



Trends of Australian emergency department care
for people with mental health diagnoses:
implications for service provision
and policy development

by

Quang Nhat Tran

B.P.H., M.Sc.

Submitted in partial fulfilment of the requirements for the Doctor of Philosophy

(Medical Studies)

University of Tasmania, March, 2021

Declaration of Originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

Signature

Quang Nhat Tran

6th December, 2019

Date

Authority of Access

Copy and communication of research reported in Chapters 3 and 7 is prohibited for two years from the date this statement was signed; after that time limited copying and communication is permitted in accordance with the Copyright Act 1968. Copying and communication of research reported in Chapters 4 to 6 are subject to provisions of associated publishers. The remaining non-published content of the thesis may be made available for loan and limited copying and communication, also in accordance with the Copyright Act 1968.

Signature

6th December, 2019

Quang Nhat Tran

Date

Statement regarding Published Work contained in Thesis

The publishers of the papers reported in Chapters 4 to 6 hold the copyright for that content, and access to the material should be sought from *Emergency Medicine Australasia* / Wiley Online Library.

Signature

6th December, 2019

Quang Nhat Tran

Date

Statement of Co-authorship

The following people and institutions contributed to the publication of work undertaken as part of this thesis:

Candidate	<i>Quang Nhat Tran</i> Menzies Institute for Medical Research, University of Tasmania
Author 1	<i>Amanda Louise Neil</i> Menzies Institute for Medical Research, University of Tasmania Primary Supervisor
Author 2	<i>Kristy Sanderson</i> School of Health Sciences, University of East Anglia (UK); and Menzies Institute for Medical Research, University of Tasmania Co-supervisor from 15 th June, 2015
Author 3	<i>April Miller</i> Menzies Institute for Medical Research, University of Tasmania
Author 4	<i>Leonard George J. Lambeth</i> Menzies Institute for Medical Research, University of Tasmania Co-supervisor from 16 th May, 2016
Author 5	<i>Barbara de Graaff</i> Menzies Institute for Medical Research, University of Tasmania Co-supervisor from 6 th December, 2018
Author 6	<i>Monique Breslin</i> Menzies Institute for Medical Research, University of Tasmania Biostatistician
Author 7	<i>Viet Tran</i> Royal Hobart Hospital Emergency Department, Tasmanian Health Service, Tasmanian Government; and School of Medicine, College of Health and Medicine, University of Tasmania
Author 8	<i>Emma J. Huckerby</i> Royal Hobart Hospital Emergency Department, Tasmanian Health Service, Tasmanian Government

Contribution of work by co-authors for each paper:**Paper 1:** Located in Chapter 3

Tran, Q.N., Sanderson, K., Miller, A., Lambeth, L.G., de Graaff, B., Neil, A.L.,
A systematic review of international trends in mental health-related emergency
department presentations between 1985 and 2015. *Psychiatric Services*, Under
revision.

Author contributions:

- *Conception and design of the systematic review:* Candidate, Author 1 and Author 2
- *Defined the scope of the review and the inclusion and exclusion criteria:* Candidate, Author 1 with support from Author 2
- *Performed the search strategy:* Candidate
- *Selected the articles for inclusion in the review:* Candidate and Author 1 with support from Author 2
- *Performed the data extraction:* Candidate and Author 5 with support from Author 1
- *Interpreted the data:* Candidate and Author 1, Author 2 and Author 4
- *Initial draft of manuscript:* Candidate
- *Refinement of draft manuscript:* Candidate with support from Author 1
- *Critically revised and edited the final manuscript:* Authors 1 to 5

Paper 2: Located in Chapter 4

Tran, Q.N., Lambeth, L.G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V.,
Huckerby, E.J., Neil, A.L., Emergency department presentations with a mental health
diagnosis in Australia, by jurisdiction and by sex, 2004-05 to 2016-17. *Emergency
Medicine Australasia*, Accepted for publication, 11 November 2019.

Author contributions:

- *Conception of the research project:* Candidate, Author 1 and Author 2
- *Acquisition of the data and data management:* Candidate
- *Selected variables for analysis:* Candidate and Author 1
- *Analysed the data:* Candidate, Author 1 and Author 6
- *Interpreted the data:* Candidate, Author 1, Author 4 and Author 6
- *Provided statistical advice:* Author 6
- *Provided enriching background for the manuscript:* Author 4 and Author 7
- *Initial draft of manuscript:* Candidate
- *Refinement of draft manuscript:* Candidate with support from Author 1
- *Critically revised and edited the final manuscript:* Author 1, Author 2 and Authors 4 to 8
- *Gave the final approval for the manuscript to be published:* Candidate, Author 1, Author 2 and Authors 4 to 8

Paper 3: Located in Chapter 5

Tran, Q.N., Lambeth, L.G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V., Huckerby, E.J., Neil, A.L., Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: a secondary data analysis. *Emergency Medicine Australasia*, 2019, DOI: 10.1111/1742-6723.13323

Author contributions:

- *Conception of the research project:* Candidate, Author 1 and Author 2
- *Acquisition of the data and data management:* Candidate
- *Selected variables:* Candidate, Author 1 and Author 4
- *Analysed the data:* Candidate, Author 1 and Author 6
- *Interpreted the data:* Candidate, Author 1, Author 4 and Author 6

- *Provided statistical advice:* Author 6
- *Provided enriching background for the manuscript:* Author 4 and Author 7
- *Initial draft of manuscript:* Candidate
- *Refinement of draft manuscript:* Candidate with support from Author 1
- *Critically revised and edited the final manuscript:* Author 1, Author 2 and Authors 4 to 8
- *Gave the final approval for the manuscript to be published:* Candidate, Author 1, Author 2 and Authors 4 to 8

Paper 4: Located in Chapter 6

Tran, Q.N., Lambeth, L.G., Sanderson, K., de Graaff, B., Breslin, M., Huckerby, E.J., Tran, V., Neil, A.L., Trend of emergency department presentations with a mental health diagnosis in Australia by diagnostic group, 2004-05 to 2016-17. *Emergency Medicine Australasia*, Accepted for publication, 4 December 2019.

Author contributions:

- *Conception of the research project:* Candidate, Author 1 and Author 2
- *Acquisition of the data and data management:* Candidate
- *Selected variables:* Candidate, Author 1 and Author 4
- *Analysed the data:* Candidate, Author 1 and Author 6
- *Interpreted the data:* Candidate, Author 1, Author 4 and Author 6
- *Provided statistical advice:* Author 6
- *Provided enriching background for the manuscript:* Author 4 and Author 7
- *Initial draft of manuscript:* Candidate
- *Refinement of draft manuscript:* Candidate with support from Author 1
- *Critically revised and edited the final manuscript:* Author 1, Author 2, and Authors 4 to 8

Paper 5: Located in Chapter 7

Tran, Q.N., Lambeth, L.G., Tran, V., Sanderson, K., de Graaff, B., Breslin, M., Neil, A.L., High acuity emergency department presentations and admitted presentations in Australia, and by jurisdiction, 2004-05 to 2016-17: all presentations and presentations with a mental health diagnosis. *Emergency Medicine Australasia*, Under review.

Author contributions:

- *Conception of the research project:* Candidate, Author 1 and Author 2
- *Acquisition of the data and data management:* Candidate
- *Selected variables:* Candidate, Author 1, Author 4 and Author 7
- *Analysed the data:* Candidate, Author 1 and Author 6
- *Interpreted the data:* Candidate, Author 1, Author 6 and Author 7
- *Provided statistical advice:* Author 6
- *Provided enriching background for the manuscript:* Author 4 and Author 7
- *Initial draft of manuscript:* Candidate
- *Refinement of draft manuscript:* Candidate with support from Author 1
- *Critically revised and edited the final manuscript:* Author 1, Author 2 and Authors 4 to 7

We, the undersigned, endorse the above stated contribution of work undertaken for each of the published (or submitted) peer-reviewed manuscripts contributing to this thesis:

Signed: _____	Signed: _____	Signed: _____
Quang Nhat Tran	Amanda Louise Neil	Alison Venn
Candidate	Primary Supervisor	Director
Menzies Institute for Medical	Menzies Institute for Medical	Menzies Institute for Medical
Research,	Research,	Research,
University of Tasmania	University of Tasmania	University of Tasmania
Date: 6 December 2019	Date: 6 December 2019	Date: 6 December 2019

Statement of Ethical Conduct

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University. Within this thesis, publicly available secondary data were collated and analysed, and as such ethics approval was not sought.

Signature

6th December, 2019

Quang Nhat Tran

Date

Acknowledgments

I appreciate the opportunity to undertake my PhD at Menzies Institute for Medical Research with full Scholarship from the Vietnam-Menzies PhD Scholarship. I have been fortunate to work with other researchers here. I would like to take this opportunity to express my appreciation to Menzies and the University of Tasmania.

I really appreciate my supervisory team, Dr. Amanda Neil, Prof. Kristy Sanderson, A/Prof. Leonard Lambeth, and Dr. Barbara de Graaff for all knowledge, supports, encouragement, patience and good humour.

I would like to say thank-you to the Graduate Research Coordinators at Menzies, Prof. Heinrich Korner, Prof. Wendy Oddy, Prof. Tracey Dickenson for their advice, support and patience to resolve my problem during my PhD candidature.

I would also like to thank the Menzies Mental Health and Wellbeing, and Health Economics Groups: Dr. Adriana Nevarez Flores, Ms. April Jankiewicz, Dr. Larissa Bartlett, Ms. Quynh Le, Prof. Andrew Palmer, Dr. Le Si, Dr. Julie Campbell, Dr. Hasnat Ahmad for all valued support.

I would also like to thank Tasmanian Health Service: Ben Spurr (Clinical Coding Manager), Mark Upton (State-wide Manager, Health Information Management Services), Kevin Ratcliffe (Senior Advisor; Case-mix Risk, Costing, and Funding) for their assistance in studies.

I would also like to thank my colleagues in Menzies, Dr. Quan Huynh, Dr. Tan Bui, Ms. Hoa Nguyen, Dr. Nga Tran, Dr. Chau Ho for their support and encouragement.

I would also like to thank my colleagues in the Community Health Department, Faculty of Public Health, Ho Chi Minh City University of Medicine and Pharmacy,

Vietnam for that they have been covering my duties while I have been doing my PhD overseas.

I would like to thank my parents for their support, love and encouragement and belief in me.

The last, but not least, I want to thank my own little family: my wife Ngoc Pham, daughter Grace, son Marcus for their continuous and enthusiastic encouragement throughout my PhD candidature.

Table of Contents

Declaration of Originality	i
Authority of Access	ii
Statement regarding Published Work contained in Thesis	iii
Statement of Co-authorship.....	iv
Statement of Ethical Conduct.....	x
Acknowledgments	xi
Table of Contents	xiii
List of Abbreviations.....	xvii
List of Figures.....	xx
List of Tables	xxii
List of Appendixes.....	xxv
Abstract	xxvi
Chapter 1. Introduction.....	1
1.1. Background.....	1
1.1.1. Global burden of mental illnesses	1
1.1.2. Deinstitutionalisation and the reduction in psychiatric bed numbers	1
1.1.3. Australian National Mental Health Strategy.....	5
1.1.4. Mental health-related emergency department presentations	5
1.1.5. Monitoring health system performance.....	8
1.2. Objectives, Aims and Structure	9
Chapter 2. Methods.....	12
2.1. Preface	12
2.2. Systematic review of peer-reviewed literature (Chapter 3).....	12
2.3. Cross sectional studies of secondary data from the <i>National Non-Admitted Patient Emergency Department Care Database</i> (NNAPEDCD) (Chapter 4 to Chapter 7)	13
2.3.1. National Minimum Data Set (NMDS) and NNAPEDCD	14
2.3.2. Australian Hospital Statistics (AHS).....	21
2.3.3. Mental Health Services in Australia (MHSA)	22

2.3.4. Data quality	24
2.3.5. Extracted data items from AHS and MHSA.....	25
2.3.6. Derived data items.....	32
2.3.7. Statistical analysis	33
2.4. Ethical issues	35
Chapter 3. A systematic review of international trends in mental health-related emergency department presentations between 1985 and 2015	36
3.1. Preface	36
3.2. Introduction.....	36
3.3. Method.....	38
3.3.1. Inclusion criteria.....	38
3.3.2. Exclusion criteria	38
3.3.3. Search strategy for identification of studies	38
3.3.4. Search strategy, data extraction process and quality control.....	39
3.3.5. Data synthesis and analysis.....	40
3.4. Results	40
3.4.1. Studies identification.....	40
3.4.2. Characteristics of studies	41
3.4.3. Trends of MHeED presentations for across all age-groups in the US.....	57
3.4.4. Trends of MHeED presentations for across all age-groups in Australia ...	65
3.5. Discussion.....	69
3.6. Limitations.....	75
3.7. Conclusion	75
Chapter 4. Emergency department presentations with a mental health diagnosis in Australia, by jurisdiction and by sex, 2004-05 to 2016-17	77
4.1. Preface	77
4.2. Introduction.....	77
4.3. Methods	78

4.3.1. Data sources	78
4.3.2. Statistical analysis	80
4.4. Results	80
4.4.1. ED, ED _{dx} , and MH _{dx} presentations, Australia	80
4.4.2. ED, ED _{dx} , and MH _{dx} presentations by jurisdiction	81
4.4.3. Trends in MH _{dx} presentations	81
4.4.4. ED _{dx} and MH _{dx} presentations by sex.....	87
4.5. Discussion.....	96
4.6. Strengths and Limitations.....	99
4.7. Conclusion	100
Chapter 5. Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: a secondary data analysis.....	102
5.1. Preface	102
5.2. Introduction.....	102
5.3. Methods	103
5.3.1. Data sources	103
5.3.2. Statistical analysis	105
5.4. Results	105
5.4.1. ED and MH _{dx} presentations by age group	105
5.4.2. Trends for all ED and MH _{dx} presentations by age group	106
5.5. Discussion.....	119
5.6. Limitations.....	123
5.7. Conclusion	123
Chapter 6. Trend of emergency department presentations with a mental health diagnosis in Australia by diagnostic group, 2004-05 to 2016-17	125
6.1. Preface	125
6.2. Introduction.....	125
6.3. Methods	127
6.3.1. Data sources	127
6.3.2. Analyses.....	127

6.4. Results	128
6.5. Discussion.....	140
6.6. Strengths and Limitations.....	145
6.7. Conclusion	146
Chapter 7. High acuity emergency department presentations and admitted presentations in Australia, and by jurisdiction, 2004-05 to 2016-17: all presentations and presentations with a mental health diagnosis	148
7.1. Preface	148
7.2. Introduction.....	148
7.3. Methods	149
7.3.1. Data sources	149
7.3.2. Statistical analysis	150
7.4. Results	150
7.4.1. High acuity ED and MH _{dx} presentations	150
7.4.2. Admitted ED and MH _{dx} presentations.....	163
7.5. Discussion.....	167
7.6. Limitations.....	169
7.7. Conclusion	170
Chapter 8. General Discussion and Conclusion.....	171
8.1. Preface	171
8.2. Summary of the thesis	171
8.3. Summary of key findings of individual studies	172
8.4. General discussion	176
8.5. Limitations.....	186
8.6. Future directions	188
8.6.1. Mental health care system and service provision.....	188
8.6.2. Reporting	189
8.6.3. Research.....	190
8.7. Conclusion	191
References	193
Appendices	237

List of Abbreviations

A&E	: Accident and emergency
AAG	: All Age-Groups
AAGR	: Average Annual Growth Rate
ABS	: Australian Bureau of Statistics
ACT	: Australian Capital Territory
ADS	: Australian Demographic Statistics
AHS	: Australian Hospital Statistics
AIHW	: Australian Institute of Health and Welfare
APC	: Admitted Patient Care
ASGC	: Australian Standard Geographical Classification
ASGS	: Australian Statistical Geography Standard
ATS	: Australasian Triage Scale
AUS	: Australia
CAGR	: Compound Annual Growth Rate
CAHN	: Critical Access Hospitals Network
COAG	: Council of Australian Governments
DEM	: Department of Emergency Medicine
DSM-III	: Diagnostic and Statistical Manual of Mental Disorders, 3 rd Edition
DSM-IV	: Diagnostic and Statistical Manual of Mental Disorders, 4 th Edition
ED	: Emergency Department

ED _{dx}	: Emergency Department (presentations) with episode-level data that had a principal diagnosis
ED _{ep}	: Emergency Department (presentations) with Episode-level data
et al.	: And others
RFV	: Reason-For-Visit
GP	: General Practice
HCUP	: Healthcare Cost and Utilization Project
ICD-9-CM	: International Statistical Classification of Diseases and Related Health Problems, 9 th revision, Clinical Modification
ICD-10-AM	: International Statistical Classification of Diseases and Related Health Problems, 10 th revision, Australian Modification
METeOR	: Metadata Online Repository
MH	: Mental Health
MHC	: Mental Health Condition
MH _{dx}	: Mental Health diagnosis
MHrED	: Mental Health-related Emergency Department
MHSA	: Mental Health Services in Australia
N/A	: Not Applicable
N/P	: Not Provided
NEAT	: National Emergency Access Target
NHAMCS-ED	: National Hospital Ambulatory Medical Care Survey – Emergency Department (US)
NMDS	: National Minimum Data Set

NNAPEDCD	: National Non-Admitted Patient Emergency Department Care Database
NPHEd	: National Public Hospital Establishments Database
NSW	: New South Wales
NT	: Northern Territory
OECD	: Organisation for Economic Co-operation and Development
PES	: Psychiatric Emergency Services
QLD	: Queensland
Ref	: Reference
RR	: Risk Ratio
SA	: South Australia
SA2	: Statistical Area level 2
SACC	: Standard Australian Classification of Countries
SE	: Standard Error
SNOMED-CT	: Systematized Nomenclature of Medicine – Clinical Terms
TAS	: Tasmania
URG	: Urgency-Related Group
US (or USA)	: United States of America
VIC	: Victoria
WA	: Western Australia
WHO	: World Health Organization

