>
<td>65 (16)</td>
<td>395</td>
</tr>
<tr>
<td>Admissions claimed on PHI, n (% admissions)</td>
<td>106 (100)</td>
<td>23 (10)</td>
<td>55 (85)</td>
<td>184 (47)</td>
</tr>
<tr>
<td>Mean length of stay per admission, days (SD) (^a)</td>
<td>23.4 (16.3)**</td>
<td>14.5 (21.5)**</td>
<td>18.0 (19.3)**</td>
<td>17.4 (20.2)</td>
</tr>
<tr>
<td>Mean case weight per admission, n (SD) (^a)</td>
<td>2.5 (1.3)**</td>
<td>3.0 (1.6)**</td>
<td>2.8 (1.3)**</td>
<td>2.8 (1.5)</td>
</tr>
</tbody>
</table>

### Other

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n (% other patients)</td>
<td>117 (39)</td>
<td>169 (56)</td>
<td>14 (5)</td>
<td>300</td>
</tr>
<tr>
<td>Admissions, n (% other admissions)</td>
<td>129 (40)</td>
<td>180 (56)</td>
<td>14 (4)</td>
<td>323</td>
</tr>
<tr>
<td>Admissions claimed on PHI, n (% admissions)</td>
<td>129 (100)</td>
<td>84 (47)</td>
<td>13 (93)</td>
<td>226 (70)</td>
</tr>
<tr>
<td>Mean length of stay per admission, days (SD) (^a)</td>
<td>1.3 (1.3)**</td>
<td>8.6 (14.1)**</td>
<td>5.3 (4.5)**</td>
<td>5.6 (11.2)</td>
</tr>
<tr>
<td>Mean case weight per admission, n (SD) (^a)</td>
<td>1.2 (0.4)**</td>
<td>2.1 (1.3)**</td>
<td>2.4 (1.7)**</td>
<td>1.8 (1.2)</td>
</tr>
</tbody>
</table>

### Error DRGs

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions, n</td>
<td>99</td>
<td>7</td>
<td>0</td>
<td>106</td>
</tr>
</tbody>
</table>

### No DRGs

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions, n</td>
<td>0</td>
<td>244</td>
<td>359</td>
<td>603</td>
</tr>
</tbody>
</table>

### Total admissions

<table>
<thead>
<tr>
<th></th>
<th>Private hospital use only</th>
<th>Public hospital use only</th>
<th>Private and public hospital use</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total admissions</td>
<td>11,391</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Abbreviations. n: Number; SD: standard deviation

\( ^a \) Kruskal-Wallis test used to compare means of continuous variables

\( ^{ns} \) Not significant

\( ^{**} \) Significant at \( p < 0.01 \)

**Comparison between service categories of admissions**

Figure 7.4 shows the proportion of individuals in each hospital use group for the five service categories. The majority of patients with a medical admission (85%) receive services in a public
hospital at least once in the study period (77% of patients only use public hospitals for medical services and 8% of patients have medical admissions in both public and private hospitals). For surgical admissions, 68% of patients receive services in a private hospital at least once in the study period (65% of patients only access private hospitals and 3% use both public and private hospitals). The use of private and public hospitals for childbirth admissions is roughly equal (50% of patients only access private hospitals and 48% of patients only access public hospitals). The proportion of patients accessing both public and private hospitals for a particular service category is low. Of all the service categories, the greatest proportion of patients accessing both private and public hospitals is for mental health services (11%).

Despite large variances in the patterns of hospital use for individuals in each of the service categories as shown in Figure 7.4, Table 7.4 shows that the proportion of hospital admissions for each service category claimed on PHI shows a similar trend to the use of private hospitals with the majority of surgical admissions claimed on PHI (78%) and less than 50% of medical and mental health admissions claimed on PHI (48% and 47% respectively).

The group of patients with both public and private hospital admissions account for the smallest proportion of admissions but have the longest average length of stay for medical and surgical admissions (7.8 and 5.4 days respectively), followed by the group with only public hospital admissions (4.8 and 5.1 days respectively) then the group with only private hospital admissions (4.6 and 2.9 days respectively). For mental health and childbirth admissions, the average length of stay is longer for the private hospital group than the other two hospital use groups, but this does not reflect significantly higher admission case weights.
Figure 7.4 Proportion of patients in each hospital use group by service category

With the exception of childbirth admissions, the mean admission case weight is significantly higher for the group with public hospital admissions only and the group with public and private hospital admissions compared to the group with private hospital admissions only. Figure 7.5 shows grouped boxplots for admission case weight for each hospital use group for the five service categories showing the median, interquartile range and minimum and maximum scores (extreme outliers for medical, surgical and other admissions are excluded from Figure 7.5 but are included in the calculation of mean case weights in Table 7.4).

For medical admissions, the interquartile range of case weights is larger for the private hospital use only and public and private hospital use groups, although the public hospital use group displays a long tail of high admissions case weights extending beyond the 75th quartile. Surgical admission case weights are distributed more narrowly for admissions in the private hospital use only group and most broadly for the public and private hospital use group. The biggest difference in median case weight scores can be seen for mental health admissions with a higher median case weight in the public hospital use group and the public and private hospital use group compared to the private hospital use group.

For medical and surgical admissions, that make up the majority of overnight hospital admissions,
there is a greater variance in the distribution of admission case weights for the group with public hospital use only and the group with both public and private hospital use suggesting greater complexity in admissions for these two groups compared to the private hospital use only group. As shown in Figure 8.5, this trend is most clear for surgical admissions.

![Boxplots of admission case weights for patients with only private hospital use, only public hospital use and both public and private hospital use, by service category](image)

Figure 7.5 Boxplots of admission case weights for patients with only private hospital use, only public hospital use and both public and private hospital use, by service category

### 7.4.3 High-needs patients’ demographic and service characteristics

The high-needs group with the top 5% of bed days for overnight admissions (n=296) accounts for 16% of all hospital admissions (19% of overnight admissions). Table 7.5 shows the demographic
and resource utilisation characteristics for the high-needs group, compared with the rest of the population with a hospital admission. The two groups do not differ significantly in relation to sex but do differ significantly on age and all resource utilisation characteristics. The high-needs patient group are significantly older with more than two thirds of the group (69%) aged 55 years and over compared to only 25% of the non-high-needs patient group who are aged 55 years and over.

During the study period, the high-needs group have an average of 7.4 overnight admissions (SD. 5.4) and an average length of stay of 13.7 days per overnight admission (SD. 102.81) compared to an average of 1.7 overnight admissions (SD.1.2) and 3.4 days (SD. 3.6) for the non-high-needs group. The mean length of stay per overnight admission is four times longer for the high-needs group compared to the comparison group and the average annual bed days per person is over 100 days for the high-needs group (101.5 days) compared to 5.7 days for the non-high-needs group. The mean admission case weight per admission is significantly higher for the high-needs group compared to the comparison group (2.2 and 1.4 respectively) confirming that the high-needs group receive more complex and resource-intensive health care.

Analysis of insurance status and hospital setting for overnight admissions finds that the two groups have a similar proportion of overnight admissions claimed on PHI (64% for the high-needs group and 62% for the non-high-needs group) but 71% of the admissions for the high-needs group occur in public hospitals (compared to 59% of admissions for the non-high-needs group) and a higher proportion of overnight admissions in public hospitals for the high-needs groups are claimed on PHI (49%) compared to the non-high-needs group (21%).
Table 7.5 Demographic and resource utilisation characteristics of high-needs and non-high-needs patients, 2010-2015

<table>
<thead>
<tr>
<th></th>
<th>High-needs patients</th>
<th>Non-high-needs patients</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n</td>
<td>296</td>
<td>8,708</td>
<td>9,004</td>
</tr>
<tr>
<td>Patients with overnight admission, n</td>
<td>296</td>
<td>5,458</td>
<td>5,754</td>
</tr>
<tr>
<td>Femalea, n (% group)</td>
<td>160** (54)</td>
<td>4,582** (53)</td>
<td>4742 (53)</td>
</tr>
<tr>
<td>Patients aged 55 years and overa, n (% group)</td>
<td>204** (69)</td>
<td>2,213** (25)</td>
<td>2,417 (27)</td>
</tr>
<tr>
<td>Hospital admissions, n (% total)</td>
<td>4,166 (16)</td>
<td>22,121 (84)</td>
<td>26,287</td>
</tr>
<tr>
<td>Overnight admissions, n (% group admissions)</td>
<td>2,191 (53)</td>
<td>9,200 (42)</td>
<td>11,391 (43)</td>
</tr>
<tr>
<td>Mean overnight admissions per patientb,c, n (SD)</td>
<td>7.4** (5.4)</td>
<td>1.7** (1.2)</td>
<td>2.0 (2.1)</td>
</tr>
<tr>
<td>Mean length of stay per overnight admissionb, days (SD)</td>
<td>13.7** (102.8)</td>
<td>3.4** (3.6)</td>
<td>5.4 (11.2)</td>
</tr>
<tr>
<td>Mean bed days per patientb,c, days (SD)</td>
<td>101.5** (22.6)</td>
<td>5.7** (6.6)</td>
<td>10.6 (32.1)</td>
</tr>
<tr>
<td>Mean case weight per overnight admissionb, n (SD)</td>
<td>2.2** (2.7)</td>
<td>1.4** (1.2)</td>
<td>1.5 (1.6)</td>
</tr>
</tbody>
</table>

*Abbreviations. n.: Number; SD: Standard deviation
a. Pearson Chi-square (χ²) test used to compare categorical variables
b. Wilcoxon rank-sum (Mann-Whitney) test used to compare means of continuous variables
c. Per patient means calculated based on patients with an overnight episode.
ns Not significant
** Significant at p < 0.01

Service categories for overnight hospital admissions for the high-needs patient group and comparison group are shown in Table 7.6. The high-needs group account for a majority of mental health admissions (63%) and almost a quarter of medical admissions (23%) and other admissions (24%). The high-needs group account for only 11% of surgical admissions and 1% of childbirth admissions.

Analysis of the top AR-DRGs for the high-needs group for overnight admissions show the top reasons for treatments, accounting for 17% of overnight admissions for the high-needs group, are rehabilitation (Z60), mental health conditions (major affective disorders (U63) and personality disorders (U67)) and respiratory conditions (E62).
Table 7.6 Overnight hospital admissions by service categories of high-needs and non-high-needs cohorts, 2010-2015

<table>
<thead>
<tr>
<th>Service Category</th>
<th>High-needs patients</th>
<th>Non-high-needs patients</th>
<th>Total study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Childbirth, n (% cat adm)</td>
<td>9** (1)</td>
<td>1,184** (99)</td>
<td>1,193</td>
</tr>
<tr>
<td>Mental health, n (% cat adm)</td>
<td>249** (63)</td>
<td>146** (37)</td>
<td>395</td>
</tr>
<tr>
<td>Medical, n (% cat adm)</td>
<td>1,245** (23)</td>
<td>4,149** (77)</td>
<td>5,394</td>
</tr>
<tr>
<td>Surgical, n (% cat adm)</td>
<td>355** (11)</td>
<td>3,022** (89)</td>
<td>3,377</td>
</tr>
<tr>
<td>Other acute, n (% cat adm)</td>
<td>76** (24)</td>
<td>247** (76)</td>
<td>323</td>
</tr>
<tr>
<td>Admissions with error DRG, n (% cat adm)</td>
<td>25** (24)</td>
<td>81 ** (76)</td>
<td>106</td>
</tr>
<tr>
<td>Admissions with missing DRG, n (% cat adm)</td>
<td>232** (38)</td>
<td>371 ** (62)</td>
<td>603</td>
</tr>
</tbody>
</table>

** Total overnight admissions 2,191 9,200 11,391

Abbreviations. % cat adm: Percentage of service category admissions
** Significant at p < 0.01 (Pearson Chi-square (χ²) test)

For the high-needs group, more than half of hospital admissions for all service categories were claimed on PHI but as shown in Figure 7.6, a higher proportion of surgical and other admissions (73% and 74% of admissions respectively) are claimed on PHI compared to medical and mental health admissions (54% and 55% of admissions respectively). Of the service categories, the largest difference in the proportion of private hospital admissions and the proportion of admissions claimed on PHI occurs for medical and other admissions. Although only 22% of medical admissions occur in private hospitals, 54% of admissions are claimed on PHI. Similarly, for other admissions, only 21% of admissions occur in private hospitals but 74% of admissions are claimed on PHI.
More than 90% of the high-needs group have at least one public hospital admission with 54% having public and private admission and 39% having only public admissions during the study period (including both overnight and same-day admissions). In relation to emergency department utilisation within the LHD, 89% of patients in the high-needs group visit an emergency department in the study period. There are a total of 1,639 emergency department visits for the high-needs group (an average of 6.2 visits per person) with 67% visits resulting in admitted patient services within the LHD.

### 7.5 Discussion

This study demonstrates the value of linking and analysing multiple data sources to understand hospital utilisation across public and private hospitals for a privately insured cohort. This study reveals the complicated interplay of hospital setting and funding mechanisms in Australia’s mixed public and private health system. PHI is associated with greater access to private hospitals, and greater patient choice in service provision, but a more detailed examination of the hospital use of a privately insured population reveals substantial use of public hospitals by privately insured patients. Despite holding PHI, 40% of people with a hospital admission in the 6-year study period only accessed services in a public hospital. Although 72% of all hospital admissions for the
insured population were claimed on PHI, 43% of hospital admissions occurred in public hospitals. If only overnight admissions are considered, 62% of admissions occur in public hospitals.

The research findings show clear patterns in the use of public and private hospitals based on service categories for overnight admissions with the majority of medical admissions occurring in public hospitals and the majority of surgical admissions occurring in private hospitals. Not surprisingly, surgical admissions are more likely to be claimed on PHI than medical admissions. This trend may be related to the coverage of PHI and contracting arrangements between private hospitals and PHI funds (O'Loughlin 2002, pp. 112-4) or differences in the specialisation of public and private hospitals in Australia (Martins 2009).

In addition to the type of services delivered, the average complexity of admissions is significantly higher for patients admitted to public hospitals (both patients that only use public hospitals and patients that use both public and private hospitals) than for patients admitted to private hospitals only for all service categories, excluding childbirth.

Findings from this study align with previous research examining health services utilisation based on differences in public and private funding and hospital setting in Australia including that patients tend to be admitted to the hospital type (public or private) they had used in the past (Gu & Johar 2017) and patients with both public and private hospital admissions having higher overall resource utilisation (Cheng et al. 2014).