List of Figures

Figure 1.1: Total public sector specialised mental health hospital beds per 100,000 population, by jurisdiction, 1992–93 to 2016–17	4
Figure 3.1: The PRISMA Flow Diagram for the systematic review.....	41
Figure 3.2: Number of studies by country and year of data assessment in the systematic review.....	54
Figure 3.3: Number of studies by country and year of publication in the systematic review.....	60
Figure 3.4: Pattern of reviewed studies from the US, Australia and Canada, by scope of data, year of data assessment, and age groups.....	62
Figure 3.5: Percentage of MHeED presentation for all age-groups from national data in the US.....	66
Figure 3.6: Percentage of MHeED presentation for all age-groups from individual hospitals' and regional data in the US	67
Figure 3.7: Percentage of MHeED presentations for all age-groups from individual hospitals' and regional data in Australia.....	68
Figure 4.1: Trends of ED presentations, with all diagnoses, and with a MH diagnosis in Australia, 2004-05 to 2016-17.....	85
Figure 4.2: Proportions and rates per 10,000 population of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by jurisdiction, 2004-05 to 2016-17, except for 2013-14 (all states and territories) and 2015-16 (ACT)†	88
Figure 4.3: Rate (per 10,000 population) and percentage of all ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by sex, 2004-05 to 2016-17, except 2013-14†	95
Figure 5.1: Number of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by age group, 2004-05 to 2016-17, except for 2013-14†.....	115
Figure 5.2: Number of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 total population, by age group, Australia, 2004-05 to 2016-17, except for 2013-14†.....	116

Figure 5.3: Percentage of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) by age group, Australia 2004-05 to 2016-17, except for 2013-14†.	117
Figure 5.4: Rates of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 people (age-group specific), by age group, 2004-05 to 2016-17, except for 2013-14†	118
Figure 6.1: Number of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 population†, by jurisdiction and diagnostic group, 2004-05 to 2016-17, except for 2013-14 (all jurisdictions) and 2014-15 and 2015-16 (ACT)††	130
Figure 6.2: Absolute number and rate per 10,000 population of ED presentations† with a MH diagnosis in Australia and jurisdictions by diagnostic group, 2016-17, except F70-F79 and F99 for ACT and NT††	139
Figure 7.1: Number of high acuity† ED presentations and those with a MH diagnosis per 10,000 population in Australia, by jurisdiction, 2004-05 to 2016-17††	160
Figure 7.2: Percentage of all ED presentations and those with a MH diagnosis that are high acuity†, Australia, by jurisdiction, 2004-05 to 2016-17††	161
Figure 7.3: Admission rates of ED presentations and those with a MH diagnosis† per 10,000 population in Australia, by jurisdiction, 2004-05 to 2016-17††	165
Figure 7.4: Percentage of all ED presentations and those with a MH diagnosis that are admitted†, Australia, by jurisdiction, 2004-05 to 2016-17††	166

List of Tables

Table 2.1: Change in scope of inclusion criteria of the NNAPEDCD, 2004-05 to 2016-17.....	17
Table 2.2: Number of public hospitals that supplied episode-level data for the NNAPEDCD, by hospital classification, 2004-05 to 2016-17.....	19
Table 2.3: Percentage of ED presentation with episode-level data that had a principal diagnosis† in Australia, by jurisdiction, 2004-05 to 2016-17	21
Table 2.4: MH principal diagnosis codes classified by ICD-10-AM and ICD-9-CM23	
Table 2.5: Data extracted from the AHS and the MHSA series	28
Table 3.1: Initial search terms (with BOOLEAN syntax) for the systematic review	39
Table 3.2: Characteristic of individual studies included in the systematic review	43
Table 3.3: Description of exclusion criteria in case definition used in studies included in the systematic review (N=32).....	52
Table 3.4: Distribution of source and scope of data and age range of study population by country (in the systematic review)	58
Table 4.1: Number, annual change (number and percentage) of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) (absolute number and as a proportion of total ED presentations) in Australia, 2004-05 to 2016-17	83
Table 4.2: Generalised linear regression models examining the trend of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) as a proportion of ED presentations with a principal diagnosis, 2004-05 to 2016-17.....	86
Table 4.3: All ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by jurisdiction, 2004-05 to 2016-17	90
Table 4.4: All ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by sex, 2004-05 to 2016-17, except 2013-14†	92
Table 4.5: Multivariable generalised linear regression model examining the trend of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) as a proportion of all ED presentations in Australia, by sex, 2004-05 to 2016-17, except 2013-14†	95

Table 5.1: Summary of numbers and rates per 10,000 population (total and age-group specific) for all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99), by age group, 2004-05 to 2016-17, except 2013-14†	108
Table 5.2: Numbers, percentage, rates per 10,000 population (total and age-group specific) for all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by age group, 2004-05 to 2016-17, except 2013-14†	110
Table 5.3: Multivariable generalised linear regression models examining the trend of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) as a proportion of all ED presentations in Australia, by age group, 2004-05 to 2016-17, except 2013-14†	119
Table 6.1: ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia and jurisdictions by diagnostic group, 2004-05 to 2015-16, except 2013-14 (all jurisdictions) and 2013-14 to 2015-16 (ACT)†	131
Table 6.2: Differences (x-fold)† and annual rates of change (AAGR and CAGR)† in absolute number and number per 10,000 populations of ED presentations with a MH diagnosis (ICD-10-AM F00-F99), between 2004-05 and 2016-17, by jurisdiction and diagnostic group	136
Table 6.3: Number of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 population† by jurisdiction and diagnostic group, 2004-05, 2016-17, and period mean††	138
Table 7.1: Number, percentage, and rate per 10,000 population of high acuity†, and admitted presentations‡, (all ED presentations and those with a MH diagnosis) in Australia and jurisdictions, from 2004-05 to 2016-17, except 2013-14 (all states and territories) and 2014-15 and 2015-16 (ACT)§	152
Table 7.2: Generalised linear regression models† examining the trend of high acuity†† and admitted‡ ED presentations per 10,000 population (all ED presentations and those with a MH diagnosis) in Australia, and by jurisdiction, 2004-05 to 2016-17	157
Table 7.3: Multivariable regression models† examining the trend of high acuity†† and admitted‡ ED presentations per 10,000 population (all ED	

presentations and those with a MH diagnosis) in Australia, with a comparison between jurisdictions and Australian national average, 2004-05 to 2016-17	158
Table 8.1: Breakpoints in the trends in proportion of MH _{dx} presentations, population rate of high acuity presentations, and admitted presentations, by jurisdiction	175

List of Appendixes

Appendix 1: Metadata items in the NNAPEDCD	238
Appendix 2: Public hospital peer group classification.....	247
Appendix 3: Study 2, published paper, Emergency Medicine Australasia	249
Appendix 4: Study 3, published paper, Emergency Medicine Australasia	259
Appendix 5: Study 4, published paper, Emergency Medicine Australasia	268

Abstract

Background: Mental illnesses are the leading cause of disability in the developed world. The treatment and care of people living with mental illnesses historically occurred in institutions. Deinstitutionalisation and reductions in psychiatric beds have since occurred in many developed countries including Canada, the US and Australia. In Australia, closure of psychiatric hospitals became national policy in 1992 through the First National Mental Health Plan. A potential consequence of the shift of care towards the community, is increased presentations to general hospital emergency departments (EDs). In Australia, no long-term trend analysis has been done to provide a comprehensive understanding of the burden of presentations with a MH diagnosis (MH_{dx}) on EDs.

Method and Results of Study 1: a systematic review aims to determine if there has been an increase in the percentage of MH-related ED (MHR_{ED}) presentations between 1985 and 2015 by country. All major databases were searched for English-language peer-reviewed literature assessing ED presentations for patients with a MH-related diagnosis including psychotic disorders (ICD-9 codes 295.00-295.95 or ICD-10 codes F20-F29). There were 81 journal articles from 17 countries identified, which were primarily from the US (n=43), then Australia (n=15). National data was only reported for the US. More than nine-tenths of the studies were published in the last half of the study period, and more than half after 2003. Most studies encompassed all age-groups (n=47); just under a third reported on children (n=23). Due to study heterogeneity and limitations of data presentation, a narrative synthesis was undertaken. Overall, national studies from the US for all age-groups showed an upward trend in the proportion of MHR_{ED} presentations since 1992, averaging 5.4% for 1992-2001 and 6.5% for 1997-2003. By year, proportions increased from 3.0% in 2001 to

3.5% in 2006, and from 6.6% in 2008 to 7.3% in 2010. Australian studies reported data for individual hospitals and by region, with upward trends found for all age-groups, particularly in NSW (2.9% in 1999 to 3.7% in 2006) and SA (0.3% in 1993 to 4.3% in 2002).

Methods of Study 2 to Study 5: Study 2 to Study 5 examined the trends of all ED and MH_{dx} presentations to Australian public hospital EDs, nationally, by jurisdiction and by characteristic of patient/presentation between 2004-05 to 2016-17, for Australia and each jurisdiction, subject to data availability. The characteristics assessed included sex of patient (Study 2), age group (Study 3), MH diagnostic group (Study 4), acuity and admission status (Study 5). These studies used aggregated data from the *National Non-Admitted Patient Emergency Department Care Database* (NNAPEDCD), a part of the *National Minimum Data Set* (NMDS), as published by the Australian Institute of Health and Welfare (AIHW). Data were derived from two series: *Australian Hospital Statistics* (AHS) and its special series for mental health, *Mental Health Services in Australia* (MHSA). The MH_{dx} presentation was defined as those with a principal diagnosis falling into the *International Classification of Diseases, 10th Revision, Australian Modification* (ICD-10-AM) codes F00-F99. Outcomes of these studies were the number and rate of presentations per 10,000 population (“population rate”), and proportion of all presentations that were MH_{dx} and growth, primarily assessed as x-fold change. Univariable generalised linear regression models were used to assess the trends. Breakpoints in the trends were tested using statistical goodness of fit tests, optimised by likelihood ratio tests. Multivariable generalised linear regression models were employed to: (1) compare the proportion of MH_{dx} presentations between jurisdictions and the national average, and between sexes (in Study 2); (2) compare the proportion of MH_{dx} presentations across age groups (in

Study 3); and (3) compare the population rates of high acuity presentations and admitted presentations between jurisdictions and the national average (in Study 5). Statistical significance was identified with $p\text{-value} \leq 0.05$

Results from Study 2: MH_{dx} presentations increased from 3.3% to 3.7% of all ED presentations with a diagnosis. Most growth occurred between 2010-11 and 2015-16. NT had the highest level of MH_{dx} presentations per 10,000 population, more than double the Australian average. The proportion of MH_{dx} presentations was highest in SA in most years, and the average annual proportion of MH_{dx} presentations was statistically significantly higher than the national average in SA, QLD, and WA. The proportion of MH_{dx} presentations increased in each jurisdiction, with significant increases for VIC, QLD, WA, ACT, and the NT. Males experienced greater numbers and rates of all ED and MH_{dx} presentations, while the proportion of MH_{dx} presentations was 8% higher for females.

Results from Study 3: children (0-14 years), followed by older persons (≥ 65 years) had the highest ED utilisation; while youth (15-24 years) and younger adults (25-34 years) predominated for MH_{dx} presentations. As a proportion of all presentations, MH_{dx} presentations were lowest in children, and highest in people 35-44 years (13.2-times higher than for children). The rate of increase in MH_{dx} presentations was higher than for all presentations in all age-groups, reaching almost 4-times higher for children.

Results from Study 4: Increased population rates of MH_{dx} presentations were observed for most diagnostic groups, except for mental retardation (F70-F79) and mood disorders (F30-F39). The greatest absolute increase was for psychoactive substance use-related disorders, including alcohol use (F10-F19), and relative increase, unspecified mental disorder (F99). There was differentiation across

jurisdictions regarding population rates of, and growth in MH_{dx} presentations for each MH-diagnostic group. In 2016-17, population rates, at least twice the national average, were observed for psychoactive substance-use (F10-F19), schizophrenia and psychotic disorders (F20-F29) and childhood and adolescence onset disorders (F90-F98) in the NT, F90-F98 in SA, personality disorders (F60-F69) in TAS and unspecified mental disorder (F99) in NSW. The most marked growth was observed for F99 in NSW.

Results from Study 5: Population rates of high acuity presentations and presentations admitted increased 2.2-fold (to 417.7/10,000 people) and 1.6-fold (to 1,0256/10,000 people) respectively for all presentations and 2.1-fold (to 16.3/10,000 people) and 2.0-fold (to 43.5/10,000 people) for MH_{dx} presentations. Trends differed between all and MH_{dx} presentations for both high acuity presentations and presentations admitted. The proportion of high acuity presentations within all ED presentations increased from 9.1% to 13.5% and from 11.2% to 14.4% for MH_{dx} presentations; high acuity MH_{dx} presentations as proportion of all high acuity ED presentations was consistent. The proportion of presentations admitted within all ED presentations increased from 28.9% to 32.5%, and from 32.2% to 38.6% for MH_{dx} presentations, with the proportion of all presentations admitted that were for a MH_{dx} increasing from 3.4% to 4.2%. Annual increases in all outcomes were observed in most jurisdictions.

Discussion: Internationally, there was an increasing number of studies on MHR_{ED} presentations in the peer-reviewed literature between 1985 and 2015, which may reflect an increase in clinical concern regarding MHR_{ED} presentations. An observed increase in the percentage of MHR_{ED} presentations was found at national level in the US and at individual hospital and jurisdictional levels in Australia, highlighting increasing demands on general hospital EDs. In Australia, the proportion

of MH_{dx} presentations, narrowly defined, has increased in all Australian jurisdictions between 2004-05 to 2016-17, but particularly since 2010-11. To better identify the impact of MH on ED presentations, the AIHW should consider expanding the breadth of MH diagnoses they report. Differences between jurisdictions indicate jurisdictional specific issues. However, significant or upwards trends of MH_{dx} presentations across all jurisdictions indicates generic issues necessitating concern and policy development at a national level. For age-specific issues, children and older persons were found as the two highest groups of ED users, while children, youth, and younger adults had the greatest increase in the population rate of MH_{dx} presentations. Across MH diagnostic groups, there were increases in the population rates of MH_{dx} presentations for most, but particularly psychoactive substance use-related disorders. Increasing rates of MH_{dx} presentations and MH_{dx} presentations admitted underscores increasing (but underestimated) demand for MH treatment in Australian public hospitals both in EDs and inpatient care.

To better identify the impact of MH on ED presentations, the AIHW should consider expanding the breadth of MH diagnoses they report. When presenting national data, cross-tabulations across patient characteristics and outcomes of presentations would provide insight into the roles of multiple factors affecting ED use for MH conditions. Clinical coding in EDs also needs to be improved to be more specific, including being able to assign multiple codes, which will enable better monitoring of trends.

Conclusion: Within the peer-reviewed literature, MH-related presentations as a proportion of all ED presentations have been found to increase in the US, Canada, and Australia. In Australia, analysis of data from the national repository shows increases across all jurisdiction. From a national perspective, the increase is most

marked from 2010-11. Healthcare planning strategies for urgent and emergency care cannot afford to overlook the growing impact of youth and young adults for MH_{dx} presentations. To reduce the need for MH crisis care in Australian EDs, strategies are required to reduce psychoactive substance use in the community, and policies may be needed to strengthen the capability of community MH services and primary care professionals to recognise, diagnose, and treat earlier in the course of illness. To comprehensively assess the burden of MHR_{ED} presentations, a national data-linking protocol is recommended. Within such an analysis, the definition of MH-related presentations could and should be expanded to include conditions which will be assigned a physical health- and/or injury-related code commonly associated with a MH condition. The use of an expanded definition is also recommended for the AIHW. The recording of multiple codes is also recommended to enable better monitoring of trends.

Chapter 1. Introduction

1.1. Background

1.1.1. Global burden of mental illnesses

People with mental health (MH) conditions are classified as a vulnerable group, facing stigma, discrimination, violence, abuse, limited access to health, social and emergency services, less education, and a higher risk of unemployment, physical disability and premature death.^[1] Mental illnesses are leading causes of disability in the developed world, and prevalence has increased in recent decades.^[2,3] Estimates of annual prevalence of mental disorder from the most recent World Mental Health Surveys co-ordinated by the World Health Organization (WHO) ranged from 6.0% for Nigeria (2002-2004) to 27.0% for the United States of America (the US) (2001-2003), and assessed at 20.7% for New Zealand (2004-2005).^[4] In Australia, the estimated prevalence of mental illness in 2014 was 20.1%.^[5]

For all countries participating in the World Mental Health Survey 2001-2003, the treatment rate for mental illnesses was highest in the US at 15.3%.^[6] High untreated rates mostly pertained to people with less severe conditions. The treatment rates for severe mental illness in high-income countries ranged between 49.7% (in Germany) and 64.5% (in Spain). In low- and middle-income countries, treatment rates were estimated to range between 14.6% (in Lebanon) and 23.7% (in Colombia). In Australia, the 2007 National Survey of Mental Health and Wellbeing found that untreated rate for people with mental disorders was 65%.^[7]

1.1.2. Deinstitutionalisation and the reduction in psychiatric bed numbers

Models of care for people with severe mental illness, such as schizophrenia and other psychotic disorders, have undergone significant change over the last half-a-

century, commencing with deinstitutionalisation. Deinstitutionalisation is the process by which stand-alone psychiatric institutions are closed, and psychiatric patients returned to the community.^[8-10] Deinstitutionalisation arose out of concerns for the human rights of psychiatric patients living in psychiatric hospitals long-term. It was implemented in many developed countries commencing with Canada and the US (1950s).^[9,11,12] In Australia, non-systematic deinstitutionalisation started from the 1950s, and systematic deinstitutionalisation started from (1980s).^[9,13] Deinstitutionalisation became national policy in 1992 through the First National Mental Health Plan.^[9]

A survey of experts from countries where deinstitutionalisation has been implemented, identified the concern that deinstitutionalisation was largely simplified to de-hospitalisation,^[14] with insufficient resources and infrastructure provided towards community-based MH services. Such inadequate community resourcing may have many consequences for MH care provision and utilisation,^[8,15-17] including homelessness, “re-institutionalisation” and “trans-institutionalisation” to correctional facilities.^[18,19] An increase of MH-related emergency department (MHrED) presentations in general hospitals may be another consequence.^[20]

Reductions in psychiatric bed numbers have occurred in Australia, the US and many other Organisation for Economic Co-operation and Development (OECD) countries in the last five decades to 2014.^[21] In 2014, the reported *per capita* rates of psychiatric beds in Australia (39/100,000 population), the US (25/100,000 population), and Canada (35/100,000 population) were much lower than the average of all OECD countries (68/100,000 population).^[21] In Australia, the per capita rates of public sector specialised mental health hospital beds, a subset of those assessed by the OECD, reduced markedly from 46/100,000 population in 1992-93 to 31/100,000

population in 2000-01, then to 29/100,000 population in 2016-17 (Figure 1.1). A similar pattern of an initial marked reduction in bed numbers per 100,000 population was also found in all jurisdictions except for the ACT. In QLD, TAS, and SA, the reduction in the rate of bed numbers occurred across the entire period. For VIC, the NT and WA the marked reduction occurred until 1997-98, 1998-99 and 2000-01, respectively then experienced less marked declines except for NT which experienced an increase from 2012-13. In NSW, the initial marked reduction (from 44/100,000 population in 1992-93 to 30/100,000 population in 2000-01) was followed by an immediate increase, with bed numbers peaking at 37/100,000 population in 2010-11. The ACT experienced a slight decline in the rate of bed numbers initially, until 1998-99, and was the only jurisdiction to experience an increase in the rate of bed numbers across the entire period, from 18/100,000 population in 1992-93 to 21/100,000 population in 2016-17. Since 2001, the jurisdictions have displayed varying trends in the rate of bed numbers. All jurisdictions had bed numbers well below the OECD average for total psychiatric bed numbers. It is important to note, however, that the psychiatric bed numbers reported by the AIHW covered the public sector only, while the OECD report covered all type of hospitals (inclusive of private sector beds).

The OECD has expressed concern that countries with low *per capita* rates of psychiatric bed numbers may not be able to meet the demand of MH patients.^[21] Sharing the concerns raised by the OECD, Allison et al. (2015) further suggested that limited access to inpatient care due to inadequate bed numbers may lead to worsening symptoms in individuals with a severe mental illness; longer stays in ED, and high readmission rates.^[21,22] It has also been argued that the decrease in psychiatric bed numbers is likely to impact on greater demand for emergency care by people with MH conditions, particularly those with severe mental illness.^[8,9,22]

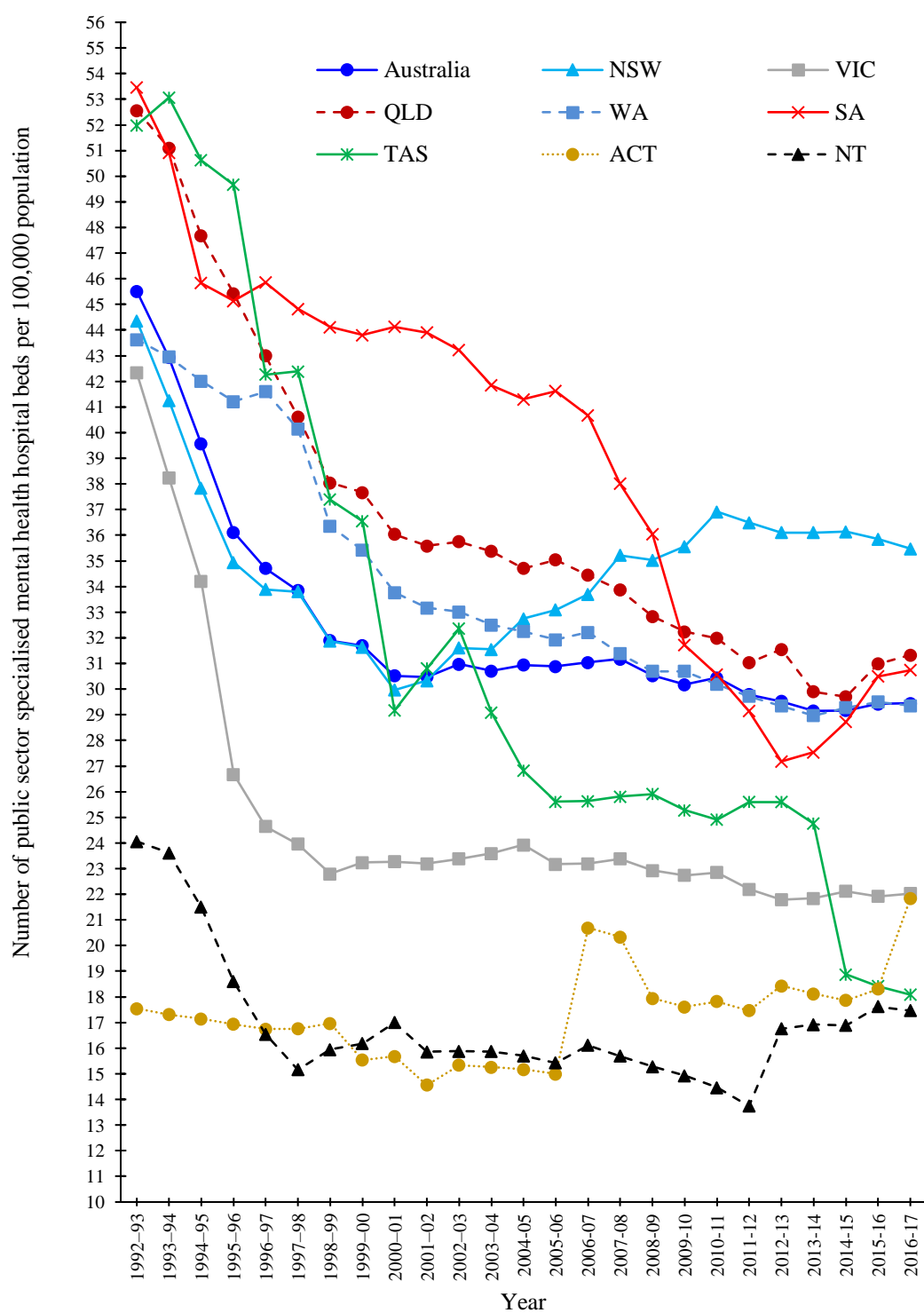


Figure 1.1: Total public sector specialised mental health hospital beds per 100,000 population, by jurisdiction, 1992–93 to 2016–17

Source: Mental health services in Australia - Specialised mental health care facilities ^[23]

1.1.3. Australian National Mental Health Strategy

Mental health reform in Australia, at the national level, started in 1992 with the First National Mental Health Plan.^[24] The Second National Mental Health Plan started in 1997 and the Third National Mental Health Plan, in 2003, followed by National Action Plan on Mental Health 2006–2011, which was guided by the Council of Australian Governments (COAG). The Fourth National Mental Health Plan started in 2009 based on the revised National Mental Health Policy (2008). The Fifth National Mental Health and Suicide Prevention Plan started in 2017.

In the First National Mental Health Plan (1992–1997), there was a focus on major structural reform emphasising shifting the care for low prevalence (severe) mental disorders from hospitals to the community. The Second National Mental Health Plan (1997–2003) focused on cooperation across multiple sectors, between government and non-governmental areas to improve treatments, and target to common mental disorders. The Third National Mental Health Plan (2003–2008) focused on an explicit population health approach and improving services through strengthening multi-disciplinary partnerships. The Fourth National Mental Health Plan (2009–2014) aimed to maintain existing efforts, and address service system weaknesses and gaps identified through consultation processes. The Fifth National Mental Health and Suicide Prevention Plan (2017 onward) is focused on health care and support services that influence the mental health and wellbeing of people and communities.^[25]

1.1.4. Mental health-related emergency department presentations

Changes in the MH-system, including deinstitutionalisation and reduction in psychiatric beds over the last six decades has contributed to significant change in MH-related service provision internationally,^[8-10] potentially involving increased care through emergency departments (EDs). Both deinstitutionalisation and reduction in

psychiatric bed numbers over the last three decades have been identified as a potential cause for burden in Australian hospital EDs.^[7,22] When this thesis was commenced in 2015, there was no systematic review on broadly defined MHR-ED presentations. In 2016, a systematic review and meta-analysis of MHR-ED presentations in adults in general hospital EDs for countries with health systems considered comparable to the English National Health System (including Australia) was conducted for the period 2000 to July 2014.^[26] Pooling data from all types of hospitals, including the data from psychiatric emergency services not necessarily within a designated hospital ED, this study reported that the percentage of MHR-ED presentations was 4% (3.5% based on the meta-analysis Forest plot). Three systematic reviews conducted in the US and Canada have also reported on MHR-ED presentations by children to any type of hospital.^[27-29] Given that the available systematic reviews have only focused on a specific health system type, or particular age group, the need to understand the burden of MH-related presentations across all ages in general hospital EDs remains a necessity for supporting policy makers in resource allocation.

Australian studies on MHR-ED use reported in the academic literature have assessed numbers and/or proportions of presentations in individual hospitals, as well as, at regional level across states and territories in Australia.^[30-33] At the national level, the Australian Institute for Health and Welfare (AIHW) has reported the absolute number of ED presentations with a MH principal diagnosis (MH_{dx}) for Australia and each jurisdiction since 2004, based on the *International Statistical Classification of Diseases and Related Health Problems (ICD), 10th revision, Australian Modification (ICD-10-AM)*, codes F00-F99.^[34-45] The AIHW uses data recorded through the jurisdictional collections and compiled in the *National Non-Admitted Patient Emergency Department Care Database (NNAPEDCD)*.^[46] For diagnoses coded using

ICD-9-CM, or *Systematized Nomenclature of Medicine – Clinical Terms* (SNOMED-CT), these were mapped to ICD-10-AM by relevant jurisdictional authorities until 2015-16, then by the AIHW. The AIHW has also reported a summary of the number (2004-05 to 2016-17) and proportion (2011-12 to 2016-17) of MH_{dx} presentations in hospital EDs per 10,000 population.^[45] However, further analysis was not performed.

The number of MH_{dx} presentations has been found to vary by the patient's demographic characteristics, such as age group.^[47-50] Age-breakdown studies have been published for Victoria (VIC)^[51-53] and New South Wales (NSW).^[54] Although ED data by age-group for MH_{dx} presentations have been reported annually by the AIHW since 2004-05,^[34-45] no trends have been assessed. Given different MH management and treatment strategies are required for different age groups,^[55-58] information on trends of MH_{dx} presentations by age-group is believed to be of benefit for service planning within EDs and the broader health system.

Regarding particular MH-diagnostic groups, the literature indicates variation in the pattern within and between countries. For example, mood disorders, anxiety, and psychoactive substance-related mental disorder held the largest share of MHrED presentations in the US between 1992 and 2001.^[50] In Australia, the leading MH-diagnostic groups in ED were neurotic, stress-related disorders in NSW (1999-2006),^[31] stress and anxiety-related diagnoses and substance-use in South Australia (SA) (2004-2011),^[59] and alcohol-related presentations in metropolitan Perth, Western Australia (WA) (2002-03 to 2016-17).^[60] However, in VIC, depression, self-harm ideation, self-harm overdose then psychosis led the MH-related reasons for visit to EDs in 2004.^[32] Hence, trends in ED presentations by MH_{dx} may also vary. The AIHW has reported on MH_{dx} by diagnostic group annually since 2004-05,^[34-45] and for each state and territory for most years. No trends have been assessed.

Further, ED burden associated with increasing severity and complexity of presentations has been identified as a potential reason for overcrowding and increasing length of stays, internationally and in Australia, for both all ED presentations and those with a MH_{dx}.^[21,22,61,62] Increasing levels of high acuity MH_{dx} presentations, i.e. those categorised as the Australian Triage Scale (ATS) level 3 or lower, and admission rates have been found in NSW^[54] and QLD,^[63] which has potentially put more demands on EDs for treatment, care and support for individuals with a MH_{dx}. Thus, health care resourcing decision-making will benefit from monitoring the trend of high acuity MH_{dx} presentations and MH_{dx} presentations admitted. The AIHW has reported on triage category and end-episode status annually for MH_{dx} since 2004-05,^[34-45] no trends have been assessed.

1.1.5. Monitoring health system performance

While clinical interventions seek to reduce mortality and morbidity at an individual level, strengthening the health system seeks to improve health at a population level.^[64] Core to strengthening the health system is building and sustaining monitoring systems and strategies, so health policies and decisions can be based on evidence and their impacts tracked. Monitoring health system performance improves predictability of the demand for health care, and provides the evidence-based for assessing the impacts of future interventions.^[65] For example, a sustained increase or decrease in health care utilisation, can reflect a change in epidemiology for a particular condition and/or its treatment.^[66] These changes can highlight the need for resource allocation (and/or reallocation) to prevent the system being overwhelmed.

To support health care planning and policy development in Australia, the National Health Information Agreement was introduced in 1993 to improve access to uniform health information across states and territories.^[67] The primary objective of

this Agreement was to ensure the appropriateness and efficiency of the national health information data collection, compilation and interpretation. This Agreement was signed between the Health Authorities of the Commonwealth, the States and the Territories of Australia, the AIHW and the Australian Bureau of Statistics. This Agreement was operated under the auspices of Australian Health Ministers' Advisory Council. In the context of this Agreement, the National Health Data Dictionary (NHDD) was established as the authoritative source of data definitions, and with refinements and expansion over the years now stands at version 16.2.^[68]

The National Minimum Data Sets (NMDS) were established through the National Health Information Agreement (1993), as the subsets of items within the NHDD that must be collected and reported at a national level. One NMDS is for ED utilisation, which gives rise to the National Non-Admitted Patient Emergency Department Care Database (NNAPEDCD). Therefore, the NMDS, including the NNAPEDCD, are important, and reliable sources of information that are intended to assist in monitoring health system performance, particularly across jurisdictions.

1.2. Objectives, Aims and Structure

The overall objective of this doctorate is to assess the trends of Australian emergency department care for people with mental health diagnoses, and ultimately to inform service provision and policy development.

The specific aims of this thesis are to:

- Examine the trends in the percentage of MH-related ED (MHrED) presentations in general hospitals between 1985 and 2015 through a systematic review of published English language peer-reviewed journals articles; and determine the characteristics of the associated studies (Study 1);

- Examine trends in the number, proportion, and rate per 10,000 population, of ED presentations with a MH diagnosis (MH_{dx}) in Australian public hospitals, nationally, by jurisdiction and by sex, between 2004-05 and 2016-17 (Study 2);
- Explore trends of MH_{dx} presentations by age group in Australian public hospitals; and whether those trends differ from all ED presentations between 2004-05 and 2016-17 (Study 3);
- Examine trends in the number and rate of ED presentations per 10,000 population by MH diagnostic group in Australian public hospitals, nationally and by jurisdiction, between 2004-05 and 2016-17 (Study 4); and
- Assess and compare trends of high acuity presentations and presentations admitted, for all ED presentations and presentations with a MH_{dx} in Australian public hospitals between 2004-05 to 2016-17, nationally and by jurisdiction (Study 5).

This thesis is considered fundamental research on MHeD presentations for Australian public hospitals given limited research in this field prior to thesis commencement.^[26] However, given reducing bed numbers at the national level between 1992-93 and 2016-17^[23] and claims of increasing levels of MHeD presentations,^[22] it is hypothesised that there have been significant increases in the absolute number, population rate and proportion of mental health-related emergency department presentations in Australia over the study period. The timeframes employed in the systematic review (1985-2015) and the series of cross-sectional studies (2004-05 to 2016-17) aligned with the implementation of deinstitutionalisation and the

introduction of the National Mental Health Strategy in Australia and in recognition of available Australian data (see section 2.2 and 2.3).

Each of the five studies (presented in Chapters 3 to 7) have been prepared as stand-alone manuscripts for publication and include background information, some of which may be repeated from this Introductory Chapter. The thesis also contains a detailed description of the methods (Chapter 2) and discussion of results (Chapter 8).

Chapter 2. Methods

2.1. Preface

This chapter summarises the methods applied in the studies presented in this thesis. They include a systematic review of academic peer-reviewed literature (Study 1, presented in Chapter 3) and four cross-sectional studies analysing secondary data from the *National Non-Admitted Patient Emergency Department Care Database* (NNAPEDCD) (Study 2 to Study 5, presented in Chapter 4 to Chapter 7).

2.2. Systematic review of peer-reviewed literature (Chapter 3)

Study 1 presented in Chapter 3 is a systematic review with narrative synthesis of the academic literature. This review encompassed a systematic search of the peer-reviewed literature published in English between 1985 and 2015. The timeframe was chosen with reference to national policy on deinstitutionalisation in Australia. The review included observational studies assessing emergency department (ED) presentations in general hospitals for patients with a mental health (MH)-related diagnosis including psychotic disorders. Psychotic disorders were classified according to the *International Statistical Classification of Diseases and Related Health Problems* (ICD), 9th revision, (ICD-9) codes 295.00-295.95, ICD-10 codes F20-F29, and equivalent codes from other clinical coding systems. Studies had to include general population data. Trials, retracted publications, and studies focused on specific mental illnesses and specialized psychiatric hospitals or services were excluded.

The search was performed on several databases with their respective vocabulary controller (see the Methods section of Study 1 in Chapter 3). The searching process followed *Cochrane's Handbook for Systematic Review of Interventions*.^[69]

After duplicates were removed, two researchers conducted independent review (Candidate and Author 1), two independent researchers extracted data using an agreed form (Candidate and Author 3), and another independent researcher (Author 2) was consulted to address any disagreements. Data extracted included study characteristics and percentage of MH-related ED (MHrED) presentations or patients presenting to a general hospital ED for a MH condition in a specified period (months, years).

2.3. Cross sectional studies of secondary data from the *National Non-Admitted Patient Emergency Department Care Database (NNAPEDCD)* (Chapter 4 to Chapter 7)

A series of studies (Study 2 to Study 5) assessed data from 2004-05 to 2016-17. This timeframe was chosen with reference to ongoing changes in the Australian National Mental Health Strategy since 1992, concerns about an association between the impact of early changes (between 1992-93 and 2000-01) and increased presentations,^[4] evidence of an increase in ED presentations for people with severe mental illness between 1997 and 2010,^[70] and the availability of MHrED presentation data for Australian public hospitals since 2004-05.

In Australia, patients who receive care from a recognised non-admitted patient services/clinics of a hospital are classified as “non-admitted patients”, and the services they receive are classified as “non-admitted occasions of service”.^[46] The “non-admitted services” include emergency, dialysis, pathology, radiology and organ imaging, endoscopy, other medical/surgical/diagnostic, mental health, drug and alcohol, dental, pharmacy, allied health, community health, district nursing, and other outreach. Emergency services include, but are not limited to, the services provided by paramedics, ambulances, and designated emergency departments in hospitals.

Accident and emergency (A&E) occasions of services, are captured in the *National Public Hospital Establishments Database* (NPHEd), with the ED presentations (only) captured in the *National Non-Admitted Patient Emergency Department Care Database* (NNAPEDCD). Therefore, not all A&E occasions of service are necessarily ED presentations.