This study also examined the interaction of both hospital setting and patient insurance status. This study shows that in relation to the most costly form of hospitalisation, overnight admissions, resource utilisation in the public sector is greater than the private sector and on average, more complex admissions are treated in public hospitals, although high-needs patients also claim a greater proportion of public hospital admissions on PHI.

High-needs patients access a greater proportion of care in public hospitals and their emergency department visits are more likely to result in admitted care. In this study, the high-needs group
claim a higher proportion of public hospital admissions on PHI than the rest of the insured population with a hospital admission. The level of insurance policy held by individuals in the high-needs patient group may be a factor in differences in claiming on PHI. People with higher healthcare needs may be more likely to hold comprehensive PHI policies in anticipation of high levels of health service utilisation.

Both the federal government and PHI funds have raised concerns in relation to the increasing rates of PHI claims for hospital admissions to the public hospital sector. Admissions to public hospitals in which the patient uses their PHI should meet certain criteria including the patient having a choice of doctor and a single, rather than shared, room where available. A counter argument has also been made that a “loophole” exists for the PHI sector in Australia in funding hospital care for insured individuals. This “loophole” is that privately insured individuals can receive services as a public patient at no cost to their insurer (Seah et al. 2013). The patterns of hospital utilisation reported in this study for privately insured patients lend some weight to the “loophole” argument. More complex admissions and a greater proportion of admissions for high-needs patients occur in public hospitals. Debate on the correct proportion of funding contributed by public and private sources remains unresolved because of the duplicated nature of PHI in funding hospital care in public hospitals in Australia, which by default, is government-funded.

The findings of this study indicate that it is important to look beyond the total number of hospital admissions and examine the types of services delivered in public and private hospitals when considering patients with PHI accessing public hospitals as there are differences in the use of public hospitals by service category and complexity of admission.

The utilisation patterns for mental health services found in this study are interesting in the context of the study findings in Chapters 4 and 5. Mental health conditions were one of the top reasons for hospital claims in the high-needs analysis developed using only insurance claims data reported in Chapter 4. The findings of the analysis in this study using linked data shows that less than half of overnight mental health admissions are claimed on PHI in the study population. These findings suggest that by considering insurance claims data only, insurers may be underestimating both the
number and the needs of people within the insured population with serious mental health issues.

The design of this study used the conceptual framework developed in Chapter 6 to build a more comprehensive record of hospital utilisation for an insured population. In addition to records of hospital admissions not claimed on PHI, missing clinical information on public hospital admissions claimed on PHI was made available through data linkage. This study demonstrates the feasibility of linking data across different health organisations but highlighted a number of data quality and integration considerations. As an example, the concordance between variables with common names across datasets should not be taken for granted when analysing linked data sources. An example from this study is the AR-DRG variables from each data source used different AR-DRG versions resulting in the need to re-code the insurance claims data to allow for comparison.

The study leveraged available research data infrastructure established for the purpose of supporting the linkage and analysis of administrative health data. Despite the purpose-built infrastructure, the approval and linkage processes took more than 18 months so there was a long lead-time before the researcher accessed the linked data extracts. Additionally, although data were shared between organisations to allow the linkage to occur, the researcher analysed data using infrastructure that was not directly integrated with the information systems of either organisation. These factors should be considered in future linkage and analytic projects designed to inform healthcare practice and planning.

There are a number of caveats in interpreting the study findings. First, the study population consists of insured individuals from only one PHI fund in one regional location in Australia and thus, results may not be generalisable to other populations, particularly as some sub-group analyses of service categories and high-needs patients had relatively small numbers. Additionally, hospital admissions for the insured population that were paid for by a third-party payer (such as the Department of Veterans’ Affairs or workers’ compensation schemes) are only included in the analysis if they occurred in the LHD. The number of additional admissions occurring outside the LHD is expected to be small. As noted earlier in this chapter in Section 7.3.1, clinical diagnosis
information on out-of-region public hospital admissions claimed on PHI (making up 5% of overnight admissions) was not available.

Finally, although information on whether patients held a PHI policy at the time of hospital admission was known, the level of PHI coverage held by individuals during the study period is not known so analysis could not determine the proportion of public hospital admissions not claimed on PHI that were related to insurance policy exclusions. Future research may investigate factors affecting choice of hospital setting or patient status, including the extent of coverage of PHI policies.

7.6 Conclusion

This chapter reports on a successful case of linking administrative data between private and public health organisations for the first time in Australia. The study provides a regional analysis of hospital utilisation for a privately insured cohort. With an increasing emphasis on person-centred care, particularly for supporting high-needs patients with chronic conditions, this type of comprehensive analysis is beneficial to understanding the mix of hospital utilisation for patients in Australia.

Although this study found that insurers contribute funding towards more than 70% of hospital admissions of insured individuals, a large proportion of this care, particularly for high-needs patients, occurs in public hospitals, for which insurers receive limited clinical information for each admission. In fact, 40% of people with a hospital admission in the study period only accessed public hospitals. There were also differences in the service categories claimed on PHI with surgical, childbirth and other admissions more likely to be claimed than medical or mental health admissions. In this and previous chapters, the studies analysed administrative data sources to understand the services provided in hospitals for which insurers pay a benefit for high-needs patients and the relative contribution of PHI to funding hospital care. To complement these findings, the final study reported in the next chapter was conducted using qualitative methods to understand perspectives of PHI representatives on designing and implementing support strategies for high-needs patients.
Chapter 8: The emerging role of the Australian PHI sector in providing CDM programs: Current activities, challenges and constraints

The study reported in this chapter was conducted for two purposes: (1) to provide PHI sector representatives with the opportunity to reflect and provide feedback on the findings of the earlier studies; and (2) to examine the approaches of PHI funds to supporting high-needs patients including the provision of CDM programs. This chapter presents the final study of the research presented in this thesis, part of Phase 3 described in Section 3.2 and Figure 3.1 on page 42. This study uses qualitative methods to expand and contextualise the findings from the studies presented in previous chapters. In addition to reflecting on the findings of the previous studies reported in this thesis, the interviews conducted with PHI representatives explored the emerging role of insurers in developing and implementing CDM strategies including the identification of target groups and the evaluation of CDM programs.

8.1 Study background

This study seeks insurer feedback on the findings of the studies related to the demographic and clinical characteristics of high-needs patients, including support for people with mental health conditions (Chapters 4 and 5), and how insurers are making use of the information they collect through insurance claims data to inform the design and development of CDM programs (Chapter 6). This study was conducted before the results of the data linkage study reported in Chapter 7 were available, so questions related to the findings of this study were not included in the interviews with insurer representatives.

As described in Section 2.5 on page 29, PHI funds have been able to offer CDM programs since 2007 following changes in government regulations. However, expenditure on these programs by the PHI sector is low, with annual benefits paid for CDM programs (A$54 million) representing only 0.4% of the benefits paid for hospital treatment (A$14.9 billion) (APRA 2018). A challenge for PHI funds in supporting high-needs patients with chronic conditions is that models of good practice emphasise continuity and coordination of care across providers and settings, yet PHI
funds can only cover a defined set of services and a range of services, most notably out-of-hospital medical services provided by both GPs and specialists, cannot be covered by PHI.

Research into CDM programs offered by the Australian PHI sector has focussed on evaluating single programs such as the HCF My Health Guardian Program, a CDM program offering a range of services including telephone and web-based support that commenced in 2009. Evaluation of the program reported a significant reduction in hospital admissions, readmissions and bed days among program participants compared to a control group (Hamar et al. 2017; Hamar et al. 2015). The evaluation of a nurse-led, home-based intervention for secondary prevention of cardiovascular disease offered by another large PHI fund, Bupa, reported contrasting findings. The trial did not find a reduction in all-cause hospitalisation in the home-based intervention group compared to the usual care group (Carrington et al. 2013) and the program was not found to be cost effective (Byrnes et al. 2015). The Telephonic Complex Care Program offered by another PHI fund in Australia, whose name was not included in the published article, provided risk assessments, tailored care plans and regular telephone follow-up to people aged 65 years or over with two or more hospital admissions in the previous 12 months. The study did not find reductions in hospital utilisation claims or total benefits paid in the 12 months following program enrolment. There was, in fact, a modest increase (A$120 per person) in general treatment benefits paid for participants covering allied health services (Morello et al. 2016).

These evaluations of Australian PHI-supported CDM programs demonstrate mixed results in relation to the effectiveness of these programs as measured by reductions in health service use, costs and improvements in health status. Although these research studies demonstrate an encouraging commitment to testing and evaluating new initiatives, the studies do not provide insight into the development and implementation of approaches and specific strategies to support high-needs patients and people with chronic conditions, which is the focus on this study. Additionally, consistent with recent research on the PHI sector’s involvement in primary health care and its implications for health equity that documented insurer primary care activities (Windle et al. 2018), the evaluation studies demonstrate a broad variety of activities offered under the banner of CDM programs ranging from infrequent telephone and web-based support to regular
home-based nurse support. The types of CDM activities, including their mode of delivery and target group, offered by a group of PHI funds are explored in more detail in this study.

As discussed in Section 2.6 on page 32, most qualitative research related to PHI in Australia has focussed on the consumer perspective, exploring reasons for uptake and use of PHI. The insurer perspective is not well represented in previous qualitative research, particularly the perspective of smaller non-profit PHI funds that are the focus of this study. These funds have their origins as restricted membership organisations and mutual societies. They make up a smaller proportion of the national insurance market but often have strong representation among specific employee sectors or geographic locations resulting in distinct membership profiles and operational environments (Shamsullah 2011, p. 25). As a result of these characteristics, these funds may take a different approach to designing and implementing CDM programs compared to larger PHI funds that have published evaluations of CDM programs, many of which are for-profit. Only a single study reporting interviews with Australian PHI representatives was found in the literature review for this study and it was conducted before the new legislation for the PHI sector was introduced in 2007. Willcox (2005) examined insurer purchasing of health services through interviews with PHI fund representatives. This study focussed on the purchasing of hospital-based services and the author concluded that the complex regulatory environment appeared to impede insurer efforts for more efficient hospital purchasing.

8.2 Methods

The research in this thesis has a sequential design as described in Chapter 3 and this study was informed by the findings of the studies presented in Chapters 4, 5, and 6 using insurance claims data. The study used a qualitative research design with in-depth, semi-structured interviews conducted with participants to reflect on the findings of the previous studies and to more broadly investigate PHI sector perspectives on, and approaches to, CDM. Semi-structured interviews were selected over other qualitative methods such as focus groups because the method allows a depth of response from each participant (DiCicco-Bloom & Crabtree 2006, p. 315).
8.2.1 Participant sample

Participant sampling for the interviews was criteria-based. All participants had to be presently working in the PHI sector and hold a senior management position. Invitations to participate were sent via email to 19 PHI organisations. A target of eight to ten interviews was set but a principle of saturation was used whereby interviews would continue until no new themes emerged (Guest et al. 2006, p. 64). Saturation was reached after eight interviews and no new interviews were scheduled. Participant and fund characteristics are presented in Table 8.1. Participants came from one PHI industry association and seven different PHI funds that represent approximately 20% of registered PHI funds in Australia (Private Health Insurance Ombudsman 2018f).

8.2.2 Interviewing procedure

Email invitations sent to potential interview participants described that the purpose of the interviews was to discuss the design and implementation of CDM programs and stipulated that interview topics were appropriate for representatives with senior management experience. A copy of the email invitation is included in Appendix 3. Due to the seniority of the participants, confirmation to participate in the interview through reply email to schedule an interview time was deemed consent to participate in the study. As described in Section 3.4 on page 46, the protocol for this study was reviewed by the University Institute that the PhD researcher is affiliated with and was deemed to be negligible risk research and thus exempted from ethical review. Interviews took places between October and December 2017 and were conducted via telephone with the duration of interviews lasting from 30 to 60 minutes. Explicit consent was received from each participant at the beginning of the interview to audio-record the interview for the purposes of transcription. The interview schedule was sent to participants in advance two weeks prior to the interview.

8.2.3 Interview schedule

Interview questions were based on key issues arising from the findings of the earlier studies including:

- Current strategy of PHI funds to support high-need members and people with chronic
conditions (including a sub-topic specifically related to support for people with mental health conditions)

- Data and information requirements for planning and implementing CDM programs
- Policy constraints and other challenges affecting the role of insurers in CDM.

The interview schedule was piloted with an individual with both research and PHI sector experience and the final schedule was minimally revised following feedback. A summarised selection of interview questions are listed below, the full interview schedule is included in Appendix 4.

1. What is your perception of the role of PHI funds in CDM?
2. Can you briefly tell me about the current strategies that your fund uses to support people living with chronic diseases?
3. Mental health was strongly represented among the top 1% of privately insured hospital users in previous analysis. Describe the priorities of your fund in the area of mental health care.
4. From your perspective, what is the most important information needed to design and implement CDM programs?
5. How does your fund measure success in CDM programs?
6. Do you have any suggestions for recommendations that would help shape the future that you want to see for the PHI sector in the area of CDM?

8.2.4 Data analysis

The interviews were transcribed and analysed following the Framework Analysis method (Ritchie & Spencer 1993). This method was developed for applied policy research and has been described as particularly suited to qualitative studies with specific questions, a priori issues and a pre-designed sample, which aligned with the circumstances of this study (Srivastava & Thomson 2009, p. 72). The five stages of Framework Analysis are familiarisation, identifying a thematic framework, indexing, charting, mapping and interpretation. Following familiarisation with the data, a thematic framework was developed, and transcripts were systematically indexed then charted into a spreadsheet. The mapping and interpretation stages linked the thematic areas back to
the study aims and key issues of investigation. The interview data were analysed by the PhD researcher only. Consideration was given to having a second coder but was decided not to be practical as a PhD research study. There was a deliberate method set for structuring interview questions based on previous study findings and as a result, concerns for interviewer bias or coding bias were reduced. Additionally, a process of member checking was conducted whereby analysed results were returned to participants for their review and validation (Birt et al. 2016). Descriptive responses were collated and synthesised for the first topic that provides an overview of the approach of different PHI funds to supporting high-needs patients. Themes are presented for the remaining issues where the majority of participants demonstrated consensus or there was collective weight of opinion. In the reporting of direct quotes, participants are denoted by a number in parentheses after quotes.

8.3 Results

8.3.1 Sample characteristics

The interview participants reflect a diversity of perspectives based on both participant and fund characteristics as shown in Table 8.1. The majority of participants were females with three participants employed for less than two years in the PHI sector and five participants employed for more than two years. The length of PHI sector experience ranged from one year to 20 years, with a median of four years. Four of the participants interviewed were employed in clinical or healthcare-related roles, focussed on CDM program development. In relation to the seven PHI funds represented, four funds had less than 100,000 total members and three funds had between 100,000 and 400,000 members. Four funds were open to all types of members, whereas three funds had restrictions on members, largely relating to employment sector. Six of the seven funds had a membership concentration in a specific state, with a concentration of members in the states on the east coast of Australia (New South Wales, Victoria or Queensland).
Table 8.1 Participant and insurance fund characteristics

<table>
<thead>
<tr>
<th>Participant Characteristics</th>
<th>Fund Characteristics&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Fund size (no. of individual members)</td>
</tr>
<tr>
<td>Female</td>
<td>Less than 100,000</td>
</tr>
<tr>
<td>Male</td>
<td>100,000 - 400,000</td>
</tr>
<tr>
<td>Time employed in the PHI sector</td>
<td>Type of fund</td>
</tr>
<tr>
<td>Two years or less</td>
<td>Open fund</td>
</tr>
<tr>
<td>Greater than two years</td>
<td>Restricted member fund</td>
</tr>
<tr>
<td>Management level</td>
<td>Concentration of membership (&gt; 50% members)</td>
</tr>
<tr>
<td>CEO</td>
<td>New South Wales</td>
</tr>
<tr>
<td>Executive management - insurance</td>
<td>Victoria</td>
</tr>
<tr>
<td>Executive management - clinical/health care focus</td>
<td>Queensland</td>
</tr>
<tr>
<td></td>
<td>No geographical concentration</td>
</tr>
</tbody>
</table>

1. Fund characteristics are reported for seven funds as one participant came from a PHI industry association so these questions were not applicable.

8.3.2 Current strategy of PHI funds to support members with chronic conditions and high healthcare needs

All participants responded that their fund currently offers services to support insured members with chronic conditions, although these services were at different stages of maturity. Four funds have established business structures separated from insurer functions to provide health and CDM programs, while one fund at an early stage of CDM program development currently has only one person dedicated to supporting the CDM needs of members.

The three main categories of CDM services offered by participant funds, and the service eligibility criteria, mode of delivery and provider type for each service are shown in Table 8.2. Four funds
offer telephone-based health navigation services provided by in-house staff. Any health fund member can call staff working in navigation services to ask specific questions about the health and aged care systems and for specific healthcare provider referrals. Four funds have contracts with third party providers to offer telephone-based disease management and health coaching programs. These programs often focus on specific chronic conditions such as diabetes, cardiovascular disease and mental health conditions, although some participants offered more general programs referred to as health coaching. In these programs, tailored care plans are developed with individuals based on their specific health goals. Participants in these programs are recruited based on hospital claims data analysis and member self-referral.

Five funds offer care coordination services, predominantly provided via telephone with in-house staff. Care coordination services have the most detailed eligibility criteria for participation including age (targeting older members greater than 55 years of age) with at least one chronic disease diagnosis and high levels of hospital use, such as more than two hospitalisations in the last two years. Care coordination services are often specifically targeted at patients leaving hospital with people identified before admission when clarifying patient eligibility for hospital benefits or after admission when insurance claims are received. These services involve an assessment and development of a care plan that identifies specific supports that an individual will receive after hospitalisation including nursing, allied health and meal delivery services.

| Table 8.2 CDM services offered by participant funds showing the number of funds offering a service by mode of delivery and provider type |
|---|---|---|---|---|
| **Mode of delivery** | **Provider type** | **Service eligibility criteria** | **Telephone-based** | **Face-to-face** | **In-house** | **Third party** |
| **Health navigation** | | Open to all members | 4 | - | 4 | - |
| **Disease management and health coaching programs** | | Member self-referral and identification through hospital admissions | 4 | - | - | 4 |
| **Care coordination services** | | Specific criteria based on hospital admission data | 4 | 1 | 4 | 1 |
Disease management and health coaching programs and care coordination services are offered as time-limited services, generally lasting from an initial period of six weeks to three months, and sometimes extending up to 12 months. All funds employ at least one employee with a clinical background. The type of clinical positions employed varied across funds. The most common profession is registered nurses, but other clinicians include dieticians, pharmacists and mental health nurses.

In addition to the three activity categories described in Table 8.2, multiple participants also noted that their fund offers hospital substitution programs and education activities aimed at improving health literacy. Hospital substitution programs refer to a range of nursing services delivered at home. The existence of these services enable patients to be discharged earlier from hospital after surgical procedures. Education activities to improve health literacy is a broad term used to refer to both marketing and communication materials provided to the entire insured population and also targeted information provided to people enrolled in CDM programs that may assist them to self-manage their condition. There is a focus on fostering independence in the type of materials disseminated and providing individuals with tools and strategies to help manage their condition.

Participants expressed a level of uncertainty and tension in how CDM services should be provided by insurers, in terms of resource requirements and the level of guidance provided to individuals.

“I suppose, we’ll have to be careful about the way we frame the message because there’s a limited capacity for us to deliver services to members and it won’t be open slather but there’ll be a way I’m sure, for our criteria for the program so that we can communicate to members, encourage them to participate, without you know, being unmanageable.” (8)

“because we charge the fund, we don’t want people ad infinitum. But the idea is to get people to be as independent as possible,” (7)

"we don’t want to be seen to be directing care, e.g. the patient should be doing X, Y and Z."
We’re here to support and complement existing treatment pathways rather than directing care.” (3)

8.3.3 Support for mental health conditions are perceived to be different to other chronic conditions

A specific question was asked about the funds’ priorities in supporting people with mental health conditions as mental health conditions were strongly represented in the group with the highest levels of hospital utilisation in Chapter 4 and was the focus of analysis in Chapter 5. Responding to mental health conditions was noted as a particularly challenging area with one participant describing mental health treatment as “the single biggest concern” for their fund.

“there is no silver bullet when it comes to mental health, but I think we still need to hold ourselves to evidence based treatment and not just frequency measures” (1)

Three respondents noted gaps in out-of-hospital care for people with mental health conditions.

“It is very expensive because it’s chronic and ongoing and I think there is a bit of a gap with regards to support, mental health support, being offered by the government and by the healthcare system in general.” (6)

Although three respondents noted that the PHI sector could be doing more in the area of prevention and early intervention for mental health conditions, there were few specific actions noted.

“I think a lot more can be done in terms of prevention, especially by the health insurer. In general, mental health awareness is increasing and people are more aware of looking after their mental health, I think the issue now is, of course awareness, which is increasing but also giving them appropriate tools that are scientifically proven and evidence-based.” (3)

Three respondents are currently developing new mental health support programs to be delivered
by in-house staff to support people post-hospital discharge and three other funds are using third party providers.

“One of the steps we’re taking is that we’re in the final stages of developing a mental health program that will be delivered by our care navigation services…that will allow us to capture those members that are leaving hospital and help them to link up with organisations in the community.” (8)

8.3.4 Data and information requirements for planning and implementing CDM programs

Hospital claims data are the main source of data used to identify people to participate in CDM activities. Six funds run routine reports to identify patients with specific chronic conditions, determined by a list of clinical diagnosis codes. Funds also review hospital claims data to identify patients with multiple hospitalisations, long lengths of stay and high cost episodes.

Participant responses related to data and information requirements for CDM frequently included reference to limitations of current data sources. The major limitation, noted by six respondents, is information on the health status of people without a hospitalisation, particularly indicators of disease risk.

“We do need good claiming data, accurate claiming data, and being able to put that all together, but the bit that we don’t have right now is some kind of really good risk identifier.” (2)

“Realistically, we need GP data, I think, to be effective in fully identifying those people before they end up with a chronic disease.” (8)

Indicators to evaluate and measure the success of CDM programs range from measures of program awareness, participation and satisfaction to more sophisticated measures to assess the effectiveness of the program, in terms of both its clinical or health effects and financial effects.
Clinical measures include changes in bodyweight and stress levels and assessment of quality of life. Financial measures include changes in service utilisation such as number of hospital admissions, length of stay, hospital readmission rates and costs of care paid by the insurer. Despite the broad range of measures described, most participants acknowledge shortcomings in their approach to evaluating CDM programs and that formal program evaluations, if planned, are in the early stages.

"There’s no point paying for services that have no ability to realise the benefits, but I do worry that we are not measuring or assessing the right things when it comes to the evidence base" (1)

"In terms of a real evaluation or impact framework still very early on. So, that’s a key piece that we've got scoped up" (4)

The desire to support effective and “evidence-based” programs was expressed by multiple participants during the interviews although participant responses indicate that this desire is challenging to fulfil in practice.

"Our priority is on disease management programs that have an evidence base in terms of health outcomes and within that, there is this challenge about how we contract with service providers to ensure that they are delivering evidence-based treatment that delivers clinical outcomes" (1)

"We're actually thinking about cancelling some of the contracts, because we keep seeing the same people getting put back on these same programs. It's like, 'Hang on, if you were successful, why are we seeing the same people year on year?' " (2)

8.3.5 Policy constraints and other challenges affecting the role of insurers in CDM

Most participants responded that PHI sector regulations constrain aspects of their role in
supporting people with chronic conditions.

"I think there is a need for simplification of the legislation to support funds in providing chronic disease management and that’s not without acknowledging, I guess, the complex dynamics about community rating, risk equalisation, adverse selection and portability." (1)

"Predominantly the Private Health Insurance Act limits the ability for insurers to pay for things outside of a hospital environment...one example is telehealth, we can’t pay benefits for that at the moment for allied health professionals, so some flexibility in the way that care is being delivered in the future will be beneficial" (8)

Participants reported challenges in negotiating an expanded role in offering CDM activities by PHI funds within the Australian healthcare system.

"Trust and engagement with the health profession no matter where you work... Trying not to do managed care², and conveying that message of managed care." (2)

"It’s certainly been one of our biggest hurdles to get some level of respect with GPs and some level of trust and I think we’re very, very slowly getting there. They’re starting to recognise that we’re not interested in being ‘pretend doctors’, we’re interested in the best interests of the members." (7)

Despite these constraints, PHI funds were optimistic about their future role in supporting CDM.

"I think there’s a tremendous opportunity for us, and as little funds we might have to band together to actually make them cost-effective. If we could work effectively with primary health care and support, like a two-way support of each other, with primary healthcare providers." (2)

² A definition for the term, “managed care,” is provided in the Glossary.
“I’d like to see that we’re an insurance and care company and we are actually sharing the health journey with someone and insurance is one of those products that support you.” (4)

8.4 Discussion

The purpose of this study was to explore the emerging role of Australian PHI funds in developing and implementing CDM strategies. The study findings indicate that all funds are implementing strategies to support people with chronic conditions, but these strategies are at different stages of maturity. Although there are different approaches in relation to organisational arrangements and in-house versus outsourced service provision, there are similarities in the types of activities offered with three main service categories reported by participants: (1) health navigation; (2) disease management and health coaching programs; and (3) care coordination services.

This qualitative study examines topics that were the subject of research in previous chapters of the thesis that were primarily investigated using administrative claims data. There is alignment between the findings from this study and the earlier studies. Support for people with mental health conditions featured strongly in both the clinical profile of high-needs patients and CDM priorities of insurers. The previous studies noted limitations in using hospital claims data to understand health services utilisation and the interview participants also responded that data limitations impact on the identification of suitable participants for CDM programs and the evaluation of programs, particularly the exclusion of medical care provided outside of hospitals from the scope of PHI policies.

CDM activities currently supported by PHI funds seem to be guided by a pragmatic approach based on available data and identified member need. Hospital claims data are the most comprehensive source of health information available to insurance funds so are the primary source used to identify participants for these programs, using either specific diagnosis codes documented in claims records such as diabetes and cardiovascular disease, or levels of service utilisation within a specific time period (such as length of stay and number of admissions). As such, CDM programs focus on high-needs patients, rather than the population at-risk of developing a chronic condition and the intervention supported by PHI funds takes place following hospital discharge. Although
participants express that their fund wants to more actively support people at risk of developing a chronic disease, identifying this at-risk group with the current data available to PHI funds is challenging. Appropriately targeting this group and providing broader CDM services likely requires linking records from disparate data sources as described and tested in Chapters 6 and 7 to build a more comprehensive picture of the health and healthcare journey of the target population.

Despite participants being optimistic about the future role of PHI funds in supporting high-needs patients with chronic conditions, a number of tensions related to the value proposition of CDM activities provided by PHI funds were reported in this study. Although government regulation has supported PHI funds having a role in CDM since 2007, the interview responses suggest there are still questions of legitimacy related to the role of the PHI sector in CDM, especially by healthcare providers. Most participants responded that they are providing care navigation and care coordination services but there are other potential providers of these services in the Australian health system such as enhanced primary care services involving nurses (Parkinson & Parker 2013) and community pharmacies (McMillan et al. 2013). Ultimately, the CDM services offered by PHI funds need to be seen by both patients and healthcare providers as effective for them to be taken up and continue to be sustainable in the future.

Additionally, most current CDM programs supported by PHI funds, both in-house and third-party services, are yet to be evaluated. Most programs were in an early stage of implementation at the time of interview so evaluation may not be appropriate. However, data limitations relating to comprehensive health service use and up-to-date information on the health status of members presents challenges to conducting rigorous evaluations on the effectiveness of programs that PHI funds offer. Evidence of effectiveness may be an important component of future viability as from a resourcing perspective, these programs require an ongoing allocation of financial and human resources.

This study has a number of limitations and caution needs to be taken in generalising study findings. The participants interviewed in this study represent only a sample of Australian PHI funds. The study was not designed to be representative of the entire sector but instead, to present
the perspectives of smaller, non-profit funds that were involved in the earlier stages of research. The research design focused on the perspective of PHI funds providing CDM services but the perspective of other stakeholders, particularly members receiving services funded by PHI would be a valuable future research direction.

8.5 Conclusion

PHI funds see a clear role for themselves in expanding beyond the traditional role of an insurer to offer CDM services. However, despite legislation permitting funds to be engaged with CDM activities for more than ten years, insurers are still in an early stage of implementation and evaluation of these activities. PHI funds have experienced a number of challenges in establishing and cementing this new role related to regulatory constraints, information gaps and relationships with other healthcare stakeholders. The study findings confirm and expand on the findings related to insurer data limitations from the earlier studies presented in this thesis.