2.3.1. *National Minimum Data Set (NMDS) and NNAPEDCD*

The NNAPEDCD is a data set created as a part of *National Minimum Data Set* (NMDS) reporting arrangements, with mandated data items provided by the state/territory health authorities to the Australian Institute of Health and Welfare (AIHW).^[71] The NNAPEDCD is comprised of data on presentations to public hospital EDs since 2003-04. When established, the National Minimum Dataset data items comprised 17 items for ED, including patient's characteristics (compensable status, postcode, location, age, sex, Indigenous status, country of birth, date of birth), ED presentations data (date and time, departure status, arrival mode, triage category, type of visit, and waiting time). In 2016-17, the number of items included in the NNAPEDCD had increased to 31. Data items that have changed over time are outlined below, and detailed in Appendix 1:

- “Non-admitted patient ED service episode—waiting time (to service delivery)” was included in 2004-05, and 2010-11 to 2011-12, then replaced by “ED stay—waiting time (to commencement of clinical care)” in 2012-13
- “Non-admitted patient ED service episode—service commencement date and time” has been included since 2005-06, then replaced by “ED stay – presentation date and time”, and “Non-admitted patient ED service episode—clinical care commencement date and time” in 2012-13.

- “Non-admitted patient ED service episode—triage date and time” has been included since 2005-06
- “Non-admitted patient ED service episode—episode end time” has been included since 2006-07, and “Non-admitted patient ED service episode—episode end date” since 2012-13.
- “Non-admitted patient ED service episode—patient departure status” was included in 2004-05 and replaced by “Non-admitted patient ED service episode—episode end status” in 2006-07
- “Health service event—presentation date and time” has been excluded since 2006-07
- “Non-admitted patient ED service episode—transport mode (arrival)” was included in 2004-05 and replaced by “ED stay—transport mode (arrival)” in 2012-13
- “Person—area of usual residence, geographical location code” was included in 2004-05 and replaced by “Person—area of usual residence, statistical area level 2 (SA2) code” in 2012-13
- “Address—Australian postcode” has been included since 2013-14
- “ED stay—diagnosis classification type”, “ED stay—principal diagnosis”, “ED stay—additional diagnosis”, and “ED stay—urgency-related group (URG) major diagnostic block” have been included since 2013-14, as has “ED stay—URG (v1.3)”
- “Record—identifier” has been included since 2014-15

The scope of the NNAPEDCD remained consistent until 2011-12 and then was modified in 2012-13, 2013-14 and 2015-16. (see Table 2.1).^[71-82] Initially, patients who were treated in ED as admitted patients within the ED environment, had this

period of care excluded from the NNAPEDCD because they were a part of the Admitted Patient Care NMDS. The scope of the NNAPEDCD initially comprised peer group A (principal referral and specialist women's and children's hospitals) and peer group B (large hospitals) (see Appendix 2). In 2012-13, patients who were admitted and remained within the ED environment (e.g. in an observation unit, short-stay unit, ED ward or awaiting a bed in an admitted patient ward of the hospital) were retained in the NNAPEDCD until they physically departed the ED.^[72,75] Therefore, the terminology changed from the "non-admitted patient ED service episode" to "ED stay" in many data items since 2012-13, as mentioned in section 1.3.1. In 2013-14, all public hospitals were included,^[83] the number of hospitals increasing from 204 to 289, primarily due to the inclusion of an additional 85 hospitals from NSW (Table 2.2). Since 2015-16, the care provided to patients in GP co-located units after being triaged within the ED has remained in-scope until commencement of clinical care.

The coverage of data within the NNAPEDCD varied by jurisdiction and was not necessarily 100%. There were a number of ED presentations missing episode-level data, and ED presentations with episode-level data not recording a principal diagnosis (see Table 2.3). The most missing data on principal diagnosis was for SA in 2008-09 (63%), and WA otherwise.

ED data from the NNAPEDCD is regularly published by the AIHW in two series: *Australian Hospital Statistics* (AHS)^[46,83-94] and *Mental Health Services in Australia* (MHSA).^[34-45]

Table 2.1: Change in scope of inclusion criteria of the NNAPEDCD, 2004-05 to 2016-17

Changes in the scope of inclusion criteria	2004-05 to 2011-12	2012-13 to 2016-17
<i>Patients who were dead on arrival</i>	Not stated	In scope (if an ED clinician certified the death of the patient)
<i>Patients who leave the ED after being triaged and then advised of alternative treatment options</i>	Not stated	In scope.
<i>Advice provided by telephone or videoconferencing</i>	Not stated	Not in scope
<i>Care provided to patients who are being treated in an ED site as an admitted patient (e.g. in an observation unit, short-stay unit, “ED ward” or awaiting a bed in an admitted patient ward of the hospital)</i>	Not in scope (included in APC NMDS)	In scope (there is an overlap in scope of the NAPEDC NMDS and the APC NMDS).
	2004-05 to 2012-13	2013-14 to 2016-17
<i>Inclusion of hospital and EDs</i>	EDs in Peer Group A and B hospitals	EDs in public hospitals where the ED meets the following criteria: <ul style="list-style-type: none"> • Purposely designed and equipped area with designated assessment, treatment and resuscitation areas. • Ability to provide resuscitation, stabilisation and initial management of all emergencies. • Availability of medical staff in the hospital 24 hours a day. • Designated emergency department nursing staff and nursing unit manager 24 hours per day 7 days per week.

	2004-05 to 2012-13	2013-14 and 2014-15	2015-16 and 2016-17
<i>Care provided to patients in GP co-located units.</i>	Not stated	Not in scope	Not in scope (However, presentations to EDs that result in a referral to a GP co-located unit after registration, but before commencement of clinical care, are in scope)

Abbreviations: APC: *Admitted Patient Care*; ED: *Emergency Department*; GP: *General Practice*; NMDS: *National Minimum Data Set*; NNAPEDCD: *National Non-Admitted Patient Emergency Department Care Database*.

Source: *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2004-05 to 2015-16*^[71-82]

Table 2.2: Number of public hospitals that supplied episode-level data for the NNAPEDCD, by hospital classification, 2004-05 to 2016-17

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Australia													
Total number of hospitals reporting ED episode-level data	148	153	164	165	184	184	186	203	204	289	290	287	287
Principal referral and specialist women's and children's hospital (Peer Group A)†	73	77	81	81	83	84	87	89	89	39	41	39	40
Large hospitals (Peer Group B)†	43	41	38	43	39	41	39	37	38	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	60	60	60	60
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	45	45	45	44
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	55	55	55
Other hospital	32	35	45	41	62	60	60	77	77	145	89	88	88
NSW													
Total number of hospitals reporting ED episode-level data	57	62	71	71	85	84	86	95	95	180	178	177	177
Principal referral and specialist women's and children's hospital (Peer Group A)†	25	27	28	28	28	29	29	30	30	13	13	13	13
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	22	22	22	22
Large hospitals (Peer Group B)†	16	14	12	15	15	16	14	13	13	//	//	//	//
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	17	17	17	17
Other hospital	16	21	31	28	42	39	43	52	52	128	88	87	87
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	38	38	38
VIC													
Total number of hospitals reporting ED episode-level data	38	38	38	38	38	39	39	40	40	40	40	40	40
Principal referral and specialist women's and children's hospital (Peer Group A)†	19	19	20	20	20	20	22	22	22	9	9	9	9
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	15	15	15	15
Large hospitals (Peer Group B)†	11	13	12	13	12	13	11	12	12	//	//	//	//
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	9	9	9	9
Other hospital	8	6	6	5	6	7	6	6	6	7	1	1	1
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	6	6	6
Qld													
Total number of hospitals reporting ED episode-level data	21	21	21	22	26	26	26	26	27	27	28	26	27
Principal referral and specialist women's and children's hospital (Peer Group A)†	15	15	16	17	18	18	18	19	19	7	8	6	7
Large hospitals (Peer Group B)†	6	6	5	5	4	4	4	3	4	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	12	12	12	12
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	8	8	8	8
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	0	0	0
Other hospital	0	0	0	0	4	4	4	4	4	0	0	0	0
WA													
Total number of hospitals reporting ED episode-level data	13	14	16	16	16	16	16	17	17	17	19	19	18
Principal referral and specialist women's and children's hospital (Peer Group A)†	4	5	6	6	6	7	7	7	7	4	5	5	5
Large hospitals (Peer Group B)†	5	5	6	6	5	4	7	7	7	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	4	4	4	4
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	6	6	6	5
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	4	4	4
Other hospital	4	4	4	4	5	5	2	3	3	3	0	0	0

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14‡	2014-15	2015-16	2016-17
SA													
Total number of hospitals reporting ED episode-level data	8	8	8	8	8	8	8	14	14	14	14	14	14
Principal referral and specialist women's and children's hospital (Peer Group A)†	5	5	5	5	5	5	5	5	5	3	3	3	3
Large hospitals (Peer Group B)†	2	2	2	2	2	2	2	1	1	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	3	3	3	3
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	4	4	4	4
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	4	4	4
Other hospital	1	1	1	1	1	1	1	8	8	4	0	0	0
TAS††													
Total number of hospitals reporting ED episode-level data	4	3	3	3	4	4	4	4	4	4	4	4	4
Principal referral and specialist women's and children's hospital (Peer Group A)†	2	3	3	2	2	2	2	2	2	1	1	1	1
Large hospitals (Peer Group B)†	2	..	..	1	1	1	1	1	1	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	2	2	2	2
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	1	1	1	1
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	0	0	0
Other hospital	0	0	0	0	1	1	1	1	1	0	0	0	0
ACT													
Total number of hospitals reporting ED episode-level data	2	2	2	2	2	2	2	2	2	2	2	2	2
Principal referral and specialist women's and children's hospital (Peer Group A)†	1	1	1	1	2	1	2	2	2	1	1	1	1
Large hospitals (Peer Group B)†	1	1	1	1	0	1	0	..	0	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	1	1	1	1
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	0	..	..	..
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	..	..	..
Other hospital	0	0	0	0	0	0	..	..	0	0	..	..	..
NT													
Total number of hospitals reporting ED episode-level data	5	5	5	5	5	5	5	5	5	5	5	5	5
Principal referral and specialist women's and children's hospital (Peer Group A)†	2	2	2	2	2	2	2	2	2	1	1	1	1
Large hospitals (Peer Group B)†	0	..	..	0	0	0	..	..	0	//	//	//	//
Other public acute group A hospitals	//	//	//	//	//	//	//	//	//	1	1	1	1
Public acute group B hospitals	//	//	//	//	//	//	//	//	//	0	..	..	..
Public acute group C hospitals	//	//	//	//	//	//	//	//	//	//	3	3	3
Other hospital	3	3	3	3	3	3	3	3	3	3	..	..	..

Abbreviations and symbols: ..: Not available / Not provided; //: Not applicable; AHS: *Australian Hospital Statistics*; ED: Emergency Department; MHS: *Mental Health Services in Australia*; NNAPEDCD: *National Non-Admitted Patients Emergency Department Care Database*;

† Episode-level data were required for public hospitals classified as Peer Group A (Principal referral and specialist women's and children's hospitals) and B (Large hospitals)

†† In Tasmania, episode-level data for large hospitals in 2004-05 were reported for two campuses, and data for 2007-08 included Mersey Community Hospital

‡ Since 2013-14, a new hospital classification system has been applied and data collection has been changed with all hospitals included.

Sources: *Australian Hospital Statistics* [46,83-94]

Table 2.3: Percentage of ED presentation with episode-level data that had a principal diagnosis[†] in Australia, by jurisdiction, 2004-05 to 2016-17

	Australia	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
2004-05	93	95	95	100	71	86	100	83	92
2005-06	92	95	90	100	74	91	100	100	94
2006-07	92	95	90	100	70	91	100	100	94
2007-08	89	86	90	100	70	90	100	100	98
2008-09	90	89	93	100	76	63	100	100	98
2009-10	92	92	94	95	76	97	89	100	100
2010-11	92	89	98	95	76	97	95	100	100
2011-12	92	88	98	95	77	98	100	100	100
2012-13	92	90	98	95	76	98	100	100	100
2013-14	95	93	100	100	75	97	100	100	100
2014-15	94	94	95	100	77	96	97	100	92
2015-16	95	97	95	99	83	96	97	..	93
2016-17	96	98	95	96	91	97	99	100	93

Abbreviations and symbols: ..: Not available / Not provided; ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

[†]The proportion of ED occasions of service reported at episode-level to the NNAPEDCD that had a diagnosis;

Sources: Australian Hospital Statistics^[46,83-94]

2.3.2. Australian Hospital Statistics (AHS)

The AHS series reports the characteristics and activity of Australia's hospitals, based on data supplied from state/territory authorities and included in the NPHEd, the NNAPEDCD, the National Elective Surgery Waiting Times Data Collection, and the National Hospital Morbidity Database.^[46,83-94] The AHS series of reports comprises *Australian Hospital Statistics* for 2004-05 to 2012-13,^[46,84-91] *Australian Hospital Statistics: Emergency department care 2013-14*,^[83] and *Emergency department care: Australian Hospital Statistics* for 2014-15 to 2016-17.^[92-94]

ED data provided in the AHS series includes the episode-level data on ED presentations by remoteness area of hospitals, triage category, waiting time, type of

ED visit, sex, age group, Indigenous status, arrival mode – transport, departure status (also known as “episode-end-status” from 2006-07), length of stay, and time of presentation. Number and percentage of ED presentations by principal diagnosis ICD-10-AM chapter and major diagnostic block for public hospital ED have been reported in the AHS series since 2013–14. However, detail on episode-level data for any particular diagnostic group has not been covered in this series.

2.3.3. *Mental Health Services in Australia (MHSA)*

The MHSA series is a specific sub-series of the AHS that reports on episodes of care with a MH-related principal diagnosis, defined by the AIHW as episodes with a principal diagnosis limited to *Chapter 5 – Mental and behavioural disorders (F00-F99)* of the ICD-10-AM. The MHSA series comprises ED data for presentations with MH_{dx} from 2004-05 to 2016-17,^[34-45] with the exception of 2013-14, which was not published. Different disease classification systems have been used across jurisdictions, including the *International Statistical Classification of Diseases and Related Health Problems, 9th revision, Clinical Modification (ICD-9-CM)*, *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification (ICD-10-AM)*, and *Systematized Nomenclature of Medicine – Clinical Terms (SNOMED-CT)*. The principal diagnosis, if coded using disease classification systems other than ICD-10-AM, was initially mapped to ICD-10-AM by relevant jurisdiction authorities. However, from 2016-17, mapping was undertaken by the AIHW. MH diagnoses are reported by the AIHW based on ICD-10-AM F-codes (F00-F99) or equivalent codes, for example, ICD-9-CM codes 290-319 (see Table 2.4).

Table 2.4: MH principal diagnosis codes classified by ICD-10-AM and ICD-9-CM

ICD-10-AM codes	ICD-9-CM codes
F00–F09: Organic, including symptomatic, mental disorders	290, 293, 294, 310
F10–F19: Mental and behavioural disorders due to psychoactive substance use	291, 292, 303, 304, 305 (excl. 305.8 and 305.9)
F20–F29: Schizophrenia, schizotypal and delusional disorders	295, 297, 298 (excl. 298.0, 298.1, 298.2), 301.22
F30–F39: Mood (affective) disorders	296, 298.0, 298.1, 300.4, 301.1, 311
F40–F48: Neurotic, stress-related and somatoform disorders	298.2, 300 (excl. 300.4, 300.19), 306 (excl. 306.3, 306.51, 306.6), 307.53, 307.80, 307.89, 308, 309 (excl. 309.21, 309.22)
F50–F59: Behavioural syndromes associated with physiological disturbances and physical factors	302.7, 305.8, 305.9, 306.3, 306.51, 306.6, 307.1, 307.4, 307.5 (excl. 307.53), 316, 648.44
F60–F69: Disorders of adult personality and behaviour	300.19, 301 (excl. 301.1, 301.22), 302 (excl. 302.7), 312.3
F70–F79: Mental retardation	317, 318, 319
F80–F89: Disorders of psychological development	299, 315, 330.8
F90–F98: Behavioural and emotional disorders with onset usually occurring in childhood and adolescence	307.0, 307.2, 307.3, 307.6, 307.7, 307.9, 309.21, 309.22, 312 (excl. 312.3), 313, 314
F99: Unspecified mental disorder	—

Abbreviations: excl.: excluding; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; ICD-9-CM: *International Statistical Classification of Diseases and Related Health Problems, 9th revision, Clinical Modification*.

Source: *Mental Health Services in Australia*.^[34-45]

Data reported in the MHSA series include MH_{dx} presentations in public hospitals:

- By patient demographic characteristics (age group, sex, Indigenous status), for Australia;
- By principal diagnosis (ICD-10-AM) for Australia and each jurisdiction;
- By triage category for Australia and each jurisdiction;

- By departure status (or episode-end-status) for Australia and each jurisdiction;
- By arrival mode for Australia and each jurisdiction (since 2016-17);
- By type of visit to ED for Australia and each jurisdiction (since 2016-17);
- By remoteness area of hospital for Australia and each jurisdiction (since 2016-17);
- By DVA status for Australia and each jurisdiction (since 2016-17).

Since 2016-17, data reported in the MHSA has also included waiting time and length of stay of MH_{dx} presentations in public hospitals for Australia and each jurisdiction.

Cross tabulations have not been reported for MH_{dx} presentations, except for diagnostic group, triage category, and episode-end status by jurisdiction.

2.3.4. Data quality

Data within the NNAPEDCD were collected in individual hospitals following the data definitions in the NHDD, then supplied to each jurisdiction's authorities for compilation.^[71] The jurisdictional authorities then provided these data to the AIHW for further cleaning, refinement, compilation, and reporting. Under the National Health Information Agreement, each data contributor takes responsibility for the quality and completeness for the data they contribute.^[67] At the national level, the supplied data is cleaned based on the data quality and timeliness protocol agreed by the AIHW and the Commonwealth Department of Health and Ageing.^[71]

Although data quality control measures are not detailed in the AIHW reports, the data are considered reliable by the AIHW.^[46] Considerations include the alignment of the national data collection process with the development of the National Health

Data Dictionary (see section 1.1.5), improving the consistency of data items collected across jurisdictions over time. Further, the AIHW has supported mapping across ICD-9-CM to ICD-10-AM diagnostic coding systems (see section 2.3.3), taking over the translation process in 2016-17, which should improve consistency in diagnosis coding. Only data for 3-character chapter level codes, rather than the most refined (5- or 6-character level) ICD-10-AM diagnostic codes that may be collected have been reported,^[46] which will minimise potential variations in coding. Finally, given that the smallest locale assessed is the jurisdictional level, any differences in local coding practices (i.e. at individual hospital level) should have minimal overall impact, particularly given the use of chapter level diagnostic codes. The robustness of NMDS and NNAPEDCD data are reflected un used for national policy development.^[46]

2.3.5. *Extracted data items from AHS and MHSA*

Data extracted from both AHS and MHSA series for Australia and each jurisdiction, comprised hospitals reporting episode-level data, all ED presentation with episode-level data (ED_{ep}), episode-level data with a principal diagnosis (ED_{dx}), presentations with a principal MH-diagnosis (MH_{dx}); ED_{ep} and MH_{dx} presentations by sex, age group, triage group, and episode-end status, and MH_{dx} presentations by MH_{dx} group. Details of coverage for each variable over the period 2004-05 to 2016-17 are listed in Table 2.5. As reflected in Table 2.5, limited cross-tabulations were available for all ED presentations, and even fewer for MH_{dx} presentations. Among the cross-tabulations available for MH_{dx} presentations, this thesis analysed and reported data for triage category by jurisdiction, episode-end-status by jurisdiction, and diagnostic group by jurisdiction. However, the recently reported cross-tabulations (since 2016-17),^[45] i.e. arrival mode by jurisdiction, Department of Veterans Affairs (DVA) by

jurisdiction, seen-on-time presentations by jurisdiction, length of stay by jurisdiction, were not analysed due to insufficient data for trend analysis. Extraction of presentations by Indigenous status were considered but excluded, given concerns about data quality across jurisdictions, the AIHW holding these data “should be used with caution”.^[46]

2.3.5.1. Age Groups

For the purpose of studies in this thesis, the following age groups as employed in the MHSa series were used:

- 0-14 years of age (referred as “children”),
- 15-24 years of age (referred as “youth”),
- 25-34 years of age (referred as “younger adult”),
- 35-44 years of age,
- 45-54 years of age,
- 55-64 years of age,
- ≥ 65 years of age (referred as “older people”).

2.3.5.2. Australasian Triage Scale (ATS)

The Australasian Triage Scale (ATS) is used to categorise ED patients based on their clinical urgency, based on the maximum waiting time to be seen.^[95] The ATS was developed by the Australasian College for Emergency Medicine, and has been officially used since 2000 when it superseded the National Triage Scale (NTS), which had been developed from the Ipswich Triage Scale (ITS).^[95] The ATS comprises five levels as follows:

- ATS-1 – “Resuscitation”: need to be seen immediately (within seconds),
- ATS-2 – “Emergency”: need to be seen within 10 minutes,

- ATS-3 – “Urgent”: need to be seen within 30 minutes,
- ATS-4 – “Semi-urgent”: need to be seen within 60 minutes,
- ATS-5 – “Non-urgent”: need to be seen within 120 minutes.

For the purpose of this thesis, high acuity presentations were defined as comprising ATS-1 and ATS-2 presentations.

Table 2.5: Data extracted from the AHS and the MHSA series

Data item	Type of data	Source	Coverage
Hospitals reported episode-level data	Absolute number	AHS	Australia (2004-05 to 2016-17); Each jurisdiction (2004-05 to 2016-17)
All ED presentation with episode-level data (ED _{ep})	Absolute number	AHS	Australia (2004-05 to 2016-17); Most jurisdictions (2004-05 to 2016-17), except ACT 2015-16
ED presentation with episode-level data that has a principal diagnosis (ED _{dx})	Percentage	AHS	Australia (2004-05 to 2016-17); Most jurisdictions (2004-05 to 2016-17), except ACT 2015-16
ED presentation with a MH principal diagnosis (MH _{dx})	Absolute number	MHSA	Australia (2004-05 to 2016-17, except 2013-14); Most jurisdictions (2004-05 to 2016-17), except ACT 2015-16
		AHS for 2013-14	Australia (2013-14)
ED _{ep} presentations by sex [†]	Absolute number	AHS	Australia (2004-05 to 2016-17)
MH _{dx} presentations by sex [†]	Absolute number	MHSA	Australia (2004-05 to 2016-17)
ED _{ep} presentations by age group ^{††}	Absolute number	AHS	Australia (2004-05 to 2016-17)
MH _{dx} presentations by age group ^{††}	Absolute number	MHSA	Australia (2004-05 to 2016-17)

Data item	Type of data	Source	Coverage
ED _{ep} presentations by triage group [‡]	Absolute number	AHS	Australia (2004-05 to 2016-17); Most jurisdictions (2006-07 to 2016-17), except ACT 2014-15 and 2015-16
MH _{dx} presentations by triage group [‡]	Absolute number	MHSA	Australia (2004-05 to 2016-17); Most jurisdictions (2004-05 to 2016-17), except 2013-14, and ACT 2014-15 and 2015-16
ED _{ep} presentations by episode-end-status [§]	Absolute number	AHS	Australia (2004-05 to 2016-17); Most jurisdictions (2004-05 to 2016-17), except ACT 2015-16
MH _{dx} presentations by episode-end-status [§]	Absolute number	MHSA	Australia (2004-05 to 2016-17); Most jurisdictions (2004-05 to 2016-17), except 2013-14, and ACT 2014-15 and 2015-16
MH _{dx} presentations by MH _{dx} group [¶]	Absolute number	MHSA	Australia (2004-05 to 2016-17), except 2013-14; Most jurisdictions (2004-05 to 2016-17), except 2013-14, and ACT 2014-15 and 2015-16. Data for F70-89 were missing for QLD 2012-13 and 2014-15; SA 2008-09 and 2009-10; TAS 2008-09; and ACT and NT 2009-10. Data for F70-F79 and F99 were missing for NT 2016-17

Abbreviations: ACT: the Australian Capital Territory; AHS: *Australian Hospital Statistics*; ED: Emergency Department; MH: Mental Health; MHSA: *Mental Health Services in Australia*; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania;

[†] Sex reported in the AIHW's reports comprises male and female

^{††} Age groups used in the AIHW's reports comprises 0-14 ("children"), 15-24 ("youth"), 25-34 ("younger adult"), 35-44, 45-54, 55-64, and ≥65 ("older people").

[‡] Triage category was based on the *Australian Triage Scale* (ATS), comprises ATS-1 ("Resuscitation"), ATS-2 ("Emergency"), ATS-3 ("Urgent"), ATS-4 ("Semi-urgent"), and ATS-5 ("Non-urgent")

§ Episode-end-status (also known as “departure status” before 2006-07) comprises “Admitted to this hospital”, “Completed”, “Referred/Transferred to other hospital for admission”, “Did not wait”, “Left at own risk”, “Died in ED as a non-admitted patient”, “Dead on arrival”, “Left the ED without being seen”, and “Not reported”

¶ MH_{dx} group based on the *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification* (ICD-10-AM) – F-codes, comprises:

F00–F09: Organic, including symptomatic, mental disorders

F10–F19: Mental and behavioural disorders due to psychoactive substance use

F20–F29: Schizophrenia, schizotypal and delusional disorders

F30–F39: Mood (affective) disorders

F40–F48: Neurotic, stress-related and somatoform disorders

F50–F59: Behavioural syndromes associated with physiological disturbances and physical factors

F60–F69: Disorders of adult personality and behaviour

F70–F79: Mental retardation

F80–F89: Disorders of psychological development

F90–F98: Behavioural and emotional disorders with onset usually occurring in childhood and adolescence

F99: Unspecified mental disorder

Sources: *Australian Hospital Statistics*,^[46,83-94] *Mental Health Services in Australia*.^[34-45]

2.3.5.3. Episode-end-status (also known as “departure status”)

Departure status within the NMDS comprises the following categories:

- “Admitted to this hospital”: Admitted to the same hospital with the ED presentation, either short stay unit, hospital-in-the-home or non-ED hospital ward
- “Completed”: Non-admitted patient ED service episode completed - departed without being admitted or referred to another hospital
- “Referred/Transferred to other hospital for admission”: Non-admitted patient ED service episode completed – referred/transferred to another hospital for admission
- “Did not wait to be attended by a health care professional”
- “Left at own risk”: Left at own risk after being attended by a health care professional but before the non-admitted patient ED service episode was completed
- “Died in ED as a non-admitted patient”
- “Dead on arrival”: patient dead on arrival without being treated in ED, and ED clinician certified the death of patient
- “Left the ED without being seen”: Registered, advised of another health care service, and left the ED without being attended by a health care professional);
- “Not reported”.

For the purpose of this thesis, admitted presentations were defined as comprising “Admitted to this hospital” and “Referred/Transferred to other hospital for admission”.

2.3.6. *Derived data items*

Data items derived/calculated for the purposes of this thesis were:

- The number of ED presentations with episode-level data that had a principal diagnosis (ED_{dx}): estimated by multiplying the reported number of ED presentations with episode-level data (ED_{ep}) by the reported proportion of presentations with a diagnosis, for Australia and each jurisdiction, for each year;
- The proportion of MH_{dx} presentations: estimated by dividing the number of MH_{dx} presentations by the number of ED_{dx} presentations
- The number of presentations (ED_{ep} , ED_{dx} and MH_{dx} presentations) per 10,000 population (also referred to as the “population rate”): estimated by dividing the number of presentations by the resident population at the end of the financial year, then multiplying by 10,000.
- The age-specific population rates of ED_{ep} , ED_{dx} , and MH_{dx} presentations: estimated based on the age-specific population at the end of the financial year
- The difference (x-fold): calculated by dividing the number, rate or proportion of presentations in 2016-17 by those in 2004-05 or the earliest for which data were available.
- The rate of change in value of an indicator (i.e. number, rate or proportion of presentations): assessed as average annual growth rate (AAGR) and compound annual growth rate (CAGR). The AAGR is the arithmetic mean of the increases in value of an indicator over a period of time, based on the assumption of a linear increase. The CAGR is the rate of return for the indicator based on the assumption of an

exponential increase. The CAGR is estimated by the following equation:

$$CAGR_{year_x} = \left(\frac{V_x}{V_1} \right)^{1/n} - 1$$

Where:

$CAGR_{year_x}$ is the compounding annual growth rate in value for the period between the first year and year x

V_x is the value in year x

V_1 is the value in the first year of the period

n is the number of years, equal to x - 1

- Proportions and rates of presentations per 10,000 population: estimated for ED_{ep} presentations and MH_{dx} presentations, by sex, by age group for Australia, and by sex, age group, diagnostic group, by high acuity level, and by admission status for Australia and each jurisdiction, for each year where data was available.

As states/territories differed in the collection and coding of ED presentations with a diagnosis of F70-F98 (see Table 2.5), the proportion of presentations by diagnostic group were assessed with and without F70-F98 as a form of sensitivity analysis.

2.3.7. Statistical analysis

Three types of statistical analyses were used in studies undertaken for this thesis. A general description of these analyses is provided below, with detailed methods provided in the corresponding Chapters. Statistical significance was identified with p-value ≤ 0.05 . Data were entered into Microsoft Excel 2016,^[96] then exported to Stata 14.^[97]

2.3.7.1. Simple linear regression

Simple linear regression was used to analyse the trends in the proportion of all ED presentations with a MH_{dx} in Study 2 (Chapter 4), and trends in the population rates of high acuity and admitted ED and MH_{dx} presentations in Study 5 (Chapter 7). These models were stratified for Australia and each jurisdiction, with “year” included as the only explanatory factor.

2.3.7.2. Multivariable generalised linear regression

Multivariable generalised linear regression was used in Study 2 (Chapters 4) to Study 5 (Chapter 7). In Study 2, this model was used to compare the proportions of MH_{dx} presentations across jurisdictions and with the national average (the reference group). Data from SA were excluded in 2004-05 and 2008-09 due to an unexpectedly large proportion of data missing a diagnosis code. Also, in Study 2, this model was used to analyse the trends, and to test for a difference in trends between males and females, with sex, year, and an interaction term between these factors. In Study 3, this model employing a log link was used to model the proportion of all ED presentations with a MH diagnosis, with age group, year, and an interaction term between these, included to estimate trend, and to test for a difference in trend between the age groups. In Study 5, this model was employed to compare the population rates of high acuity and admitted ED and MH_{dx} presentations across jurisdictions with the national average. The contribution (%) of each jurisdiction to the total number of Australian ED presentations in each year was included as a weighting term, due to significantly different numbers of ED presentations across jurisdictions.

2.3.7.3. Breakpoint analysis

Breakpoints were tested for jurisdictions using statistical goodness-of-fit tests. Likelihood ratios were used to optimise the breakpoints and compare the models with a breakpoint to the model with a simple trend.

2.4. Ethical issues

As we collated and analysed publicly available secondary data, we did not seek ethics approval.

Chapter 3. A systematic review of international trends in mental health-related emergency department presentations between 1985 and 2015

3.1. Preface

This chapter presents Study 1 of this thesis, which is a systematic review of the peer-reviewed literature reporting data on mental health (MH)-related emergency department (ED) presentations (MHrED presentations) published between 1985 and 2015. This chapter details study identification, characteristics of the reviewed studies, trends in the proportions of MHrED presentations. A manuscript of this study is under review, with a revision requested by *Psychiatric Services*.

3.2. Introduction

People with mental health conditions (MHC) are classified as a vulnerable group, facing stigma, discrimination, violence, abuse, limited access to health, social and emergency services, less education, and a higher risk of unemployment, physical disability and premature death.^[1] Mental illnesses are the leading cause of disability in the developed world,^[10,98,99] and prevalence has increased in recent decades.^[3,98,100]

Models of care for people with severe mental illness, such as schizophrenia and other psychotic disorders, have undergone significant change over the last half-a-century, commencing with deinstitutionalisation.^[9,11,12] Concurrent with deinstitutionalisation was to be the development of community-based services. However, a survey of experts from countries where deinstitutionalisation has been implemented identified the concern that deinstitutionalisation was largely simplified to de-hospitalisation,^[14] with insufficient resources and infrastructure provided

towards community-based mental health services. Such inadequate community resourcing may have many consequences for mental health care provision and utilisation,^[8,15-17] including homelessness, “re-institutionalisation” and “trans-institutionalisation” to correctional facilities.^[18,19] An increase of MHrED presentations in general hospitals may be another consequence.^[20]

In addition to deinstitutionalisation, reductions in psychiatric bed numbers have occurred in the US,^[12,101] Australia^[22] and many other Organisation for Economic Co-operation and Development (OECD) countries.^[21] The OECD has expressed concern that countries with low rates of psychiatric bed numbers, including the US, Canada and Australia, may not be able to meet the demand of MH patients in the community. Regarding Australia, Allison et al. (2015) identified an 8-fold reduction in psychiatric bed numbers per 100,000 population over the five decades to 2014. Sharing the concerns raised by the OECD, Allison et al. (2015) further suggested that limited access to inpatient care due to inadequate bed numbers may lead to worsening symptoms in individuals with a severe mental illness; longer stays in emergency departments (ED), and high readmission rates.^[21,22] The decrease in psychiatric bed numbers is likely to impact demand for emergency care by people with MHCs, particularly those with severe mental illness.^[8,9,22]

In order to comprehensively understand the burden of MH-related presentations in general hospital EDs, there is a need to conduct a systematic review of studies reporting the proportion of MHrED presentations in general hospitals. To date, a systematic review and meta-analysis of MHrED presentations in adults in general hospital EDs in countries with health systems considered comparable to the English National Health System has been undertaken for the period 2000 to July 2014.^[26] There have also been three systematic reviews of studies reporting MHrED

presentations by children to any type of hospital.^[27-29] However, the need to understand the burden of MH-related presentations by all ages in general hospital EDs remains a necessity for supporting policy makers in resource allocation.

A systematic review was undertaken to (1) examine the trends in the percentage of MHrED presentations in general hospitals between 1985 and 2015, and (2) determine the characteristics of the associated studies.

3.3. Method

An initial systematic search of the peer-reviewed literature was conducted in September 2015 with an update to December 2015. The following inclusion and exclusion criteria were applied.

3.3.1. Inclusion criteria

Observational studies assessing ED presentations for patients with a MH-related diagnosis including psychotic disorders (ICD-9 codes 295.00-295.95 or ICD-10 codes F20-F29) in general hospitals were included. Peer-reviewed papers published in English between 1985 and 2015 were included (Table 3.1).

3.3.2. Exclusion criteria

Studies without general population data, as well as trials, retracted publications, and studies focused on specific mental illnesses and specialised psychiatric hospitals or services were excluded.

3.3.3. Search strategy for identification of studies

A comprehensive search was performed on several databases, including EMBASE, Medline (Ovid), Cochrane, PsycINFO (ProQuest), EconLit (ProQuest), PILOTS (ProQuest), PsycARTICLES (ProQuest), ScienceDirect, Scopus, with vocabulary control by MeSH, Emtree, ProQuest thesaurus and others regarding the

databases. The searching process followed *Cochrane's Handbook for Systematic Review of Interventions*.^[69]

Table 3.1: Initial search terms (with BOOLEAN syntax) for the systematic review

No.	Terms
#1	(mental* OR psych*)
#2	(ill* OR health* OR disorder* OR problem* OR disease* OR condition* OR abnormal* OR confusion* OR defect* OR disturbance* OR insufficienc* OR symptom* OR derangement* OR issue* OR morbid* OR comorbid* OR complicat* OR predetermine* OR "reason-for-visit" OR care* OR syndrome* OR classif* OR diagnos* OR attribut* OR cause* OR relat*)
#3	(emergen* OR urgen* OR ambulance* OR ambulatory OR triage* OR "ED" OR "DEM")
#4	(service* OR care* OR present* OR visit* OR attend* OR use* OR utili* OR consum* OR demand* OR supply* OR pattern* OR prevalen* OR trend* OR profile OR manag* OR seek* OR rate* OR proportion* OR probabilit*)
Proximity operator	EMBASE: NEAR/ <i>n</i> OVID: ADJ <i>n</i> Cochrane: NEAR/ <i>n</i> ProQuest: NEAR/ <i>n</i> Scopus: W/ <i>n</i> ScienceDirect: W/ <i>n</i>
Search terms	(#1 $\left[\begin{array}{c} \text{NEAR/3} \\ \text{ADJ3} \\ \text{W/3} \end{array} \right]$ #2) AND (#3 $\left[\begin{array}{c} \text{NEAR/4} \\ \text{ADJ4} \\ \text{W/4} \end{array} \right]$ #4)
Limit	Search in: Title – Abstract; Language: English; Subjects: human; Publication year: 1985-2015; Publication type: article OR conference paper

Abbreviation: ED: Emergency Department; DEM: Department of Emergency Medicine

3.3.4. Search strategy, data extraction process and quality control

The search strategy summarized in Table 3.1 was employed, then duplicates removed. Records were then independently assessed for inclusion by two review authors (Candidate and Author 1). Disagreements were resolved by another reviewer

(Author 2). Data were extracted independently by two authors (Candidate and Author 3) using an agreed form. Study characteristics, including authors, year of publication, years of data assessment, type of publication, location, source and scope of data, and percentage of MHrED presentations or patients presenting to a general hospital ED for a MH condition in a specified period (months, years), were extracted. Disagreements were resolved through discussion with Author 1. For studies in which data were reported for multiple years or time periods, the data were recorded separately for each period. Data were analysed with Stata 12.