Although participants report introducing a variety of new services to support people with chronic conditions, these services are yet to be evaluated in terms of return on investment, effectiveness in improving health outcomes and reduction in insurer costs. There is a need to access and analyse a broader range of health information to fully implement and evaluate CDM programs. The findings of this study contribute an important perspective on the extent of the role of insurers in supporting the care of high-needs patients. The next (and final) chapter synthesises findings from the five studies and discusses some of the policy recommendations and implications arising from the research.
Chapter 9: Discussion and Conclusions

Better understanding the demographic, clinical and service use characteristics of high-needs patients has become an important area of research given that high levels of service utilisation is associated with the highest health costs (Long et al. 2017). The overarching aim of the research presented in this thesis is to contribute new knowledge on the role of the Australian PHI sector in supporting the care of high-needs patients. There has been little prior research into the services that high-needs patients claim on their PHI policies or the additional support strategies that PHI funds now offer to support CDM. The research incorporates five studies using both quantitative and qualitative methods. Phase 1 of the research analysed the demographic, service utilisation and clinical characteristics of high-needs patients within a privately insured cohort using insurance claims data and investigated the strengths and limitations of using claims data for understanding service utilisation (Chapters 4 and 5). In Phase 2, a conceptual framework of domains to consider in designing information systems for CDM using multiple data sources was developed and applied to the Australia PHI sector (Chapter 6). Phase 3 expanded on the findings of the studies from Phase 1 and 2. Using the conceptual framework, a novel study using linked PHI claims and LHD hospitalisation data sources was conducted to examine the movement of an insured population between public and private hospitals and use of PHI across these settings (Chapter 7). In the final study, interviews were conducted with PHI executives to confirm and reflect on the earlier study findings, explore the approaches that PHI funds are taking to support high-needs patients with chronic conditions, and examine the factors that influence the design and implementation of CDM strategies, given the PHI sector’s role as a supplementary insurer in Australia’s health system (Chapter 8).

To conclude this thesis, this final chapter synthesises findings from each of the studies in response to the overall aim and scope of the research. Given the policy relevance of this research, practical implications and recommendations arising from the research findings that are relevant to both government policymakers and PHI sector representatives are described. Limitations of the research are also discussed as well as directions for future research, which were beyond the scope of this research but that will further understanding of the role of PHI in supporting the care of high-needs patients.
9.1 Summary of research findings and implications

Research findings relating to the five research questions outlined in Section 1.3.1 on page 20 are summarised below. A feature of mixed methods research is the possibility of developing new findings or inferences that are not possible from single-method studies using only quantitative or only qualitative research methods. The term “meta-inferences” has been used to describe theoretical statements or narratives developed through the integration of findings from mixed-methods research (Venkatesh et al 2013). Meta-inferences developed from the integration of findings from qualitative and quantitative research studies presented in this thesis for research questions 2 and 3 are discussed below.

Q1: What are the demographic, service utilisation and clinical characteristics of high-needs patients with PHI?

Three different measures of resource utilisation – number of admissions, number of bed days and total insurance benefits paid – were used to identify and compare the characteristics of high-need patients in the first study presented in Chapter 4. Three high-needs patient cohorts defined by the measures were developed and the resource utilisation of the three groups was analysed. Demographic and admission characteristics of the three high-needs cohorts were similar with the three groups being older with higher levels of public hospital use than the rest of the insured population with a hospital admission. In relation to clinical characteristics, the same top five principal diagnosis categories – mental health, dialysis, rehabilitation, pharmacotherapy for neoplasms and neoplasms (with principal diagnosis other than pharmacotherapy) – are found for the three cohorts and for each cohort, the top five categories account for more than two thirds of all hospital admissions for the cohorts.

The study results suggest that the top 1% of patients most commonly claim for services related to a narrow range of conditions – mental health conditions, cancer (including patients receiving chemotherapy), chronic kidney disease (including patients receiving dialysis) and rehabilitation.
Among the privately insured population, the highest users of hospital services are seeking services for a narrow range of conditions that are not the targets of traditional CDM programs offered by PHI funds, which focus on diabetes and cardiovascular disease. However, frequent hospital admissions are often a key selection criterion used to target individuals for CDM enrolment. These findings suggest that private health insurers need to better align CDM programs or provide appropriate, targeted support to high-needs patients as they represent the highest levels of resource utilisation and costs to insurers.

The findings of this study highlight the difference between potentially preventable hospitalisations and potentially preventable conditions. The major reasons for accessing health services in the top 1% of privately insured hospital users in this study, including chemotherapy, dialysis and most rehabilitation, are not easily preventable. Although the mode of treatment may be modified, via a same-day visit or even through hospital substitution programs, the ability for insurers to generate cost savings from CDM programs targets at high users of hospital services should not be assumed. Rigorous evaluation is required.

**Q2: How suitable are current PHI data sources for informing strategies for better supporting high-needs patients?**

Focussing on privately insured patients with claims for mental health-related hospitalisations, the second study (presented in Chapter 5) examined the type, organisation and frequency of mental health services accessed. Although only 1.4% of individuals with a hospitalisation in the two-year study period made a mental health-related claim, resource utilisation was much higher for patients with mental health-related claims compared to patients with other types of hospitalisations.

The group with mental health-related hospitalisations had significantly more overnight admissions and same-day visits than the group with other types of hospitalisations and the average length of stay for overnight admissions was three times longer for the mental health group (15.0 days compared to 4.6 days). Among the group of patients with mental health-related hospital claims, the two sub-groups with the highest levels of resource utilisation are those who claim for both
same-day and overnight hospitalisations and those who claim for both mental health-related and other types of hospitalisations.

Regulatory arrangements restricting PHI coverage of out-of-hospital services results in PHI funds having a limited view of service use. The study found that more than two thirds (68%) of patients with an overnight mental health-related hospitalisation did not make any PHI claims for mental health services in the 28 days following discharge. As PHI cannot cover certain services for which Medicare pays a benefit (including out-of-hospital psychiatry and GP consultations), it is challenging for insurers to proactively monitor and support people with mental health and other chronic conditions.

In the Australian public hospital sector, receiving community-based treatment and follow-up care after a hospital discharge are indicators of best-practice mental health treatment (AIHW 2018e). However, this information is not available to insurers as most treatment funded by PHI occurs in the private sector. The sporadic nature of claims for mental health-related care highlights how the PHI sector only plays a partial role in funding health service use for the privately insured population.

The findings of the first part of the study presented in Chapter 6 demonstrate that PHI funds also lack information on disease risk factors, in addition to comprehensive information on health services use. The use of hospital claims data as the primary source of data for identifying target groups for CDM programs only captures a limited portion of the potential target group. Patients with a hospitalisation make up a minority of the insured population and the coding of chronic conditions and risk factors in claims data is dependent on medical documentation and coding practices of health professionals. The implications of the findings presented in Chapters 5 and 6 is that the current data sources available to PHI funds does not contain adequate information to build effective information systems for CDM. Multiple data sources are needed to build a comprehensive picture of health service use across hospital and community settings.

The data quality issues and information gaps in insurance claims data highlighted in the findings
of the quantitative studies presented in Chapters 4, 5 and 6 are confirmed and expanded by integrating these findings with qualitative results from the study presented in Chapter 8. These findings provide insights into the types of information missing from insurance claims data that would be beneficial for designing and implementing CDM programs from an insurer perspective including a robust risk identifier, GP or primary care service utilisation information and measures evaluating the effectiveness of CDM interventions.

Q3: For PHI funds to play a more proactive role in CDM, what factors need to be considered when collecting data and developing information systems to support high-needs patients?

The findings of the analysis presented in Chapters 4 and 5, and the first stage of research presented in Chapter 6, emphasise that insurance claims are an incomplete data source for understanding health service use and health status. The findings suggest that insurers that want to enhance their role in CDM need to not only improve the quality of claims data collected but ensure that data from multiple sources are used to inform strategies to support high-needs patients and people with, and at-risk of developing, chronic conditions.

A conceptual framework was developed using a targeted literature review and interviews. The framework identifies four domains that should be considered in developing information systems for CDM using multiple data sources. The four domains are to define information requirements, assess data sources, ensure data quality and integrate information systems and analytics.

Applying this framework to the Australian PHI sector suggests that insurers require a more structured approach to the collection and use of health data. The role of PHI funds is primarily in paying claims for health services and as such, insurer information systems are tailored to fulfil this function. The information requirements, data sources and systems to provide and monitor CDM programs are different to the current payment focussed systems and require significant changes.

Insurers need to be clear about the goal of CDM programs to identify information and data
requirements. Insurers should carefully consider how insurance policy design, current information infrastructure and relationships with healthcare providers and patients affect data collection, data quality and data analytics and subsequently, impacts the implementation of CDM activities.

The findings of the quantitative studies presented in Chapters 4, 5 and 7 confirm that data availability, data quality and the primary or original purpose of an information system are key factors to consider when developing information systems to support high-needs patients. Findings from the qualitative study presented in Chapter 8 extend considerations beyond the identification of issues to some of the contextual factors that are important considerations when developing solutions including government regulation of the PHI sector. Regulations constrains the operations of the sector in relation to the scope of health services covered (and thus, extent of data on health service use collected via insurance claims data). Additionally, contractual, payment-focussed relationships guide the interaction of the PHI sector with healthcare providers which limits opportunities for collaborative data sharing for care coordination for high-needs patients.

**Q4: What is the relative contribution of a PHI fund to paying for hospital services for an insured population, relative to publicly funded hospital services?**

The study in Chapter 7 linking PHI claims and LHD hospital data sources reveals the complicated interplay of funding and service delivery in Australia’s mixed public and private health system. The study found that insurers contribute to funding more than 70% of hospital admissions of insured individuals. However, a large proportion of this care, including a majority of overnight admissions (62%) and more complex admissions, occurs in public hospitals for which insurers currently receive limited clinical information. Despite the study population holding PHI, 40% of people with a hospital admission were only admitted to a public hospital in the six-year study period. The use of PHI among this group was low with PHI used for only 19% of hospital admissions for the group.

There are differences in claiming patterns based on service categories with surgical, childbirth and other admissions more likely to be claimed on PHI than medical or mental health admissions. The
group of patients with both public and private hospital admissions account for the smallest proportion of admissions but have the longest average length of stay for medical and surgical admissions compared to the group of patients with only private hospital admissions or the group with only public hospital admissions. For mental health and childbirth admissions, the average length of stay is longer for the private hospital use group than the public hospital use or the public and private hospital use groups, but this does not reflect significantly higher admission complexity as measured by admission case weights.

For the high-needs group, 64% of overnight admissions are claimed on PHI even though 71% of overnight admissions occur in public hospitals. Consistent with the findings of earlier studies, mental health admissions are strongly represented in the utilisation of the high-needs group with the group accounting for 63% of all mental health admissions for the study population (compared with 23% of all medical admissions and only 11% of all surgical admissions). This study shows that in relation to the most costly form of hospital treatment, overnight admissions, resource utilisation in the public sector is greater than the private sector and on average, more complex admissions are treated in public hospitals, although the high-needs group also claim a greater proportion of public hospital admissions on PHI.

Q5: What strategies are PHI funds using to support CDM, especially for high-needs patients, and what are the factors influencing the design and implementation of strategies?

All PHI fund representatives interviewed expressed a desire for their fund to have a more active role in CDM. Funds have adopted different approaches to implementing CDM strategies with a key distinction between funds that have built an in-house team to support CDM and those that rely on outsourced service provision. The major CDM activities that PHI funds offer are (1) health navigation services; (2) structured CDM and health coaching programs; and (3) developing and monitoring care coordination plans. PHI funds stress their role should support but not direct care and assist the role of GPs who are the centre of care for a person with a chronic condition. Insurer CDM activities are targeted at members with diagnosed chronic conditions and high levels of service utilisation. This is a pragmatic response given the scope of PHI coverage being primarily
for hospital-based care.

Participant responses suggest that current activities are affected by data limitations. Although participants report a number of ways in which they are making use of available data sources to support CDM program implementation, a number of challenges due to data limitations remain including targeting interventions and evaluating programs. Participant observations are consistent with the interpretation of findings from the studies in the first phase of research (Chapters 4 and 5). PHI representatives want their fund to play a greater role in CDM but most participants in the interviews did not clearly express a vision of how this expanded role would be achieved within the current regulatory and business constraints of the PHI sector, which in particular, affect the collection and effective use of health data.

Summary of findings on the role of the PHI sector on supporting the care of high-needs patients

High-needs patients, as defined by the quantum of hospital resources utilised, use their PHI to claim for services for a narrow range of conditions that are not aligned to the conditions that are the focus of most CDM programs. Mental-health related conditions account for a high proportion of service use among the top users. Although insurers pay for services across both public and private hospital sectors, they are not a comprehensive insurer of hospital care with findings for one PHI fund that approximately one third of hospital care is not claimed on PHI. Although, high-needs patients receive a greater proportion of hospital care in public hospitals, they are also more likely to claim care in public hospitals on PHI than the rest of the insured population with a public hospital admission. PHI funds are increasingly offering a range of CDM services including care coordination services, health navigation hotlines and telephone-based disease management programs. These programs are delivered by a combination of in-house staff and contracted third parties. PHI representatives reported challenges in identifying target groups for CDM interventions and evaluating the effectiveness of interventions due to the regulated scope of PHI coverage, which limits data collected by insurers on the health status and service utilisation of insured individuals.
9.2 Contributions of thesis

This thesis makes a substantial contribution to knowledge and to practice with its aim to better understand the role of the PHI sector in supporting the care of high-needs patients. This new knowledge was summarised for each research question in Section 9.1. Although the thesis presents research of an applied nature and there is a focus on practical contributions, these contributions would not have been possible without the theoretical and methodological contributions of the research.

The thesis makes a theoretical contribution in the development of a conceptual framework identifying four domains that should be considered when developing information systems for CDM using multiple data sources in real-world practice settings. In addition to a theoretical consideration of how the framework can be applied to the PHI sector in Chapter 6, the framework is practically used in Chapter 7 to inform the design of the data linkage study, a methodological contribution of the research. In this study, administrative data from a PHI fund and a LHD are linked together. This is an Australian first. This novel study demonstrates a rigorous method for undertaking data linkage that protects privacy and data security while also involving the organisations contributing data, building their data management knowledge and capabilities and improving the quality of information available to inform analysis and planning.

9.3 Observations and recommendations for future policy and practice

Taken together, the findings of this research suggest that the role of the PHI sector in supporting the care of high-needs patients is fairly narrow. Interpretation of the research findings suggests a number of factors are contributing to the extent of the PHI sector’s role in supporting the care of high-needs patients. Observations and recommendations for future policy and practice are described below.