3.3.5. Data synthesis and analysis

A narrative synthesis was employed to interpret the results given data limitations and heterogeneity across studies and mental health systems.

3.4. Results

3.4.1. Studies identification

The review process, summarised in Figure 3.1, identified 11,706 records through database searches with a further 346 articles identified through a search of reference lists of the retrieved full-texts. After assessment for eligibility, two articles were found to be reporting on the same study,^[47,102] of which the earlier^[47] was included in the review given the provision of more comprehensive data. An erratum^[103] for one article^[104] was also identified, the reference for the original article only is specified below. In total, 81 studies were included in the narrative synthesis.

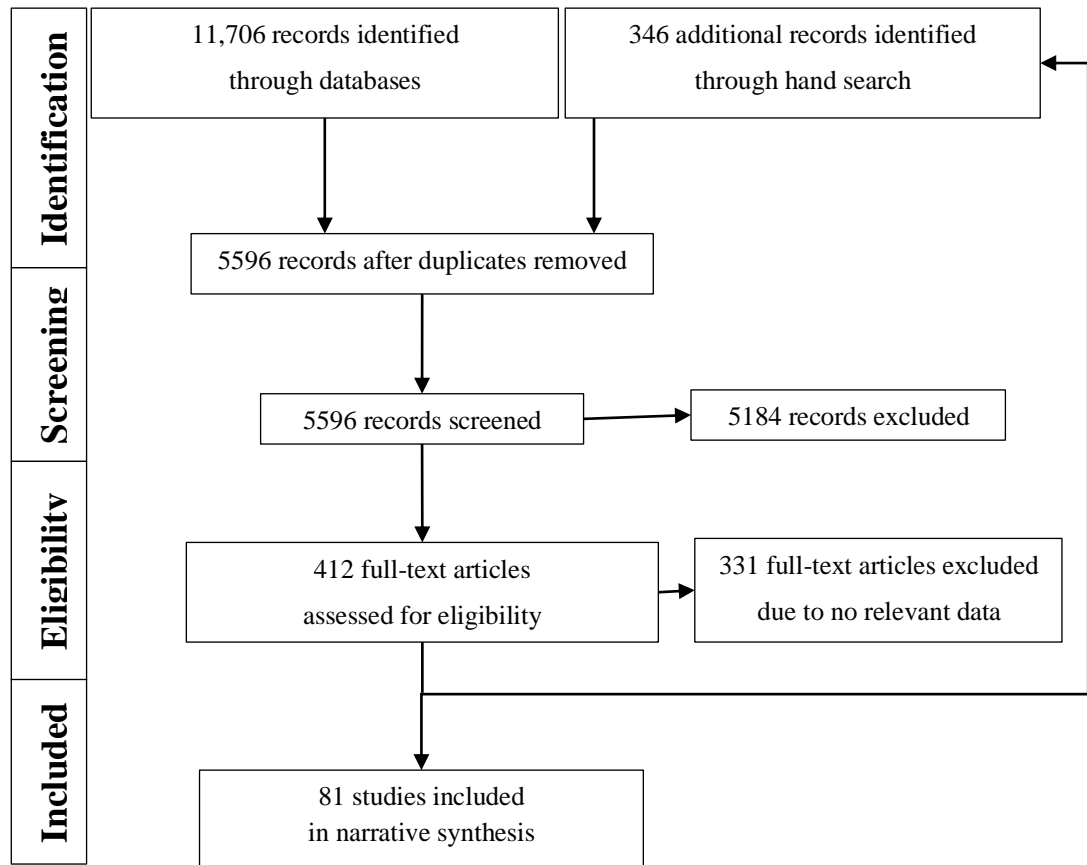


Figure 3.1: The PRISMA Flow Diagram for the systematic review

3.4.2. Characteristics of studies

Table 3.2 provides an overview of the characteristics of included studies, including author, year of publication, location, the scope of data, timeframes, study population, and data of MHrED presentations. There were publications from 17 countries, with an increasing number of publications over time (Figure 3.2). In the first half of the study period (i.e., papers published between 1985 and 2000), five publications were identified (Figure 3.3), and a total of seven until 2003; in the subsequent 12 years (2004-2015), 74 studies were published. During this second half of the study period, 11 studies were published between 2001 and 2005; 26 between 2006 and 2010, and a further 39 between 2011 and 2015 reflecting an increasing trajectory. The annual growth rate over the entire study period was 30.1%: 2.0% for the period 1985-2002 and 59.3% for 2003-2015. The doubling time for publications

was 2.6 years across the entire study period, 1.5 years since 2003. The cumulative number of publications increased exponentially ($R^2=0.95$).

Studies from the US ($n=43$),^[47-50,105-143] Australia ($n=15$)^[30-33,59,63,144-152] and Canada ($n=8$)^[11,104,153-158] predominated. There were small numbers of studies from European ($n=8$),^[159-166] South American ($n=1$),^[167] Asian ($n=4$),^[168-171] African ($n=1$),^[172] and Middle Eastern ($n=1$)^[173] countries. The earliest study identified was from India, published in 1988 (Table 3.2, Table 3.3), with an unspecified year of data collection.^[168] The year of data assessment was also not specified in four other studies, one each from Scotland (published in 1996),^[161] Canada (published in 2006),^[154] UK (published in 2007),^[162] and Iran (published in 2012).^[173] The earliest data knowingly assessed was for 1986 in a US study,^[105] 1987 in a Canadian study,^[11] and 1988 in another US study^[106] (Figure 3.2). Publication lags ranged from one to seven years with an average of 3.8 years.

Table 3.2: Characteristic of individual studies included in the systematic review

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
<i>US</i>							
Puryear DA, et al. (1991) ^[105]	Dallas, Texas	1 hospital	May 1986 – May 1987	AAG	12		N/A
Stebbins LA & Hardman GL (1993) ^[106]	Newton, Massachusetts	1 hospital	Jul 1988 – Jun 1989	AAG	5		N/A
Little DR, et al. (2011) ^[123]	Wisconsin	1 hospital	Jan 2008 – Aug 2008	AAG		7.2	N/A
Minassian A, et al. (2013) ^[130]	San Diego, California	1 hospital	Jan 2008 – Dec 2008	AAG	3.8	2.5	N/A
Liu SW, et al. (2013) ^[128]	Massachusetts	1 hospital	Jan 2010 – Dec 2010	AAG		4.7	N/A
Snowden M, et al. (2014) ^[134]	Seattle, Washington	1 hospital	2013	AAG	8.8		N/A
Bhumaid R, et al. (2015) ^[135]	District of Columbia	1 hospital	2009	AAG		1.3	N/A
Frank JW, et al. (2013) ^[127]	Rhode Island	Regional	Jan 2007 – Dec 2009	AAG	3.9		N/P
CDC (2013) ^[47]	North Carolina	Regional	2008-2010	AAG			↑
			2008-2010		9.8		
				2008	8.3		
				2009	8.7		
				2010	9.3		
Hsia RY, et al. (2015) ^[138]	California	Regional	2005-2011	AAG			↑
				2005	4.0		
				2006	4.0		
				2007	4.1		
				2008	4.2		
				2009	4.1		
				2010	4.4		
	2011	4.5					

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
Larkin GL, et al. (2005) ^[50]	National	National	1992-2001	AAG	5.4		↑
Larkin GL, et al. (2006) ^[113]	National	National	1997-2003	AAG	6.5		N/P
Slade EP, et al. (2010) ^[49]	National	National	2001-2006	AAG			↑
			2001		3.0		
			2002		2.9		
			2003		3.0		
			2004		3.2		
			2005		3.3		
			2006		3.5		
Chakravarthy B, et al. (2013) ^[126]	National	National	2002-2008	AAG	6.8		↑
			2002		6.4		
			2008		7.0		
Hartley D, et al. (2007) ^[116]	National, rural	National, rural	Apr 2004 – Sep 2004	AAG	9.4		N/A
Ku BS, et al. (2010) ^[121]	National	National	2005-2006	AAG	2.4		N/P
Nalliah RP, et al. (2013) ^[48]	National	National	2008	AAG	12.5		N/A
Nolan JM, et al. (2015) ^[140]	National	National	2008	AAG	6.5		N/A
Watts S (2015) ^[143]	National	National	2010	AAG	7.3		N/A
Vohra R, et al. (2015) ^[142]	National	National	2006-2011	AAG		10.0	↑
Christodulu KV, et al. (2002) ^[107]	Baltimore, Maryland	1 hospital	Mar 1996 – Jun 1997	0-18	5		N/P
Goldstein AB, et al. (2005) ^[110]	Baltimore, Maryland	1 hospital	Apr 2001 – Mar 2002	0-18	4.8		N/A
Dorfman DH, et al. (2006) ^[111]	Boston, Massachusetts	1 hospital	Jan 2001 – Dec 2002	0-17	2.4		N/P
Soto EC, et al. (2009) ^[120]	New York City	1 hospital	2002	0-17	4.9		N/A
Mahajan P, et al. (2007) ^[117]	Michigan	1 hospital	2002	0-19	1.4		N/A
Grupp-Phelan J, et al. (2009) ^[118]	Cincinnati, Ohio; Detroit, Michigan; New York	4 hospitals	2002	0-19			N/A

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
Goldstein AB, et al. (2007) ^[114] Waseem M, et al. (2011) ^[124] Sheridan DC, et al. (2015) ^[141]	Children Hospital of Michigan	1 hospital	2004 Jan 2004 – Dec 2007 2009-2013	0-18	2.4	1.7	N/A ↑ ↑
	Children's National Medical Center				2.1		
	Morgan Stanley Children's Hospital of New York Presbyterian				1.2		
	Cincinnati Children's Hospital Medical Center				4.4		
	Baltimore, Maryland						
	New York City				0.8		
	Portland, Oregon						
					2009		
					2010		
					2011		
Matsu CR, et al. (2013) ^[129]	Hawaii	Regional	Jan 2000 – Dec 2010	0-17	2012		↑
					2013		
					2000		
					2001		
					2002		
					2003		
					2004		
					2005		
					2006		
					2007		
					2008		
					2009		
					2010		

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
Lynch S, et al. (2015) ^[139]	Florida	Regional	Jul 2011 – Jun 2012	0-18	2.4		N/A
Huffman LC, et al. (2012) ^[125]	California	Regional	Jan 2005 – Dec 2009	5-17	5.1		N/P
Sills MR, & Bland SD (2002) ^[108]	National	National	1993-1999	0-18	1.6		↑
				1993	1.2		
				1994	1.6		
				1995	1.6		
				1996	1.6		
				1997	1.7		
				1998	2.0		
				1999	1.5		
Grupp-Phelan J, et al. (2007) ^[115]	National	National	1995-2001	0-18			↑
				1995	2.0		
				1996	2.2		
				1997	2.4		
				1998	2.2		
				1999	2.4		
				2000	2.8		
				2001	2.7		
Case SD, et al. (2011) ^[122]	National	National	2001-2008	0-18	2.0		↑
Pittsenbarger ZE, et al. (2014) ^[132]	National	National	2001-2010	0-18	2.0		↑
Mahajan P, et al. (2009) ^[119]	National	National	2003-2005	0-19	3.3		N/P
Simon AE & Schoendorf KC (2014) ^[133]	National	National	2001-2011	6-20			↑
				2001	4.4		
				2002	4.1		

Author (year)	Area	Scope of data	Timeframe	Population (Age group)	% of MHR _{ED}							
					pres	ppl	trend					
				2003	4.9							
				2004	5.5							
				2005	5.1							
				2006	5.2							
				2007	5.4							
				2008	5.8							
				2009	5.4							
				2010	5.5							
				2011	7.2							
				Fahimi J, et al. (2015) ^[137]	National			National	1997-2010	11-24	4.3	N/P
				Kunen S, et al. (2006) ^[112]	National			National	2004	> 14	6.4	N/A
Cully JA, et al. (2005) ^[109]	Houston, Texas	1 hospital	Jan 1994 – Sep 2001	≥ 18	6.7	N/P						
Brennan JJ, et al. (2014) ^[131]	San Diego, California	Regional	2008-2010	≥ 18	1.4	5.1	N/P					
Choi NG, et al. (2015) ^[136]	National	National	2012	≥ 65	20.4	N/A						
Australia												
Kalucy R, et al. (2005) ^[33]	Adelaide, South Australia	1 hospital	1993-2003	AAG			↑					
				1993	0.3							
				1994	0.6							
				1995	1.2							
				1996	1.7							
				1997	2.4							
				1998	2.5							
				1999	3.3							
				2000	3.6							

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
				2001	3.5		
				2002	4.3		
Bidargaddi N, et al. (2015) ^[59]	South Australia	Regional	Jan 2004 – Jun 2011	AAG	4.2		↑
Fry M & Brunero S (2004) ^[144]	Sydney, New South Wales	1 hospital	Sep 2002 – Aug 2003	AAG	2.3		N/A
Brunero S, et al. (2007) ^[146]	Sydney, New South Wales	1 hospital	Sep 2002 – Aug 2003	AAG	2.4		N/A
Lee S (2006) ^[30]	Sydney, New South Wales	1 hospital	Aug 2002 – Aug 2004	AAG	3.9		↑
Lee S, et al. (2008) ^[148]	Sydney, New South Wales	1 hospital	2003-2005	AAG	3.9		N/P
Cutler D, et al. (2013) ^[150]	Sydney, New South Wales	1 hospital	2011	Adult	4.6		N/A
Starling J, et al. (2006) ^[145]	Sydney, New South Wales	1 hospital	Jul 2001 – May 2002	2-17	0.8		N/A
Tankel AS, et al. (2011) ^[31]	New South Wales	Regional	Jan 1999 – Dec 2006	AAG	3.3		↑
				1999	2.9		
				2006	3.7		
Bost N, et al. (2015) ^[63]	Gold Coast, Queensland	1 hospital	Sep 2011 – Sep 2012	AAG	4.5		N/A
Moore G, et al. (2007) ^[147]	Melbourne, Victoria	1 hospital	2003-2004	AAG	4.6		N/P
Knott JC, et al. (2007) ^[32]	Victoria	Regional, 5 hospitals	May 2004 – Oct 2004	AAG			N/A
	Victoria	Regional			4.7		
	Alfred Hospital (Inner South)	1 hospital			4.8		
	Dandenong Hospital (Southern)	1 hospital			5.1		
	Maroondah Hospital (Outer East)	1 hospital			3.7		
	Geelong Hospital (Barwon)	1 hospital			5.5		
	Royal Melbourne Hospital (Inner West)	1 hospital			4.5		
Enticott JC, et al. (2015) ^[152]	Cities of Greater Dandenong and Casey, Victoria	Regional	2008-09	AAG	3.0		N/A
Shafiei T, et al. (2011) ^[149]	Melbourne, Victoria	1 hospital	Aug 2008 and Jan 2009	18-65		5.3	N/P
Alarcon-Manchego P, et al. (2015) ^[151]	Victoria	Regional, 4 hospitals	May 2013 – Oct 2013	≥ 18			N/A

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
	Victoria	Regional			5.5		
	Royal Melbourne Hospital (Inner West)	1 hospital			5.8		
	Dandenong Hospital (Southern)	1 hospital			6.5		
	Geelong Hospital (Barwon)	1 hospital			4.1		
	Alfred Hospital (Inner South)	1 hospital			5.8		
Canada							
Oyewumi LK, et al. (1992) ^[11]	Saskatoon, Saskatchewan	Regional, 3 hospitals	Jul 1987 – Sep 1987	AAG			N/A
	Saskatoon, Saskatchewan	Regional			2.2		
	University Hospital	1 hospital			3.9		
	Saskatoon City Hospital	1 hospital			2.1		
	St. Paul's Hospital	1 hospital			1.6		
Jarvis GE, et al. (2005) ^[153]	Montreal, Quebec	1 hospital	1999	AAG	3.0		N/A
Clarke DE, et al. (2006) ^[154]	Winnipeg	1 hospital	Unknown (1 month)	AAG	5.3		N/A
Kennedy A, et al. (2009) ^[155]	Eastern Ontario	1 hospital	Apr 2005 – Mar 2006	0-17		1.5	N/A
Mapelli E, et al. (2015) ^[104]	Vancouver, British Columbia	1 hospital	2002-2012	0-19	1.9		↑
			2002		1.6		
			2003		1.9		
			2004		1.9		
			2005		1.8		
			2006		1.7		
			2007		2.0		
			2008		2.0		
			2009		1.9		
			2010		1.8		

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
Newton AS, et al. (2009) ^[156]	Alberta	Regional	2011	0-17	2.1		
			2012		2.3		
			Apr 2002 – Mar 2006				↑
			2002		0.9		
			2003		0.9		
Ali S, et al. (2012) ^[157]	Alberta	Regional	2004	0-17	1.0		
			2005		1.0		
			Apr 2002 – Mar 2008		1.2		↑
Cappelli M, et al. (2012) ^[158]	Eastern Ontario	1 hospital	2007	0-17	3.0		N/A
<i>Brazil</i>							
Padilha VM, et al. (2013) ^[167]	Campinas, Sao Paulo	1 hospital	May 2010 – May 2011	AAG	2.6		N/A
<i>UK</i>							
Keene J & Rodriguez J (2007) ^[162]	1 English county	Regional	Unknown	>15	8.1		N/A
<i>Belgium</i>							
Bruffaerts R, et al. (2004) ^[159]	Leuven	1 hospital	Mar 2000 – Oct 2000	AAG		3.5	N/A
Bruffaerts R, et al. (2006) ^[160]	Leuven	1 hospital	Mar 2000 – Mar 2002	AAG		3.7	N/P
<i>France</i>							
Saliou V, et al. (2005) ^[165]	Northern district, Paris	1 hospital	Jan 2004 – Jun 2004	> 18	8.0		N/A
<i>Germany</i>							
Kropp S, et al. (2005) ^[163]	Hannover	1 hospital	2002	AAG		7.7	N/A
<i>Italy</i>							
Zeppeigno P, et al. (2015) ^[166]	Piedmont	1 hospital	2008-2011	AAG		0.8	
<i>Scotland</i>							
Hislop L, et al. (1996) ^[161]	Western Infirmary, Glasgow	1 hospital	Unknown	AAG	0.3		N/A

<i>Author (year)</i>	<i>Area</i>	<i>Scope of data</i>	<i>Timeframe</i>	<i>Population (Age group)</i>	<i>% of MHR-ED</i>		
					<i>pres</i>	<i>ppl</i>	<i>trend</i>
Denmark							
Nexoe J, et al. (2013) ^[164]	Greenland	Regional	May 2010 – Jun 2010	AAG	5.0		N/A
Iran							
Jolfaei AG, et al. (2012) ^[173]	Tehran	1 hospital	Unknown	AAG	0.1		N/A
Hong Kong							
Chan CM, et al. (2009) ^[169]	New Territories	1 hospital	Aug 2007 – Oct 2007 Dec 2007 – Feb 2008	AAG	1.8 1.3		N/A
India							
Adityanjee D, et al. (1988) ^[168]	New Delhi	1 hospital	Unknown	AAG		1.9	N/A
Japan							
Nishi D, et al. (2006) ^[170]	Tokyo	1 hospital	Feb 2004 – Jan 2005	AAG		14.4	N/A
Taiwan							
Chen CK, et al. (2010) ^[171]	Penghu	1 hospital	Jan 2003 – Dec 2006	AAG	2.7		N/P
Madagascar							
Kannan VC, et al. (2015) ^[172]	Mahajan, Boeny	1 hospital	Jan 2011 – Sep 2012	AAG		6.2	N/P

Abbreviations: %: percentage; ↑: Increase; AAG: All age-groups; N/A: Not applicable due to the timeframe in the study which was one year or less; N/P: Not provided; pres: presentations; ppl: people.