*Observation 1: Broader health cover reforms have made the role of PHI in the Australian health system less clear*
Previous research has noted that legislative and policy changes relating to the PHI sector have been layered on top of one another for several decades, resulting in a lack of clarity in relation to the role of PHI in Australia’s health system (Boxall & Gillespie 2013, p. 182). Government incentives to increase PHI membership across the Australian population introduced in the late 1990s has seen the emergence of a large number of hospital insurance policies with service or procedure exclusions, restricted levels of benefits and patient co-payments (Thomas 2012, pp. 273-4). These restricted insurance policies may erode the government policy objective of PHI reducing the burden on the public hospital system. The findings from the study in Chapter 7 show that PHI is not comprehensively funding the hospital access of a privately insured population. Although a majority of hospitalisations for patients with PHI are claimed on PHI, nearly one in three (28%) of admissions occur as a public patient. Furthermore, for high-need patients, only two thirds (64%) of overnight hospital admissions are claimed on PHI.

Legislative reforms in 2007 introduced opportunities for insurers to both offer and pay benefits for new services to support people with chronic conditions. However, the continuing restrictions on insurers covering out-of-hospital medical care mean that insurers lack visibility of comprehensive health service utilisation and early stage chronic disease risk factors. These restrictions make targeting CDM interventions challenging. The promise and potential of the role of the PHI sector in supporting high-needs patients remains largely unfulfilled, with insurers offering time-limited programs to a small number of people with complex, chronic conditions. Despite the relatively small scale of operations, many insurers are starting to frame their businesses as both insurance provider and providers of health and disease management services.

There is a tension in the current coverage of PHI policies that on one hand have expanded coverage for CDM programs, while on the other hand, have coverage restrictions and/or member co-payment requirements for health services for an increasing number of insurance policies. While insurers express a view that they want to be involved in more actively supporting the health and disease management needs of their members, as reported in the fifth study (reported in Chapter 8), both regulatory arrangements and insurer business decisions on policy coverage prevent insurers having access to comprehensive information on health service use. This information is needed to
effectively plan, monitor and evaluate CDM programs.

**Recommendations**

1. The Australian Government should clarify what the role of PHI should be within Australia’s health system and identify the necessary enablers to achieve this role. The Australian government subsidies of PHI in the future should be based on this clarified role.

This recommendation is consistent with calls from multiple health advocacy bodies in Australia (Consumers Health Forum of Australia 2018; Australian Healthcare and Hospitals Association 2018) and pertinent given the large ongoing financial contribution that the government makes to the PHI sector through the PHI rebate, totalling more than A$6 billion per year (Commonwealth of Australia 2017). The review should clearly address the government policy objectives for the role of PHI in Australia’s health system and delineate the future role of PHI funds. This includes insurers’ potential future role as a funder of health services through their insurance function and their role as health service providers.

**Observation 2: Private health insurers face regulatory constraints in more actively supporting high-needs patients but also lack accountability mechanisms to ensure improved health outcomes**

Insurers report that the role of private health insurers in supporting health and disease management is constrained by the regulated scope of the PHI sector in Australia. In particular, PHI funds cannot pay benefits for GP and other specialist medical services provided outside of hospital settings. As a result, CDM programs supported by insurers tend to be poorly integrated with primary care services and insurer CDM activities tend to target people with high levels of hospital use, rather than people at earlier stages of illness.

However, Australia’s dual health insurance environment also reduces the accountability of private health insurers for bearing the full costs of poorly managed high-needs patients. In addition to the exclusion of out-of-hospital medical services from insurance policies, the government-funded
public hospital system also effectively acts as a “safety net” for privately insured individuals who cannot or do not want to access services as a private patient due to the cost or availability of services. This phenomenon has been referred to as a “loophole” for the PHI sector (Seah et al. 2013), and if an insured individual with high health service utilisation drops or downgrades their insurance cover, it is likely to improve the financial position of the PHI fund. The findings of the study in Chapter 7 found that high-needs patients have a greater proportion of hospital activity occur in public hospitals compared to the general insured population, although they also claim a higher proportion of public hospital admissions on PHI compared to the rest of the insured population with a public hospital admission.

Although, private health insurers may strive to improve the health of members as a social goal, they currently have little business imperative to improve care. Despite generous government subsidies for PHI premiums via the PHI rebate, insurers are not accountable for the quality of services they are funding or whether they are being delivered in the most efficient way. Current government performance indicators for the PHI sector prioritise population coverage, in terms of the number of insured individuals, and benefits paid (Podger 2007). There are no metrics related to the quality or efficiency of services funded, or the value of services funded in terms of improving health status.

The current PHI regulatory system also has few incentives for insurers to offer evidence-based CDM services for high-needs patients. Australia’s risk equalisation scheme reimburses PHI funds for the costs of elderly and chronically ill patients (Connelly et al. 2010). However, the scheme’s existence also reduces incentives for PHI funds to closely monitor the effectiveness of the programs they are supporting in terms of reductions in health services use.

Private health insurers could be doing more to understand and improve the quality and outcomes of services for which they pay benefits. Current payment models do not facilitate insurers capturing data on quality and outcomes, often focussing on the outputs of care in terms of number of bed days and services delivered. To improve legitimacy as a partner in CDM for both patients and providers, insurers need to demonstrate that they are interested in funding quality, value-based
Recommendations

2. The review of the role of the PHI sector should explicitly consider the following areas relevant to the support of high-needs patients
   - Implications of the current exclusion of out-of-hospital medical services and pharmaceuticals from PHI coverage
   - Accountability mechanisms to ensure the effectiveness and clinical utility of the services that private health insurers are funding if government subsidies of the sector are to continue.

3. PHI funds should introduce mechanisms to monitor and report on the effectiveness of services they are funding, particularly for services that are provided in-house or by insurer-affiliated companies.

Observation 3: Private health insurer ambitions in health and disease management are not well supported by their current information systems strategy

The research presented in this thesis highlights that many aspects of insurer’s current information systems are not well suited to designing and implementing health and disease management strategies. High quality health information is not an optional extra for CDM, it is an integral component of successful programs with information required to identify areas of health need within the insured population, target interventions, monitor health outcomes, and evaluate the success of interventions. Yet, the analysis of insurance claims data in Chapters 4, 5 and 6 found a number of limitations of using this data source to understand health status and service utilisation. The variability in the recording of diagnosis information is due to differences in PHI payments models across PHI funds, and also within PHI funds for treatment in public and private hospitals. Health services providers, both hospitals and allied health professionals, are only required to submit information to PHI funds that the fund uses for payment.
The current information systems used by insurers and the data collected are not aligned with the information requirements for effective CDM programs. Current information systems focus on insurance claims payment primarily for hospital-based services, paid on a retrospective, fee-for-service model.

Despite limitations on the information available to PHI funds for CDM programs based on current data sources, insurers could still be making better use of available data by developing a clear strategy about the information required for designing, targeting and evaluating their programs. The traditional role of a health insurer as a payer of health services cannot be ignored. The lack of data on health status and health outcomes in insurance claims data reflects the absence of these indicators in current insurer payment models. Greater focus on these indicators could enhance the value and utility of insurance claims data.

**Recommendations**

4. PHI funds should have an information strategy for CDM programs that clearly sets out what information is required, how data will be collected to meet information requirements and how information systems will be developed or enhanced to ensure meaningful analysis of data to inform CDM programs.

5. PHI funds should consider a minimum dataset of hospital admission information, linked to payment models for services, that is required from all service providers. As discussed in Section 4.2.3 on page 51, it is now a requirement that full Hospital Casemix Protocol (HCP) data are sent to private health insurers for all hospital admissions (public and private) that they fund. However, this applies only to future hospital claims from 1 July 2018. PHI funds should consider how this data will be used to inform the design and delivery of programs. Additionally, PHI should consider what further information is needed to both design and evaluate health services and outcomes, and how this information can be gathered via data collected from other funded services including CDM program providers, dental and allied health.
9.4 Future research directions

The findings of this research suggest several areas of further research. The data linkage study in Chapter 7 that analysed hospital-based care for a privately insured population could be expanded to provide a more comprehensive picture of health services utilisation and medication history for high-needs patients. Additional administrative data sources that are already used in health services research in Australia include the Medical Benefits Schedule capturing a range of government-subsidised medical consultations, tests and procedures and the Pharmaceutical Benefits Scheme that records prescribed medications that receive government subsidies. A study linking and analysing these data sources with the claims and hospital records could provide further information on health service and medication use of high needs patients.

The qualitative study in Chapter 8 presents an industry perspective from the PHI sector on approaches to designing and implementing CDM programs. This study did not include the perspective of privately insured, high-needs patients with chronic conditions. Previous research has explored the perspective of older Australians with chronic illness in relation to PHI but this study focussed on motivators for people to maintain PHI and financial pressure associated with PHI premium costs (Jeon et al. 2012). Future research could examine the experiences of privately insured high-needs patients with chronic conditions accessing CDM services funded by PHI and more broadly, their experience navigating the healthcare system and dual health insurance arrangements in Australia to manage their health.

Further research could also be conducted on the impact of PHI policy design and insurer-hospital contracting arrangements on the support provided to high-needs patients. There is a high degree of variation in the coverage of PHI policies, ranging from basic to comprehensive coverage. The impact of policy coverage and provider contracting arrangements on the use of PHI for hospital care could be examined. With the exception of a study examining insurer perspectives on hospital purchasing conducted more than a decade ago (Willcox 2005), these topics have not been explored in Australia.
9.5 Generalisability

The data sources used in the quantitative research presented in Chapters 4, 5 and 6 are broadly representative of the hospital claims of the insured population in Australia. The group of PHI funds represent approximately 10% of the Australian PHI market. The insurance claims sample used in this research is comparable to the national PHI market, with regard to member age (69% hospital admissions in the sample are for people aged 55 years and over versus 64% nationally), sex (females account for 55% admissions versus 54% nationally) and location of residence (36% hospital admissions occur in New South Wales versus 32% nationally) (APRA 2017).

More caution is required in interpreting the findings of the studies presented in Chapters 7 and 8. The study in Chapter 7 uses a sample population from one PHI fund in one region in Australia. Given geographic differences in the organisation of the Australian health system, service utilisation patterns and movement between private and public hospitals may not reflect patterns in other parts of Australia.

As discussed in Chapter 8, the qualitative interviews with PHI fund representatives were not designed to be representative of the Australian PHI sector as a whole. Instead, the interview participants reflect the perspective of smaller, non-profit PHI funds and were from a subset of funds that contributed data analysed in the earlier studies. These insurers may have different approaches to, and challenges in, providing CDM support for high-needs patients, compared with larger funds due to funds’ concentration of members in specific geographic locations and/or restricted membership eligibility based on employment in a specific occupational sector.

Although this research project focuses on the Australian health system, which has distinct health insurance arrangements compared with other countries, the findings from this study may provide lessons for other countries. Many countries such as Canada, the United Kingdom and Italy have supplementary PHI systems to cover specific services and reduce pressure on government-operated health services, and other countries such as the United States have both government and PHI systems that people move between depending on their social circumstances.
9.6 Research limitations

Limitations of this research have been discussed throughout the thesis in each chapter. This section will not repeat these limitations but instead, will highlight the most important limitations in the context of the overall research topic. The research focused on how PHI funds support the care of high-needs patients. Direct measures of need were not available in the data sources analysed as they are not commonly collected in administrative data. Instead, resource utilisation measures were used as proxies for defining high-need patients, an approach consistent with previous research as confirmed by the United States National Academy Medicine in a recent report on high-cost, high-needs patients (Long et al. 2017).

This research sought to leverage administrative data sources not commonly used in research to understand the role of PHI in supporting the care of high-needs patients. The use of administrative data has many benefits including gaining access to data on a large population that would be infeasible using other research data collection methods but there are also important limitations that should be considered in the interpretation of results. Most of the administrative data analysed were originally collected for the purpose of service payment. Hospitals employ clinical coders to analyse medical records and code clinical information such as disease diagnoses and procedures performed to receive funding. There are auditing processes that exist to check these records but clinical information contained in these administrative data sources is only as good as the original medical records on which the coding is based. There may be errors or omissions in these codes reflected in this analysis but due to the large number of records analysed, it is unlikely that any errors would produce a systematic bias in the study results.

An additional limitation of the insurance claims data sources is the completeness of records sent from hospitals to private health insurers. The research identified differences in clinical information contained within the claims records based on the type of hospital and model of payment. These limitations did modify some of the ways in which analyses were conducted. For example, the study in Chapter 4 only reported clinical information from private hospital admissions claimed on PHI. This limitation reflects the applied nature of the research and the real-world challenges that both health service providers and payers face in trying to generate meaningful insights from their
data to inform policy and planning activities such as assessing needs, targeting interventions and evaluating services.

These data limitations drove new lines of enquiry in the research process to better understand the data and information system requirements for informing CDM programs as presented in Chapter 6. The study in Chapter 7, in which data from a PHI fund and a LHD were linked, was designed to gather more comprehensive information on both the service utilisation and clinical characteristics of hospital use of a privately insured cohort.

9.7 Conclusions

The overall aim of the research presented in this thesis is to use disparate data sources to contribute new knowledge on the role of PHI in supporting the care of high-needs patients in Australia. The thesis demonstrates that the primary role of insurers is in paying benefits for hospital-based services with a majority of high-need patients’ hospital use occurring for a small number of conditions, mental health conditions, cancer, rehabilitation and dialysis which differ from the focus of CDM programs. Although the role of the PHI sector has started to change in the last decade following legislation changes to enhance CDM support, this process of change has been slow, and the role of insurers is still narrow. PHI funds are hampered in expanding their role in CDM of the insured population by regulatory constraints, resource availability and relationships with both patients and healthcare providers, which result in a lack of comprehensive, quality health information on the privately insured population. Accurate information on the health needs of the insured population is crucial for designing and implementing effective strategies to support high-need patients.

Private health insurers express a desire to have a more active role in CDM but there is a lack of clarity on what this role currently is, or should be. Currently, although a reduction in health service utilisation is often the justification cited by insurers for investment in CDM programs, there is a misalignment between hospital claims of high-needs patients and the target groups of CDM programs. The PHI sector’s supplementary role in funding health services in the Australian health system also results in a lack of accountability for the quality and effectiveness of the CDM
services that insurers offer.

The research findings suggest that the Australian government needs to clarify the role of PHI in Australia’s health system into the future. This includes the accountability of the PHI sector to contributing to health system goals set by the Australian government, given the large subsidy paid to the sector through the PHI rebate. For the PHI sector, the research findings suggest that more attention needs to be paid to the development of information strategies that can inform CDM approaches, and the infrastructure needed to meaningfully analyse data and support insurer ambitions to play a more active role in supporting high-needs patients and people with chronic conditions.

This mixed method research has asked important questions about the role of the private health insurance sector, a significant part of the Australian health system that receives an annual $6 billion public subsidy. The research has used both quantitative and qualitative methods to offer five perspectives on the research topic including the first ever Australian study analysing the hospital utilisation and insurance status of a cohort of privately insured people, examining the relative contribution of PHI to funding hospital care. This research supports the view that PHI is an important component of the Australian health system. That said, PHI is making a niche contribution to the health system rather than being a core funder of a comprehensive suite of health services for those people with PHI. While the research presented in this thesis has generated new knowledge on the sector, it has also identified a range of issues and challenges that reflect on the future viability of the sector. These issues include the role of insurers in effectively supporting CDM care for their members within a constrained regulatory environment and the need for vast improvements in insurer information systems including data collection and use to better understand and support the health needs of the insured population. Data collection issues are closely linked to the payment models used by insurers to fund services and the design of insurance policies including which services are paid for. These issues suggest important policy challenges and research questions that will require priority attention in the future.
References

ACCD - See Australian Consortium for Classification Development
AIHW - See Australian Institute of Health and Welfare
APRA – See Australian Prudential Regulation Authority
vol. 11, no. 2, p. 94.


Butler, JRG 2002, ‘Policy change and private health insurance: did the cheapest policy do the trick?’, *Australian Health Review*, vol. 25, no. 6, pp. 33-41.


Coleman, K, Austin, BT, Brach, C & Wagner, EH 2009, ‘Evidence On The Chronic Care Model In The New Millennium’, *Health Affairs*, vol. 28, no. 1, pp. 75-85.


IHPA - See Independent Hospital Pricing Authority


National Casemix and Classification Centre 2013, Australian coding standards (Eighth Edition), Australian Health Services Research Institute, University of Wollongong, Wollongong.


NCCC - National Casemix and Classification Centre


NHMRC - See National Health and Medical Research Council


Parkinson, AM & Parker, R 2013, ‘Addressing chronic and complex conditions: What evidence is there regarding the role primary healthcare nurses can play?’, Australian Health Review, no. 5, p. 588-93.


Private Health Insurance Administration Council 2015, Competition in the Australian Private Health Insurance Market, Private Health Insurance Administration Council, Canberra.


Wagner, EH, Austin, BT & Von Korff, M 1996b, ‘Organizing Care for Patients with Chronic Illness’, *The Milbank Quarterly*, vol. 74, no. 4, pp. 511-44.


Appendices

Appendix 1

1. AR-DRG version 6.0x (short description)


801A OR PR UNREL TO PDX+CCC
801B OR PR UNREL TO PDX+SMCC
801C OR PR UNREL TO PDX-CC
960Z UNGROUPABLE
961Z UNACCEPTABLE PRINCIPAL DX
963Z NEONATAL DX NOT CONSNT AGE/WGT
A01Z LIVER TRANSPLANT
A03Z LUNG OR HEART/LUNG TRANSPLANT
A05Z HEART TRANSPLANT
A06A TRACHEOSTOMY W VENT>95 +CCC
A06B TRCH&VNT-CCC OR TRCH/VNT+CCC
A06C VENTILATION>95 - CCC
A06D TRACHEOSTOMY -CCC
A07Z ALLOG BONE MARROW TRANSPLANT
A08A AUTO BONE MARROW TRANSPLNT+CCC
A08B AUTO BONE MARROW TRANSPLNT-CCC
A09A RENAL TRANSPLANT+PANCREAS+/CCC
A09B RENAL TRANSPLANT -PANCREAS-CCC
A10Z INSERTION OF VAD
A11A INS IMPLNT SP INFUS DEV+CCC
A11B INS IMPLNT SP INFUS DEV-CCC
A12Z INS NEUROSTIMULATOR DEV
A40Z ECMO
B01A VENTRICULAR SHUNT REV+CSCC
B01B VENTRICULAR SHUNT REV-CSCC
B02A CRANIAL PROCEDURES + CCC
B02B CRANIAL PROCEDURES + SCC
B02C CRANIAL PROCEDURES - CSCC
B03A SPINAL PROCEDURES + CSCC
B03B SPINAL PROCEDURES - CSCC
B04A EXTRACRANIAL VASCULAR PR +CCC
B04B EXTRACRANIAL VASCULAR PR -CCC
B05Z CARPAL TUNNEL RELEASE
B06A CBL PSY,MUS DYSY, NPTHY PR +CC
B06B CBL PSY. MUS DYSY, NPTHY PR -CC
B07A PRPHL & CRANL NERV & OTH PR+CC
B07B PRPHL & CRANL NERV & OTH PR-CC
B40Z PLASMAFHERESIS + NEURO DIS SD
B41Z TELEMETRIC EEG MONITORING
B42A NERV SYS DX W VENT SUPPORT+CCC
B42B NERV SYS DX W VENT SUPPORT-CCC
B60A ACUTE PARA/QUAD+-OR PR +CCC
B60B ACUTE PARA/QUAD+-OR PR -CCC
B61A SPINAL CORD COND+/-OR PR +CSCC
B61B SPINAL CORD COND+/-OR PR -CSCC
B62Z APERHESIS
B63Z DMNTIA&CHRNIC DISTURB CRBRL FN
B64A DELIRIUM+CCC
B64B DELIRIUM-CCC
B65Z CEREBRAL PALSY
B66A NERVOUS SYSTEM NEOPLASM+CSCC
B66B NERVOUS SYSTEM NEOPLASM-CS-CSCC
B67A DEGNRTV NERV SYS DIS+CSCC
B67B DEGNRTV NERV SYS DIS+MCC
B67C DEGNRTV NERV SYS DIS-CC
B68A MLT SCLROSIS&CEREBEL ATAXIA+CC
B68B MLT SCLROSIS&CEREBEL ATAXIA-CC
B69A TIA & PRECEREBRAL OCCLUSN+CSCC
B69B TIA & PRECEREBRAL OCCLUSN-CS-CSCC
B70A STROKE & OTH CEREB DIS +CCC
B70B STROKE & OTH CEREB DIS +SCC
B70C STROKE & OTH CEREB DIS -CSCC
B70D STRKE&OTH CEREB DIS DIE/TRN<5D
B71A CRANIAL & PERIPHL NERV DSRD+CC
B71B CRANIAL & PERIPHL NERV DSRD-CS-CSCC
B72A NRVS SYS INF EX VRL MNGTS+CSCC
B72B NRVS SYS INF EX VRL MNGTS-CS-CSCC
B73Z VIRAL MENINGITIS
B74A NONTRAUMATIC STUPOR & COMA +CC
B74B NONTRAUMATIC STUPOR & COMA -CC
B75Z FEBRILE CONVULSIONS
B76A SEIZURE + CSCC
B76B SEIZURE - CSCC
B77Z HEADACHE
B78A INTRACRANIAL INJURY+CSCC
B78B INTRACRANIAL INJURY-CS-CSCC
B79A SKULL FRACTURES+CSCC
B79B SKULL FRACTURES-CS-CSCC
B80Z OTHER HEAD INJURY
B81A OTHER DSRD OF NERVOUS SYS+CSCC
B81B OTHER DSRD OF NERVOUS SYS-CS-CSCC
B82A CHR UNSP PARA/QUAD+/-OR PR+CSCC
B82B CHR UNSP PARA/QUAD+/-PR+SCC
B82C CHR UNSP PARA/QUAD+/- PR -CS-CSCC
C01Z PROC FOR PENETRATING EYE INJURY
C02Z ENUCLEATIONS & ORBITAL PROCS
C03Z RETINAL PROCEDURES
C04Z MAJOR CORN, SCLERAL&CONJNCT PR
C05Z DACRYOCYSTORHINOSTOMY
C10Z STRABISMUS PROCEDURES
C11Z EYELID PROCEDURES
C12Z OTHER CORN, SCLERAL&CONJNCT PR
C13Z LACRIMAL PROCEDURES
C14Z OTHER EYE PROCEDURES
C15A GLAUCOMA/CX CATARACT PROCS
C15B GLAUCOMA/CX CATARACT PROCS, SD
C16Z LENS PROCEDURES
C60A AC & MJR EYE INFECTN +CC
C60B AC & MJR EYE INFECTN -CC
C61A NEUROLOGICAL&VASCLR EYE DIS+CC
C61B NEUROLOGICAL&VASCLR EYE DIS-CC
C62Z HYPHHEMA &MED MANAGD EYE TRAUMA
C63Z OTHER DISORDERS OF THE EYE
D01Z COCHLEAR IMPLANT
D02A HEAD & NECK PR +CSCC
D02B HEAD & NECK PR +MALIGNANCY/MCC
D02C HEAD & NECK PR -MALIGNANCY -CC
D03Z SURGCL RPR CLEFT LIP/PALATE DX
D04A MAXILLO SURGERY + CC
E73C PLEURAL EFFUSION + CC
E74A INTERSTITIAL LUNG DIS + CCC
E74B INTERSTITIAL LUNG DIS + SMCC
E74C INTERSTITIAL LUNG DIS - CC
E75A OTHER RESP SYS DX + CCC
E75B OT RESP SYS DX + SMCC
E75C OTHER RESP SYS DX - CC
E76Z RESPIRATORY TUBERCULOSIS
F01A IMPLANT/REPLCMNT AICD TTL+ CCC
F01B IMPLANT/REPLCMNT AICD TTL - CCC
F02Z OTHER AICD PROCEDURES
F03A CRDC VALV PR+PMP+INV INVES+CCC
F03B CRDC VALV PR+PMP+INV INVES- CCC
F04A CRD VLV PR+PMP- INV INVES+CCC
F04B CRD VLV PR+PMP- INV INVES- CCC
F05A CRNRY BYPSS+INV INVES+REOP/ CCC
F05B CRNRY BYPSS+INV INVES-REOP-C CC
F06A CRNRY BYPSS INV+REOP/CSCC
F06B CRNRY BYPSS INV-REOP-CS CC
F07A OTHER CARDTHOR/VASC PR+PMP+C CC
F07B OTH CARDTHOR/VASC PR+PMP+SMCC
F07C OTHER CARDTHOR/VASC PR+PMP- CCC
F08A MJR RECONSTR VASC PR-PUMP+CCC
F08B MJR RECONSTR VASC PR-PUMP-C CCC
F09A OTH CARDIOTHOR PR-PUMP+C CC
F09B OTH CARDIOTHOR PR-PUMP +SMCC
F09C OTH CARDIOTHOR PR-PMP -CC
F10A INTERVENTN CORONARY PR+AMI+CCC
F10B INTERVENTN CORONARY PR+AMI- CCC
F11A AMPUTN CIRC SYS-UP LMB&TOE+CCC
F11B AMPUTN CIRC SYS-UP LMB&TOE-CCC
F12A IMPLANT/REPLACE PM,TOT SYS+CC C
F12B IMPLANT/REPLACE PM,TOT SYS- CCC
F13A UP LIMB&TOE AMP CIRC DIS + CSCC
F13B UP LIMB&TOE AMP CIRC DIS - CSCC
F14A VASC PR-MJR RECONSTR-PUMP+CCC
F14B VASC PR-MJR RECONSTR-PUMP+SMCC
F14C VASC PR-MJR RECONSTR-PUMP-CC
F15A INTER CORONARY PR-AMI+STN+CS CC
F15B INTER CONORNY PR-AMI+STNT-CS CC
F16A INTERVN CORONARY PR-AMI+STN+CC
F16B INTERV CORONARY PR-AMI+STNT-CC
F17A INSERT/REPLACE PM GENERTR+CS CC
F17B INSERT/REPLACE PM GENERTR- CS CC
F18A OTHER PACEMAKER PROCEDURES+CC
F18B OTHER PACEMAKER PROCEDURES-CC
F19Z TRNS-VSCLR PERC CRDC INTR V
F20Z VEIN LIGATION & STRIPPING
F21A OTH CIRC SYS OR PR+CCC
F21B OTH CIRC SYS OR PR-CCC
F40A CIRC SYS DX+VENTILTR SUPPT+CCC
F40B CIRC SYS DX+VENTILTR SUPPT-CCC
F41A CRD DSRD+AMI+INV INVE PR+CS CC
F41B CRD DSRD+AMI+INV INVE PR-CS CC
F42A CRD DSRD-AMI+IC IN PR +CSCC
F42B CRD DSRD-AMI+IC IN PR -CS CC
F42C CRD DSRD-AMI+IC IN PR SD
F43Z CIRC SYS DIAG W NIV
F60A CRD DSRD+AMI-INV INVE PR+CCC
F60B CRD DSRD+AMI-INV INVE PR-CCC