Table 3.3: Description of exclusion criteria in case definition used in studies included in the systematic review (N=32)

Group	Description of exclusion criteria in definition	ICD-9	ICD-10	n†
1	Comorbidity or dual diagnosis ^[146,171]			2
2	Intoxication, withdrawal syndrome, overdose without mental disorder ^[32,33,161,166]			4
3	Senile and pre-senile organic psychotic conditions ^[126,129,133,141]	290	F01-F03	4
4	Substance-related disorder ^[47,121,128,154]	291-292, 303-305	F10-F19	4
5	Transient organic psychotic conditions ^[47,126,133,141,151]	293	F05-F09	5
6	Persistent mental illness due to conditions classified elsewhere (Dementias) ^[47,126,133,141,151,166]	294	F01-F03	6
7	Psychoses with origin specific to childhood ^[126,133,135]	299	F84, F88, F89	3
8	Somatoform, dissociative and conversion disorder, ^[156,157] Nonpsychotic mental disorders ^[135]	300.1, 300.6-300.9 307.80, 307.89	F44-F45, F48	2 1
9	Personality disorders ^[126,129]	301	F6x	2
10	Psychosexual disorder ^[113,126,129,135,156,157]	302	F52	6
11	Puerperal psychosis ^[135,156,157]		F53	3
12	Non-dependent tobacco-use disorder ^[113,135,141]	305.1		3
13	Antidepressant type abuse ^[135,141]	305.8		2
14	Physiological malfunction arising from mental factors ^[50,112,113,126,129,135]	306		6
15	Special symptoms or syndromes, not elsewhere classified ^[112,126,129,135]	307		4
16	Tic disorders ^[135,156,157]	307.2	F95	3
17	Sleeping disturbances ^[113,135,156,157]	307.4	F51	4
18	Enuresis, Encopresis, Post-concussion syndrome ^[113,135]	307.6, 307.7 310.2		3
19	Acute reaction to stress ^[112,126,135]	308		3

Group	Description of exclusion criteria in definition	ICD-9	ICD-10	n†
20	Adjustment reaction ^[126]	309		1
21	Specific nonpsychotic mental illness following organic brain damage ^[112,115,126,129,133,135,141]	310		8
22	Disturbance of conduct, not elsewhere classified ^[112,135]	312		3
23	Disturbance of emotions specific to childhood & adolescence ^[47,112,126,135,170]	313, 314		6
24	Specific delays in development ^[47,112,115,126,129,132,133,135,141,156,157]	315	F80-F82	12
25	Psychological and behavioural factors associated with diseases classified elsewhere ^[47,108,112,115,117-119,126,129,133,135,141,156,157]	316	F54	15
26	Intellectual Disabilities ^[31,47,108,112,115,117-119,122,126,129,131-133,135,141,156,157]	317-319	F70-F79	18

† Sum of the number of studies (n) is not equal 33 due to multiple exclusion criteria applied in studies

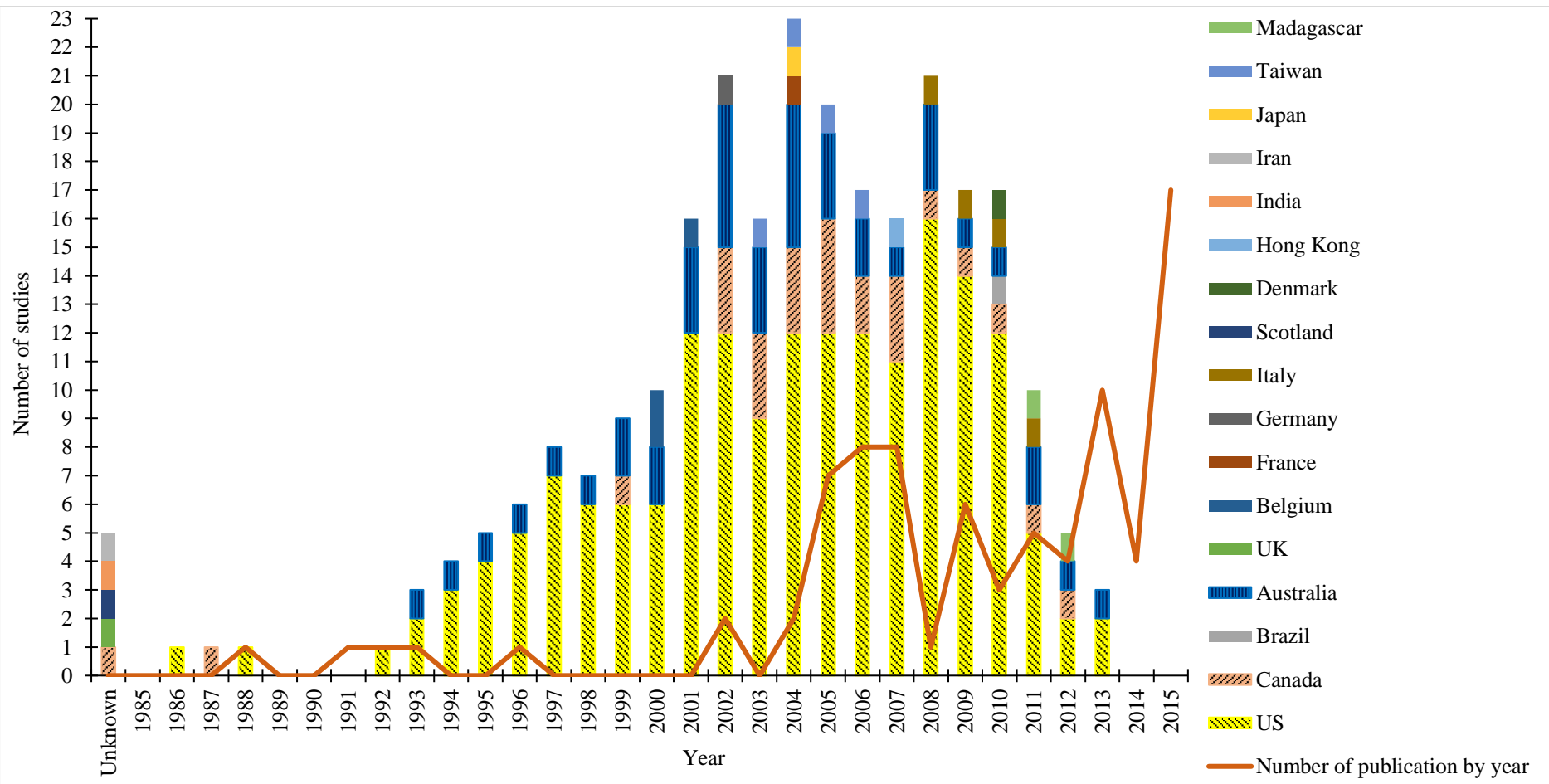


Figure 3.2: Number of studies by country and year of data assessment in the systematic review

A summary of the scope and source of data by country is provided in Table 3.4. Data were collected mostly from administrative databases (n=74)^[11,30-33,47-50,59,63,104-133,135-152,155-158,162-172] and less commonly surveys (n=5).^[154,159-161,173] Nationally representative data was only published for the US (n=19).^[48-50,108,112,113,115,116,119,121,122,126,132,133,136,137,140,142,143] Regional data were published for the US (n=8),^[47,118,125,127,129,131,138,139] Australia (n=5),^[31,32,59,151,152] Canada (n=3),^[11,156,157] Denmark^[164] and the United Kingdom (UK).^[162] Forty-seven studies (58.8%) reported data from individual hospitals, predominantly from the US (n=17),^[105-107,109-111,114,117,118,120,123,124,128,130,134,135,141] Australia (n=12),^[30,32,33,63,144-151] and Canada (n=6).^[11,104,153-155,158] Studies from individual hospitals were also published for another 11 countries,^[159-161,163,166-173] including two studies from Belgium^[159,160] and one each for the others. Four studies, one from the US,^[118] two from Australia,^[32,151] and one from Canada,^[11] provided both individual hospital and regional data.

Mental disease classifications used were the *International Statistical Classification of Diseases and Related Health Problems*, 9th (ICD-9, n=33)^[31,33,47-50,108,109,112,113,115,117-119,122,126-129,131-133,136-143,146,148,172] and 10th revisions (ICD-10, n=11),^[32,59,63,125,149,151,152,156-158,163] the *Diagnostic and Statistical Manual of Mental Disorders*, 3rd (DSM-III, n=4)^[11,105,106,109] and 4th Editions (DSM-IV, n=16),^[30,50,104,109,113,120,123,135,155,159,160,165,166,170-172] and *Reason-For-Visit* codes (RFV, n=4)^[113,115,130,143] (Table 3.4). However, 21 studies did not specify the classification used and were based on the existence of a MH-related presenting complaint.^[107,110,111,114,116,121,124,134,144,145,147,150,153,154,161,162,164,167-169,173] ICD-9 and ICD-10 were used mostly in the US, Canadian, and Australian studies, and the DSM-IV was predominantly used in studies from other countries.

Across the studies, variation in MH-related diagnosis inclusion and exclusion criteria was observed. Most studies (n=49) used broadly defined MH-related diagnoses as ICD-9 codes 290-319 or ICD-10 codes F00-F99 without any exclusions.^[11,30,48,49,59,63,104-107,109-111,114,116,120,123-125,127,130,134,136-140,143-145,147-150,152,153,155,158-160,162-165,167-169,172,173] However, 32 studies^[31-33,47,50,108,112,113,115,117-119,121,122,126,128,129,131-133,135,141,146,151,154,156,157,161,166,170,171,174] had at least one specific exclusion based on MH-related diagnosis as listed in Table 3.3. The main exclusion criteria were intellectual disabilities (n=18),^[31,47,108,112,115,117-119,122,126,129,131-133,135,141,156,157] psychological and behavioural factors associated with diseases classified elsewhere (n=15),^[47,108,112,115,117-119,126,129,133,135,141,142,156,157] and developmental delays (n=12).^[47,112,115,126,129,132,133,135,141,142,156,157]

A variety of age ranges were reported across studies (Table 3.4). Most studies focused on all age-groups (n=47),^[11,30-33,47-50,59,63,105,106,113,116,121,123,126-128,130,134,135,138,140,142-144,146-148,152-154,159-161,163,164,166-173] followed by children (n=23).^[104,107,108,110,111,114,115,117-120,122,124,125,129,132,134,139,141,145,155-158] In regard to other specific age groups, eight were identified for adults,^[109,112,131,149-151,162,165] two for youth,^[133,137] and two for elderly populations.^[105,136]

In the US, there were similar numbers of studies focused on all age-groups (n=20)^[47-50,105,106,113,116,121,123,126-128,130,134,135,138,140,142,143] and children (n=17),^[107,108,110,111,114,115,117-120,122,124,125,129,132,139,141] with both sets of studies published across the study timeframe (Figure 3.4). Among the other seven studies, there were three studies for adults,^[109,112,131] two for youth^[133,137] and two for elderly populations.^[105,136]

Canadian studies focused on all age-groups (n=3) in the first two-thirds of the study timeframe,^[11,153,154] and children (n=5) in the last third^[104,155-158] (Figure 3.4).

Most Australian studies (n=11) focused on all age-groups and assessed data for 1993 or later.^[30-33,59,63,144,146-148,152] For Australia, a single study published in 2006 reported data for children,^[145] and three studies reported data for adults, which were published in 2011, 2013, and 2015^[149-151] (Figure 3.4).

Based on the aim to assess trends over time, this paper focuses on studies for all age-groups from the US (n=20) and Australia (n=11), which were the most numerous, homogenous and comparable samples.

3.4.3. Trends of MHRD presentations for across all age-groups in the US

Among the 20 studies covering all age-groups in the US, ten employed national data,^[48-50,113,116,121,126,140,142,143] seven used data from individual hospitals,^[105,106,123,128,130,134,135] and three used regional data.^[47,127,138]

There were three sources of data employed in the national studies. Those sources were the National Hospital Ambulatory Medical Care Survey – Emergency Department (NHAMCS-ED) (seven studies),^[49,50,113,121,126,140,143] the Critical Access Hospitals Network (CAHN) (one study),^[116] and the Healthcare Cost and Utilization Project (HCUP) (two studies).^[48,142] The NHAMCS-ED commenced in 1992 and collected administrative data from non-institutional, general and short-stay hospitals, but excluded Federal, Military, and Veterans Administration hospitals.^[175] The CAHN gathered data from rural hospitals and commenced in 1997.^[176] The HCUP gathered administrative data from state-wide data systems commencing in 1988.^[177] Data gathered by HCUP does not specifically exclude any hospital.

Table 3.4: Distribution of source and scope of data and age range of study population by country (in the systematic review)

Country	Total†	Source of data††				Scope of data‡			Age range of study population§				Mental disease classification system¶					
		c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
Total	81	74	5	1	1	19	18	48	47	10	23	2	4	33	11	4	16	21
US	43	42	0	1	0	19	8	17	20	4	17	2	4	28	1	3	6	8
Australia	15	15	0	0	0	0	5	12	11	3	1	0	0	4	6	0	1	4
Canada	8	6	1	0	1	0	3	6	3	0	5	0	0	0	3	1	2	2
Belgium	2	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0	2	0
Brazil	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
UK	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
France	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0
Germany	1	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0
Italy	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Scotland	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
Denmark	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Hong Kong	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
India	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
Japan	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Taiwan	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Madagascar	1	1	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0
Iran	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1

† Sum of data in each row is not equal to the total number in the second column because of studies reporting both regional and individual hospital data. Multiple classifications were also used in some studies;

†† **Source of data:** ^c Administrative; ^d Survey; ^e Commentary; ^f Unspecified;

‡ **Scope of data:** ^s National; ^h Regional; ⁱ Individual hospital;

§ **Age range of study population:** ^j All age-groups; ^k Adult, adolescent, elderly; ^l Children; ^m Transitional ages;

¶ **MH Classification:** ⁿ Reason-For-Visit only; ^o ICD-9 (*International Statistical Classification of Diseases and Related Health Problems, 9th revision*); ^p ICD-10 (*International Statistical Classification of Diseases and Related Health Problems, 10th revision*); ^q DSM-III (*Diagnostic and Statistical Manual of Mental Disorders, 3rd edition*); ^r DSM-IV (*Diagnostic and Statistical Manual of Mental Disorders, 4th edition*); ^s Unspecified mental disease classification