179
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G60B</td>
<td>DIGESTIVE MALIGNANCY - CCC</td>
</tr>
<tr>
<td>G61A</td>
<td>GI HAEMORRHAGE + CSCCC</td>
</tr>
<tr>
<td>G61B</td>
<td>GI HAEMORRHAGE - CSCCC</td>
</tr>
<tr>
<td>G62Z</td>
<td>COMPLICATED PEPTIC ULCER</td>
</tr>
<tr>
<td>G63Z</td>
<td>UNCOMPLICATED PEPTIC ULCER</td>
</tr>
<tr>
<td>G64A</td>
<td>INFLAMMATORY BOWEL DISEASE +CC</td>
</tr>
<tr>
<td>G64B</td>
<td>INFLAMMATORY BOWEL DISEASE -CC</td>
</tr>
<tr>
<td>G65A</td>
<td>GI OBSTRUCTION + CSCCC</td>
</tr>
<tr>
<td>G65B</td>
<td>GI OBSTRUCTION - CSCCC</td>
</tr>
<tr>
<td>G66Z</td>
<td>ABDOMINAL PAIN/MESENTERIC ADENTS</td>
</tr>
<tr>
<td>G67A</td>
<td>OESPHS, GASTR + CSCCC</td>
</tr>
<tr>
<td>G67B</td>
<td>OESPHS, GASTR - CSCCC</td>
</tr>
<tr>
<td>G70A</td>
<td>OTHER DIGESTIVE SYS DIAG + CSCCC</td>
</tr>
<tr>
<td>G70B</td>
<td>OTHER DIGESTIVE SYS DIAG - CSCCC</td>
</tr>
<tr>
<td>H01A</td>
<td>PANCREAS, LIVER &amp; SHUNT PR + CCC</td>
</tr>
<tr>
<td>H01B</td>
<td>PANCREAS, LIVER &amp; SHUNT PR - CCC</td>
</tr>
<tr>
<td>H02A</td>
<td>MJR BILIARY TRACT PR + CSCCC</td>
</tr>
<tr>
<td>H02B</td>
<td>MJR BILIARY TRACT PR - CSCCC</td>
</tr>
<tr>
<td>H05A</td>
<td>HEPATOBILIARY DIAGNOSTIC PR + CSCCC</td>
</tr>
<tr>
<td>H05B</td>
<td>HEPATOBILIARY DIAGNOSTIC PR - CSCCC</td>
</tr>
<tr>
<td>H06A</td>
<td>OTH HEPTOBILIRY &amp; PANCRS PR + CSCCC</td>
</tr>
<tr>
<td>H06B</td>
<td>OTH HEPTOBILIRY &amp; PANCRS PR - CSCCC</td>
</tr>
<tr>
<td>H07A</td>
<td>OPEN CHOLECYSTECTOMY+CDE + CSCCC</td>
</tr>
<tr>
<td>H07B</td>
<td>OPEN CHOLECYSTECTOMY-CDE - CSCCC</td>
</tr>
<tr>
<td>H08A</td>
<td>LAP CHOLECYSTECTOMY+CDE + CSCCC</td>
</tr>
<tr>
<td>H08B</td>
<td>LAP CHOLECYSTECTOMY-CDE - CSCCC</td>
</tr>
<tr>
<td>H40A</td>
<td>ENDO PR BLEED OES VARICES + CSCCC</td>
</tr>
<tr>
<td>H40B</td>
<td>ENDO PR BLEED OES VARICES - CSCCC</td>
</tr>
<tr>
<td>H43A</td>
<td>ERCP PROCEDURE + CSCCC</td>
</tr>
<tr>
<td>H43B</td>
<td>ERCP PROCEDURE - CSCCC</td>
</tr>
<tr>
<td>H60A</td>
<td>CIRRHOSIS &amp; ALC HEPATITIS + CSCCC</td>
</tr>
<tr>
<td>H60B</td>
<td>CIRRHOSIS &amp; ALC HEPATITIS - CSCCC</td>
</tr>
<tr>
<td>H60C</td>
<td>CIRRHOSIS &amp; ALC HEPATITIS - CC</td>
</tr>
<tr>
<td>H61A</td>
<td>MALG HEPATOBILIARY SYS PAN + CSCCC</td>
</tr>
<tr>
<td>H61B</td>
<td>MALG HEPATOBILIARY SYS PANC - CSCCC</td>
</tr>
<tr>
<td>H62A</td>
<td>DISORDERS PANCREAS-MALIG + CSCCC</td>
</tr>
<tr>
<td>H62B</td>
<td>DISORDERS PANCREAS-MALIG - CSCCC</td>
</tr>
<tr>
<td>H63A</td>
<td>DSRD LVR-MAL,CIRR,ALC HEP+ CSCCC</td>
</tr>
<tr>
<td>H63B</td>
<td>DSRD LVR-MAL,CIRR,ALC HEP - CSCCC</td>
</tr>
<tr>
<td>H64A</td>
<td>DISORDERS OF BILIARY TRACT + CC</td>
</tr>
<tr>
<td>H64B</td>
<td>DISORDERS OF BILIARY TRACT - CC</td>
</tr>
<tr>
<td>I01A</td>
<td>BL/MLT MJ JT PR LWR EXT+RV + CSCCC</td>
</tr>
<tr>
<td>I01B</td>
<td>BL/MLT MJ JT PR LWR EXT-RV - CSCCC</td>
</tr>
<tr>
<td>I02A</td>
<td>MCRVAS TT/SKIN GRAFT+ CSCCC-HAND</td>
</tr>
<tr>
<td>I02B</td>
<td>SKIN GRAFT - CSCCC - HAND</td>
</tr>
<tr>
<td>I03A</td>
<td>HIP REPLACEMENT + CCC</td>
</tr>
<tr>
<td>I03B</td>
<td>HIP REPLACEMENT - CCC</td>
</tr>
<tr>
<td>I04A</td>
<td>KNEE REPLACEMENT + CSCCC</td>
</tr>
<tr>
<td>I04B</td>
<td>KNEE REPLACEMENT - CSCCC</td>
</tr>
<tr>
<td>I05A</td>
<td>OTH JNT REPLACEMENT + CSCCC</td>
</tr>
<tr>
<td>I05B</td>
<td>OTH JNT REPLACEMENT - CSCCC</td>
</tr>
<tr>
<td>I06Z</td>
<td>SPINAL FUSION + DEFORMITY</td>
</tr>
<tr>
<td>I07Z</td>
<td>AMPUTATION</td>
</tr>
<tr>
<td>I08A</td>
<td>OTHER HIP &amp; FEMUR PROC + CSCCC</td>
</tr>
<tr>
<td>I08B</td>
<td>OTHER HIP &amp; FEMUR PR - CSCCC</td>
</tr>
<tr>
<td>I09A</td>
<td>SPINAL FUSION + CSCCC</td>
</tr>
<tr>
<td>I09B</td>
<td>SPINAL FUSION - CSCCC</td>
</tr>
<tr>
<td>I10A</td>
<td>OTHER BACK &amp; NECK PROCS + CSCCC</td>
</tr>
<tr>
<td>I10B</td>
<td>OTHER BACK &amp; NECK PROCS - CSCCC</td>
</tr>
</tbody>
</table>
111Z LIMB LENGTHENING PROCEDURES
112A INFC/INFM BONE/JNT+MISC PR+CCC
112B INFC/INFM BNE/JNT+MISC PR+SMCC
112C INFC/INFM BNE/JNT+MISC PR-CC
113A HUMER,TIBIA,FIBUL,ANKL PR+CC
113B HUMER,TIBIA,FIBUL,ANKL PR-CC
115Z CRANIO-FACIAL SURGERY
116Z OTHER SHOULDER PROCEDURES
117A MAXILLO-FACIAL SURGERY +CC
117B MAXILLO-FACIAL SURGERY -CC
118Z OTHER KNEE PROCEDURES
119A OTHER ELBOW, FOREARM PROCES +CC
119B OTHER ELBOW, FOREARM PROCES -CC
120Z OTHER FOOT PROCEDURES
121Z LOC EX, REM INT FIX DEV HP&FM
123Z LOC EX,REM INT FIX-HP&FM
124Z ARTHROSCOPY
125A BNE,JNT DX+TIC PR INC BIOPSY+CC
125B BNE,JNT DX+TIC PR INC BIOPSY-CC
127A SOFT TISSUE PROCEDURES +CC
127B SOFT TISSUE PROCEDURES -CC
128A OTH MUSCULOSKELETAL PR+CC
128B OTH MUSCULOSKELETAL PR-CC
129Z KNEE RECONSTRUCTION/REVISION
130Z HAND PROCEDURES
131A HIP REVISION +CCC
131B HIP REVISION -CCC
132A KNEE REVISION +CCC
132B KNEE REVISION +SCC
132C KNEE REVISION -CSCC
160Z FEMORAL SHAFT FRACTURES
161A DISTAL FEMORAL FRACTURES +CC
161B DISTAL FEMORAL FRACTURES -CC
163A SPR,STR&DSLC HIP,PELV&THIGH+CC
163B SPR,STR&DSLC HIP,PELV&THIGH-CC
164A OSTEOMYELITIS +CSCC
164B OSTEOMYELITIS -CSCC
165A MUSCSKEL MALIG NEO+CCC
165B MUSCSKEL MALIG NEO -CCC
166A INFLM MUSCL DSR +CSCC
166B INFLM MUSCLSKTL DSR -CSCC
167A SEPTIC ARTHRITIS + CSCC
167B SEPTIC ARTHRITIS - CSCC
168A NON-SURG SPINAL DISORDERS +CC
168B NON-SURG SPINAL DISORDERS -CC
168C NON-SURG SPINAL DISORDERS, SD
169A BONE DISEASES AND ARTHRO +CSCC
169B BONE DISEASES AND ARTHRO+CSCC
171A OTH MUSCTENDIN DISRD +CSCC
171B OTH MUSCTENDIN DISRD -CSCC
172A SPEC MUSCTEND DISRD +CSCC
172B SPEC MUSCTEND DISRD -CSCC
173A AFTCARE MUSCK IMPL +CSCC
173B AFTCARE MUSCK IMPL -CSCC
174Z INJ FOREARM, WRIST, HAND, FOOT
175A INJ SH,ARM,ELB,KN,LEG,ANKL +CC
175B INJ SH,ARM,ELB,KN,LEG,ANKL -CC
176A OTH MUSCULOSKELETAL DISRD +CSCC
176B OTH MUSCULOSKELETAL DISRD -CSCC
177A FRACTURE OF PELVIS+CSCC

182
I77B FRACTURE OF PELVIS -CSCC
I78A FRACTURE NECK FEMUR+CSCC
I78B FRACTURE OF NECK FEMUR-CSCC
I79A PATHOLOGICAL FRACTURE +CCC
I79B PATHOLOGICAL FRACTURE -CCC
J01A MICRVS TSS TRNSF SKN/BRST+CSCC
J01B MICRVS TSS TRNSF SKN/BRST-CSCC
J06A MAJOR PR MALIG BREAST CONDTNS
J06B MAJOR PR NON-MALIG BREAST CNDS
J07A MINOR PR MALIG BREAST CONDNS
J07B MINOR PR NON-MALIG BREAST CNDS
J08A OTH SKN GRF/&DBRDMNT PR +CC
J08B OTH SKN GRF/&DBRDMNT PR -CC
J09Z PERIANAL & PILONIDAL PR
J10Z SKN, SUBC TIS & BRST PLASTIC PR
J11Z OTHER SKIN, SUBC TIS & BRST PR
J12A L LMB PR +ULCR/CELS+CSCC
J12B L LMB PR+ULCR/CELS-CCC+GRAFT
J12C L LMB PR+ULCR/CELS-CCC-GRAFT
J13A L LMB PR-ULC/C+CCC/(GFT+SCC)
J13B L LMB PR-ULC/C-CCC-(GFT+SCC)
J14Z MAJOR BREAST RECONSTRUCTIONS
J60A SKIN ULCERS +CCC
J60B SKIN ULCERS -CCC
J60C SKIN ULCERS, SAMEDAY
J62A MALIGNANT BREAST DISORDERS +CC
J62B MALIGNANT BREAST DISORDERS -CC
J63A NON-MALIGNANT BREAST DISORD+CC
J63B NON-MALIGNANT BREAST DISORD-CC
J64A CELLULITIS +CSCC
J64B CELLULITIS -CSCC
J65A TRAUMA TO SKN, SUB TIS & BST+CSCC
J65B TRAUMA TO SKN, SUB TIS & BST-CC
J67A MINOR SKIN DISORDERS
J67B MINOR SKIN DISORDERS, SAMEDAY
J68A MAJOR SKIN DISORDERS +CSCC
J68B MAJOR SKIN DISORDERS -CSCC
J68C MAJOR SKIN DISORDERS, SAMEDAY
J69A SKIN MALIGNANCY +CCC
J69B SKIN MALIGNANCY -CCC
J69C SKIN MALIGNANCY, SAMEDAY
K01A OR PR DIABETIC COMPLICATNS+CSCC
K01B OR PR DIABETIC COMPLICATNS-CCC
K02A PITUITARY PROCEDURES +CC
K02B PITUITARY PROCEDURES -CC
K03Z ADRENAL PROCEDURES
K04A MAJOR PROCS FOR OBESITY +CC
K04B MAJOR PROCS FOR OBESITY -CC
K05A PARATHYROID PROCEDURES +CSCC
K05B PARATHYROID PROCEDURES -CSCC
K06A THYROID PROCEDURES +CSCC
K06B THYROID PROCEDURES -CSCC
K07Z OBESITY PROCEDURES
K08Z THYROGLOSSAL PROCEDURES
K09A OTH ENDCRN, NUTR & META PR +CCC
K09B OTH ENDCRN, NUTR & META PR+SMCC
K09C OTH ENDCRN, NUTR & META PR -CC
K40A ENDO/INVEST PR METAB DIS +CCC
K40B ENDO/INVEST PR METAB DIS -CCC
K40C ENDO/INVEST PR METAB DIS, SD
K60A DIABETES + CSCC
K60B DIABETES - CSCC
K61Z SEVERE NUTRITIONAL DISTURBANCE
K62A MISC METABOLIC DISORDERS +CSCC
K62B MISC METABOLIC DISORDERS -CSCC
K63A INBORN ERRORS OF METABOLISM+CC
K63B INBORN ERRORS OF METABOLISM-CC
K64A ENDOCRINE DISORDERS + CS CCC
K64B ENDOCRINE DISORDERS - CSCC
L02A OP INS PERI CATH DIALYSIS+CS CCC
L02B OP INS PERI CATH DIALYSIS-CSCC
L03A KDNY, URT&MJR BLDR PR NPSM +CCC
L03B KDNY, URT&MJR BLDR PR NPSM +SCC
L03C KDNY, URT&MJR BLDR PR NPSM-CSCC
L04A KDY, URT&MJR BLDR PR N-NPM+CCC
L04B KDY, URT&MJR BLDR PR N-NPM+SCC
L04C KDY, URT&MJR BLDR PR N-NPM-CSCC
L05A TRANURETH PROSTATECTOMY +CS CCC
L05B TRANURETH PROSTATECTOMY - CSCC
L06A MINOR BLADDER PROCEDURES+CS CCC
L06B MINOR BLADDER PROCEDURES - CSCC
L07A TRANURETHRAL PROCS +CC
L07B TRANURETHRAL PROCS -CC
L08A URETHRAL PROCEDURES + CC
L08B URETHRAL PROCEDURES - CC
L09A OTH KIDNY & URNRY TRCT PR+C CCC
L09B OTH KIDNY & URNRY TRCT PR+SCC
L09C OTH KIDNY & URNRY TRCT PR-CSCC
L40Z URETEROSCOPY
L41Z CYSTOURETHROSCOPY, SAME DAY
L42Z ESW LITHOTRIPSY+URINARY STONES
L60A RENAL FAILURE +CCC
L60B RENAL FAILURE +SCC
L60C RENAL FAILURE - CSCC
L61Z HAEMODIALYSIS
L62A KDNY&UNRY TRCT NEOPLASMS +CS CCC
L62B KDNY&UNRY TRCT NEOPLASMS -CSCC
L63A KDNY & UNRY TRCT INF +CS CCC
L63B KDNY & UNRY TRCT INF -CS CCC
L64Z URINARY STONES & OBSTRUCTION
L65A KDNY & UNRY TR SGNS&SYMPS+CS CCC
L65B KDNY & UNRY TR SGNS&SYMPS-CSCC
L66Z URETHRAL STRICTURE
L67A OTH KIDNY & URNRY TR CT DX+CSCC
L67B OTH KIDNY & URNRY TR CT DX-CSCC
L68Z PERITONEAL DIALYSIS
M01A MAJOR MALE PELVIC PROC +CS CCC
M01B MAJOR MALE PELVIC PROC -CSCC
M02A TRANURETHRAL PROSTATECTOMY+CS CCC
M02B TRANURETHRAL PROSTATECTOMY-CSCC
M03Z PENIS PROCEDURES
M04Z TESTES PROCEDURES
M05Z CIRCUMCISION
M06A OTH MALE REPROD SYS OR PR +CC
M06B OTH MALE REPROD SYS OR PR -CC
M40Z CYSTOURETHROSCOPY, SAME DAY
M60A MALIGNANCY, MALE REPR SYS+CS CCC
M60B MALIGNANCY, MALE REPR SYS-CSCC
M61Z BENIGN PROSTATIC HYPERTROPHY
M62Z INFLAMMATION MALE REPRD SYSTEM
M63Z STERILISATION, MALE
M64Z OTHER MALE REPRODUCTIVE SYS DX
N01Z PELVIC EVSCRTN & RADCL VLVCMTY
N04A HYSTERECTOMY FOR NON-MALG+CSCC
N04B HYSTERECTOMY FOR NON-MALG-CSCC
N05A OOPH&COM FAL TUBE PR NML+CSCC
N05B OOPH&COM FAL TUBE PR NML-CSCC
N06A FEM REP SYS RECONSTRCT PR+CSCC
N06B FEM REP SYS RECONSTRCT PR-CSCC
N07Z OTH UTERN & ADNEXA PR FOR NML
N08Z ENDOS & LAPAR PR, FEM REPR SYS
N09Z CONISTN,VAGINA,CERVIX&VULVA PR
N10Z DXC CURETTGE, DXC HYSTEROSCOPY
N11Z OTH FEMALE REPRODUCTIVE SYS PR
N12A UTRN & ADNX PR FOR MAL+CSCC
N12B UTRN & ADNX PR FOR MAL-CSCC
N60A MALIGNANCY FEM REPROD SYS +CCC
N60B MALIGNANCY FEM REPROD SYS -CCC
N61Z INFECTIONS, FEMALE REPROD SYST
N62Z MNSTRL & OTH FEM REPR SYS DIS
O01A CAESAREAN DELIVERY +CCC
O01B CAESAREAN DELIVERY +SCC
O01C CAESAREAN DELIVERY -CSCC
O02A VAGINAL DELIVERY +OR PR +CSCC
O02B VAGINAL DELIVERY +OR PR -CSCC
O03A ECTOPIC PREGNANCY +CC
O03B ECTOPIC PREGNANCY -CC
O04A POSTPARTUM&POST ABORTN+PR+CSCC
O04B POSTPARTUM&POST ABORTN+PR-CSCC
O05Z ABORTION+ OR PROC
O60A VAGINAL DELIVERY +CSCC
O60B VAGINAL DELIVERY -CSCC
O60C VAGINAL DEL SINGLE UNCOMPL
O61Z POSTPARTUM & POST ABORTN-OR PR
O63Z ABORTION-OR PROC
O64A FALSE LABOUR <37 WK/+CCC
O64B FALSE LABOUR >=37 WK -CCC
O66A ANTE NATAL&OTH OBSTETRIC ADM
O66B ANTE NATAL&OTH OBSTETRIC ADM,SD
P01Z NEONATE,D/T<5DAY ADM+SIG OR PR
P02Z NEO,CARDIOTHORACIC/VASCULAR PR
P03Z NEO,ADMWT 1000-1499G+SIG OR PR
P04Z NEO,ADMWT 1500-1999G+SIG OR PR
P05Z NEO,ADMWT 2000-2499G+SIG OR PR
P06A NEO,ADMWT >2499G+SIG OR PR+MMP
P06B NEO,ADMWT >2499G+SIG OR PR-MMP
P60A NEO,D/TR<5D ADM-SIG PR+NEWBORN
P60E NEO,D/TR<5D ADM-SIG PR-NEWBORN
P61Z NEONATE, ADMISSION WT <750 G
P62Z NEONATE, ADMISSION WT 750-999G
P63Z NEO,ADMWT 1000-1249G-SIG OR PR
P64Z NEO,ADMWT 1250-1499G-SIG OR PR
P65A NEO,ADMWT 1500-1999G-SG OR+MMP
P65B NEO,ADMWT 1500-1999G-SG OR+MJP
P65C NEO,ADMWT 1500-1999G-SG OR+OTP
P65D NEO,ADMWT 1500-1999G-SG OR-PRB
P66A NEO,ADMWT 2000-2499G-SG OR+MMP
P66B NEO,ADMWT 2000-2499G-SG OR+MJP
P66C NEO,ADMWT 2000-2499G-SG OR+OTP
P66D NEO,ADMWT 2000-2499G-SG OR-PRB
P67A NEO, ADMWT >2499G-SIG OR PR+MMP
P67B NEO, ADMWT >2499G-SIG OR PR+MJP
P67C NEO, ADMWT >2499G-SIG OR PR+OTP
P67D NEO, ADMWT >2499G-SIG OR PR-PRB
Q01Z SPLENECTOMY
Q02A OTH OR PR BLD&BLD FRM ORG+CSCC
Q02B OTH OR PR BLD&BLD FRM ORG-CSCC
Q06A RETICLEND&IMNTY DIS+CSCC
Q06B RETICLEND&IMNTY DIS-CSCC-MAL
Q06C RETICLEND&IMNTY DIS-CSCC-MAL
Q61A RED BLOOD CELL DISDERS + CSCC
Q61B RED BLOOD CELL DISDERS - CSCC
Q62Z COAGULATION DISORDERS
R01A LYMPHMA&LEUKMA+MJR OR PR +CSCC
R01B LYMPHMA&LEUKMA+MJR OR PR -CSCC
R02A OTH NPLSTC DSRD+MJR OR PR+CSCC
R02B OTH NPLSTC DSRD+MJR OR PR+SMCC
R02C OTH NPLSTC DSRD+MJR OR PR-CC
R03A LYMPHMA LEUKMA+OTH OR PR +CSCC
R03B LYMPHMA LEUKMA+OTH OR PR -CSCC
R04A OTH NPLSTC DSRD+OTH OR PR +CC
R04B OTH NPLSTC DSRD+OTH OR PR -CC
R60A ACUTE LEUKAEMIA + CCC
R60B ACUTE LEUKAEMIA - CCC
R61A LYMPHMA &N-ACUTE LEUKAEMIA+CSCC
R61B LYMPHMA &N-ACUTE LEUKAEMIA-CSCC
R61C LYMPHOMA/N-A LEUKAEMIA, SAMEDAY
R62A OTHER NEOPLASTIC DISORDERS +CC
R62B OTHER NEOPLASTIC DISORDERS -CC
R63Z CHEMOTHERAPY
R64Z RADIOTHERAPY
S60Z HIV, SAMEDAY
S65A HIV-RELATED DISEASES +CCC
S65B HIV-RELATED DISEASES +SCC
S65C HIV-RELATED DISEASES -CSCC
T01A OR PROC INFECT& PARAS DIS+CSCC
T01B OR PROC INFECT& PARAS DIS+SMCC
T01C OR PROC INFECT & PARAS DIS-CC
T40Z INFECT&PARAS DIS+VENT SUPPORT
T60A SEPTICAEMIA + CCC
T60B SEPTICAEMIA - CCC
T61A POSTOP & POSTTRAUM INFECT+CSCC
T61B POSTOP & POSTTRAUM INFECT-CSCC
T62A FEVER OF UNKNOWN ORIGIN + CC
T62B FEVER OF UNKNOWN ORIGIN - CC
T63Z VIRAL ILLNESS
T64A OTH INFECTOUS&PARSTIC DIS +CCC
T64B OTH INFECTIOUS&PARSTIC DIS+SMCC
T64C OTH INFECTIOUS & PARSTIC DIS-CC
U40Z MENTAL HEALTH TREAT, SAMEDY+ECT
U60Z MENTAL HEALTH TREAT, SAMEDY-ECT
U61A SCHIZOPHRENIA DISORDERS+MHLS
U61B SCHIZOPHRENIA DISORDERS-MHLS
U62A PAR&ACUTE PSYCH DSRD+CSCC/MHLS
U62B PAR&ACUTE PSYCH DSRD-CSCC-MHLS
U63A MJR AFFECT DSRD A>69/+CSCC
U63B MAJOR AFFECTIVE DSRD A<70-CSCC
U64Z OTH AFFECT & SOMATOFORM DSRD
U65Z ANXIETY DISORDERS
U66Z EATING & OBSESSV-COMPULSV DSRD
Appendix 2

2. Variables used in data linkage study

Private health insurance hospital claims data

- Person identifier
- Membership joining date
- Membership termination date
- Sex
- Age group at admission (five-year age groups)
- Hospital admission identifier
- Hospital admission date
- Hospital separation date
- Hospital type
- Diagnosis related group (AR-DRG)
- Principal ICD-10 diagnosis (used for recoding AR-DRG codes)
- Additional ICD-10 diagnosis (used for recoding AR-DRG codes)
- Mode of separation (used for recoding AR-DRG codes)
- Procedure codes (used for recoding AR-DRG codes)

Local Health District hospital admission data

- Person identifier
- Sex
- Age group at admission (five-year age groups)
- Hospital admission identifier
- Hospital admission date
- Hospital separation date
- Diagnosis related group (AR-DRG)
- DRG version
- Health insurance status
Local Health District emergency department data

- Person identifier
- Visit identifier
- Visit date
- Mode of separation – ED (lists whether or not patient was admitted to hospital)
Appendix 3

3. Participant email for telephone interviews

Dear Colleague

I am writing to invite you and/or a member of your senior Executive team to participate in a telephone interview as part of the CMCRC-supported PhD research project, “The role of private health insurance in supporting the care needs of people with chronic illness.” The supervisor for this research is Professor Kathy Eagar, Director of the Australian Health Services Research Institute at the University of Wollongong. The industry partner for this research project is HAMBS Systems Ltd.

The project examines the burden of disease and health service use among people with chronic conditions, investigates the data and information requirements for chronic disease management and explores policy and service delivery challenges that influence the involvement of the private health insurance sector in chronic disease management. The aim of this specific research study is to gather perspectives of senior executives in private health insurance funds on the factors influencing the design and implementation of strategies to support people with chronic disease.

Participation in this study will involve a 30-45 minute telephone interview that will be scheduled between October and December 2017. In the interview, I will ask about your views on the current and future role of the private health insurance sector in chronic disease management in the Australian health system. An indicative list of questions will be supplied prior to the interview.

With your consent, the interview will be audio-recorded for the purposes of transcription and data analysis. Audio-recordings will be destroyed at the conclusion of the study. Any publications arising from this study will not identify individual participants or organisations and will be subject to CMCRC and HAMBS publication review processes. Participant email confirmation and scheduling of an interview for the project will be deemed consent to participate in the research study.

It is anticipated that findings from the study will benefit the participants by presenting a comprehensive view of chronic disease management strategy and programs occurring across the private health insurance sector in Australia. The study will also seek participant views on earlier analysis of insurance claims data conducted as part of the project and seek input into recommendations for the project overall.

The protocol for this research study has been reviewed by the management of the Australian Health Services Research Institute at the University of Wollongong and classified as negligible risk research. As such, this study is exempted from ethical review by a Human Research Ethics Committee.

I look forward to speaking with you. If you had any questions or require further information, please contact me on jkhoo@cmcrc.com or 0401 XXX XXX. Alternatively, if you have any concerns, the supervisor of this research, Professor Eagar can be contacted on keeg@uow.edu.au or 02 4221 XXXX.

Kind regards
Jo Khoo
PhD Candidate
Australian Health Services Research Institute, University of Wollongong and CRCMC
Appendix 4

4. Interview questions: Perspectives of private health insurance funds on the factors influencing the design and implementation of strategies to support people with chronic illness

General questions (to understand the membership profile of your fund)

1. How long have you worked in your current position?
2. How long have you worked in the private health insurance sector?
3. How many members in your health fund?
4. What is the geographic distribution of your membership?
5. Are there any features that make your fund membership distinct from the national population? Or from other health insurance funds?

Overview of chronic disease management strategy

6. What is your perception of the role of private health insurers in chronic disease management?
7. Can you briefly tell me about the current strategies that your fund uses to support people with chronic diseases?

Strategies to support health care needs of the chronically ill

Analysis of insurance claims data among the top 1% of hospital users showed that this group was responsible for a large proportion of total resource utilisation for the insured population and were being admitted to hospital primarily for a small number of conditions or treatment interventions – mental health, cancers, rehabilitation and dialysis.

8. Do the findings concur with your own experience or internal analysis?
9. What is your fund’s approach to people with high claims history?

Mental health was strongly represented among the top 1% of hospital users.

10. Describe the priorities of your fund in the area of mental health care.
Data and information requirements for chronic disease management

11. From your perspective, what is the most important information needed to design and implement chronic disease management programs?

12. Can you comment on the adequacy of the data sources currently used by your fund to inform chronic disease management programs?

13. What additional data sources would be valuable to inform chronic disease management programs?

14. How does your fund measure success in chronic disease management programs?

Future and recommendations

15. Thinking about the future in 5-10 years’ time:

a) what would you like the approach of private health insurance funds’ to chronic disease management to look like?

b) what do you think it will actually look like?

There has been recent media and government attention on the number of privately insured admissions in public hospitals. This may be particularly relevant to people with chronic disease and high health care needs.

16. If you had the opportunity to influence the conditions under which privately insured individuals went to public or private hospitals, what position would you take?

17. Do you have any suggestions for recommendations that would help shape the future that you want to see for the private health insurance sector in the area of chronic disease management?

18. Do you have any final thoughts on this topic that you would like to share?