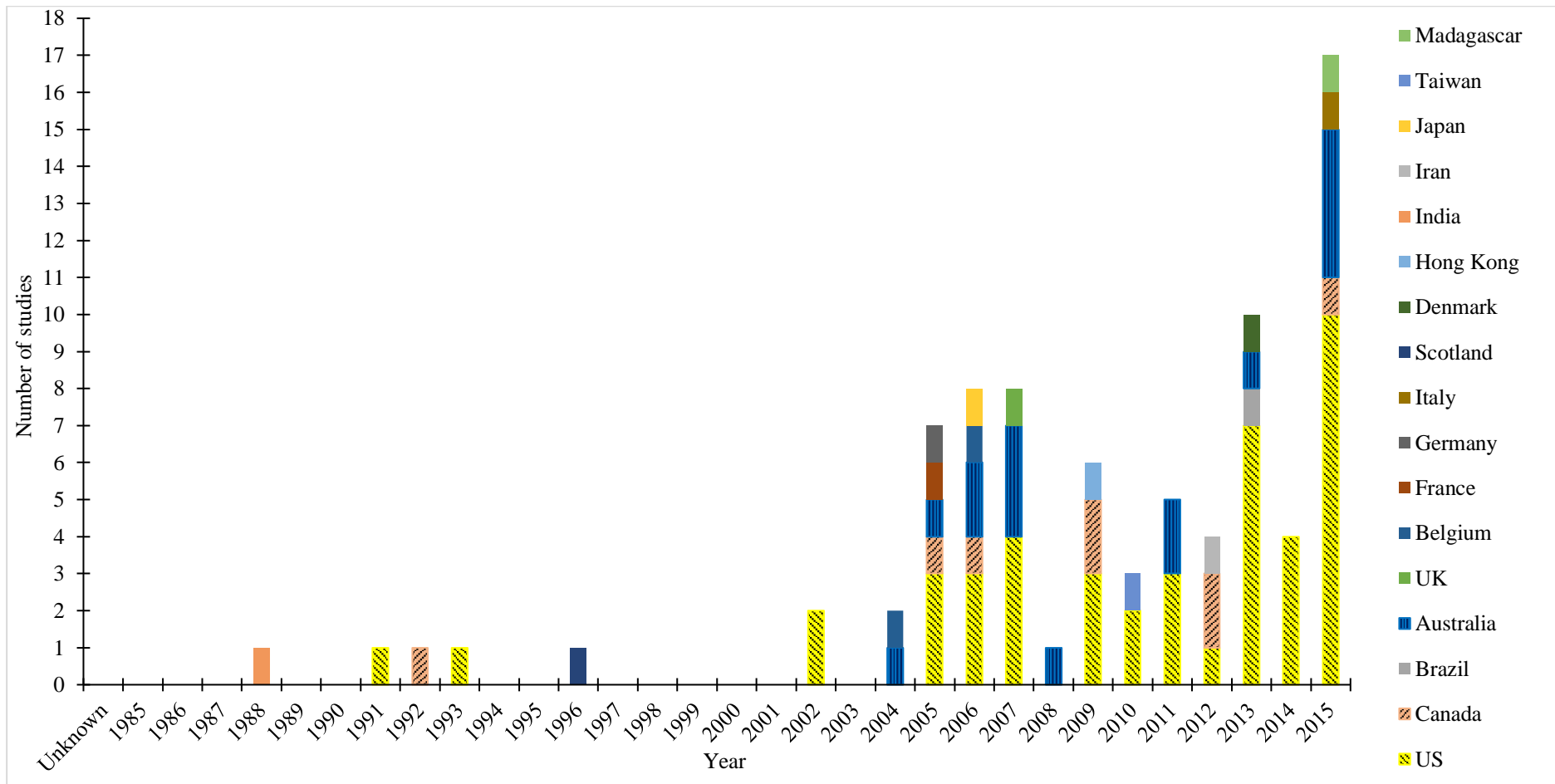
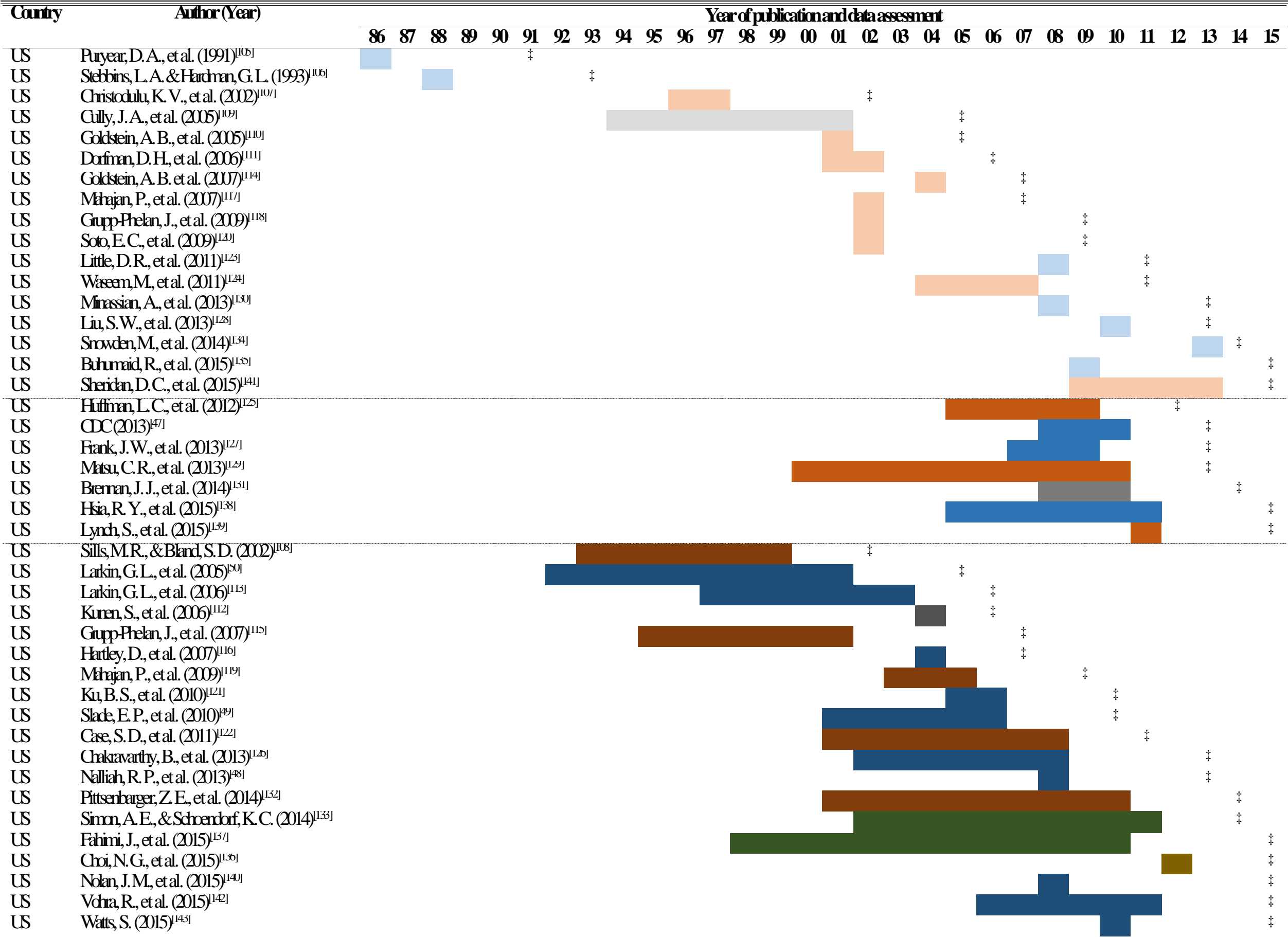


Figure 3.3: Number of studies by country and year of publication in the systematic review



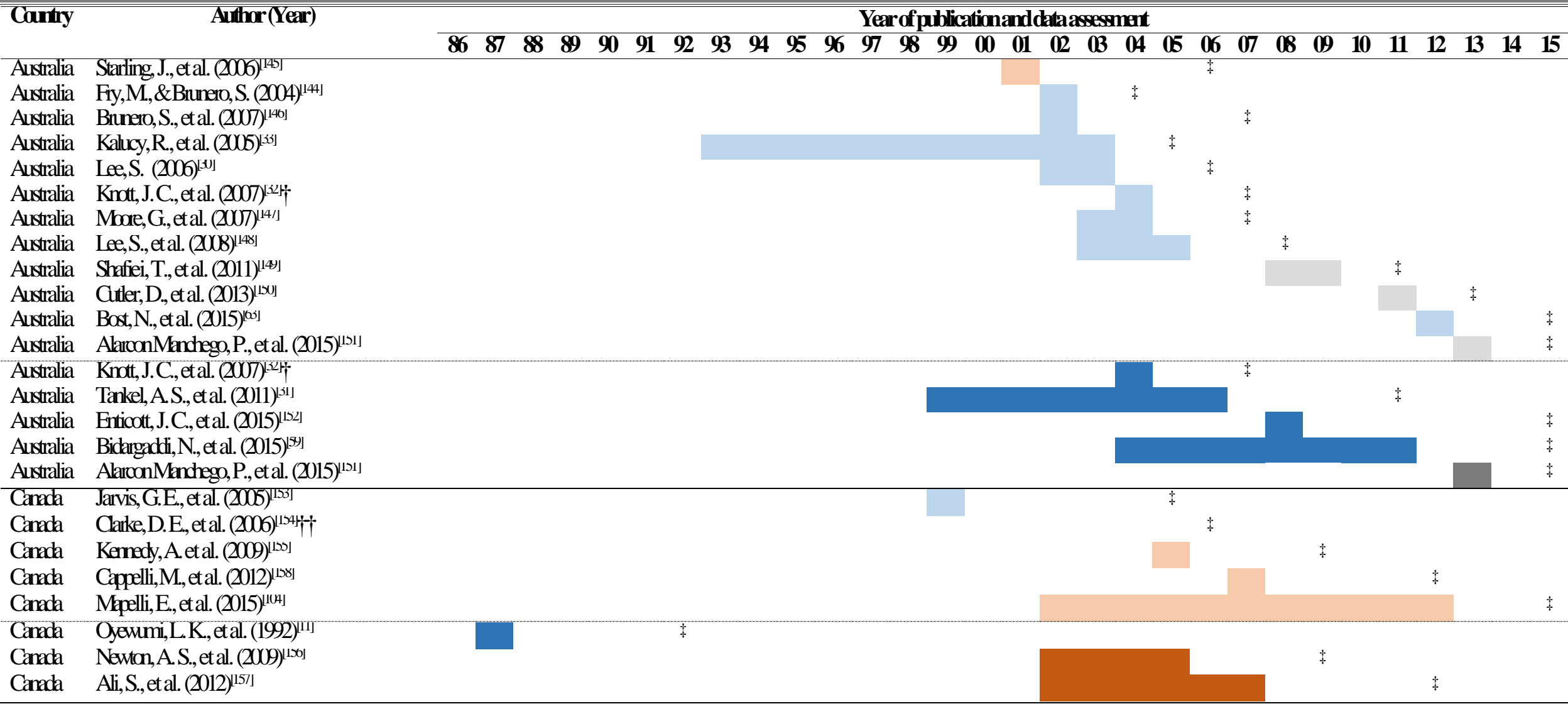


Figure 3.4: Pattern of reviewed studies from the US, Australia and Canada, by scope of data, year of data assessment, and age groups

Abbreviations and symbols:

- † Study reported both individual hospitals and regional data;
- †† Publication for across all age-groups in a hospital published for 1-month data (unknown year);
- ‡ Year of publication

Scope of data	Individual hospital	Regional	National
All age-groups			
Children			
Adult			
Elderly			
Youth			

Within the NHAMCS-ED studies five definitions of a MHrED presentation were used. The broadest definition comprised either a MH-related RFV or a diagnosis with an ICD-9 code of 290-319 or ICD-10 code of F00-F99, or any relevant V-code, E-code, or DSM-IV code (NHAMCS-ED Definition I).^[140,143] One study used the NHAMCS-ED Definition I codes but required the mental health code as the primary diagnosis or as one of three reasons for visit (NHAMCS-ED Definition II).^[49] The other definitions were not restricted to principal diagnosis but had increasing code exclusions. They were NHAMCS-ED Definition III: NHAMCS-ED Definition I excluding ICD-9 code 306;^[50] NHAMCS-ED Definition IV: NHAMCS-ED Definition III excluding ICD-9 codes 302, 305.1, 307.4, 307.6, 307.7, and 310.2;^[113] and NHAMCS-ED Definition V: NHAMCS-ED Definition III, excluding ICD-9 codes 290, 293, 299, 301, 302, 307-319.^[126]

Overall, studies reporting national data on the proportion of MHrED presentations showed increased MHrED presentations over time (Figure 3.5). Based on the broadest NHAMCS-ED definition (NHAMCS-ED Definition I), the percentage of MHrED presentations increased from 6.6% in 2008^[140] to 7.3% in 2010.^[143] In another analysis based on principal diagnosis (“NHAMCS-ED Definition II”), the percentage of MHrED presentations was lower but, nevertheless, increased from 3.0% in 2001 to 3.5% in 2006.^[49]

With regard to narrower definitions employing code exclusions, a study using NHAMCS-ED Definition III, stated there was an increase in the percentage of MHrED presentations between 1992 and 2001, with an average of 5.4%,^[50] while an average of 6.5% was reported between 1997 and 2003 for NHMACS-ED Definition IV.^[113] A study using NHMACS-ED Definition V, stated there was an increase in the percentage of MHrED presentations between 2002 and 2008, with an average of 6.8%.^[126]

In an analysis limited to urban EDs in 2005-2006 with diagnoses defined as “NHAMCS-ED Definition I”, the average percentage of MHRD presentations was 2.4%,^[121] which was substantially lower than the national average (6.8%).^[121,126] Consistent with this finding, there was a higher percentage of ED presentations for MHCs in rural areas reported using data from the 2004 CAHN survey at 9.4%, based on the presenting complaints recorded in the emergency room visit log by ED staff.^[116,126] However, the highest percentages of MHRD presentations, 12.5%, in 2008,^[48] was reported for the broadest database, the HCUP, which used a definition of MH conditions based on MH-related ICD-9-CM codes equivalent to “NHAMCS-ED Definition I”.

Regarding non-national data, three studies were identified that reported regional data on MHRD presentations,^[47,127,138] and four reported individual hospital data^[105,106,130,134] (Figure 3.6). A further four studies reported on the percentage of patients presenting to individual hospital EDs for a MH condition^[123,128,135,142] (Table 3.2). Of the regional studies, one each from Rhode Island^[127] and California^[138] used a definition comprising MH-related ICD-9-CM codes as a primary diagnosis similar to “NHAMCS-ED Definition II”, while the third from North Carolina employed narrower code inclusions (excluding ICD-9 codes 291-294, 303-305, 313-319) but allowed for up to eleven diagnoses.^[47] The proportion of MHRD presentations in North Carolina was much higher than either California or Rhode Island in similar periods, i.e., 8.3%-9.3% between 2008 and 2010 in North Carolina^[47] compared to 4.0%-4.5% between 2005 and 2011 in California,^[138] and 3.9% between 2007 and 2009 in Rhode Island.^[127] In regard to individual hospitals, which employed a consistent definition of MHRD presentations, equivalent to “NHAMCS -ED Definition I”, the proportion of MHRD presentations varied across individual

hospitals at different time points: 12% in a Texas hospitals in 1986-87,^[105] 5% in a Massachusetts hospital in 1988,^[106] 3.8% in a San Diego hospital in 2008,^[130] and 8.8% in a Seattle hospital in 2013.^[134]

3.4.4. Trends of MHRd presentations for across all age-groups in Australia

Eleven Australian studies considered MHRd presentations for all age-groups, of which most (n=7) reported individual hospital data only; three provided regional data only; and one reported both individual hospital and regional data. There were five studies based on data collected in New South Wales,^[30,31,144,146,148] three for Victoria,^[32,147,152] two for South Australia,^[33,59] and one for Queensland.^[63] In each of these studies MHRd presentations were defined as MH-related principal diagnoses based on ICD-9 (290-319), ICD-10 (F00-F99) or DSM-IV. The first publication was in 2004 and reported data for a hospital in the capital of New South Wales, Sydney, for the period 2002/03.^[144] The earliest and most comprehensive data, however, was collected from a hospital in the capital of South Australia, Adelaide.^[33] In this study, a marked increase in MHRd presentations was reported, increasing from 0.3% in 1993 to 4.3% in 2002 (Figure 3.7). In the eight other studies of individual hospitals, all hospitals were located in urban areas in one of four states, including South Australia. Rates of MHRd presentation of between 2.4% and 5.5% were reported between 2002 and 2012^[30,32,63,144-148] (Figure 3.7). In the four regional studies, MHRd presentations increased from 2.9% to 3.7%, and averaged 3.3% in New South Wales (1999 to 2006),^[31] were 4.7% in Victoria (2004),^[32] 3.0% for the residents of the Victorian Cities of Greater Dandenong and Casey presenting to any Victorian ED (2008-09),^[152] and averaged 4.2% in South Australia (2004 to 2011).^[59]

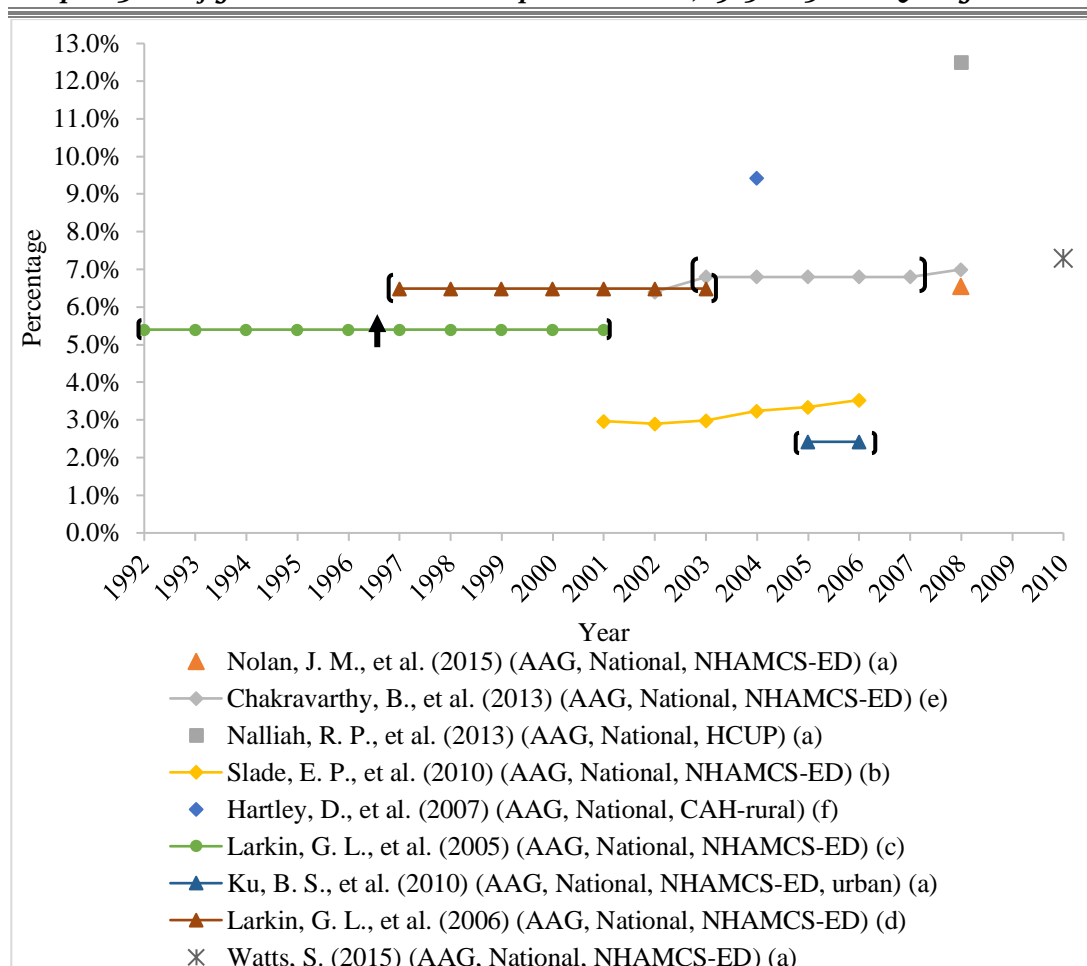


Figure 3.5: Percentage of MHrED presentation for all age-groups from national data in the US

Abbreviations and symbols: Parentheses (“()”): average proportions of MHrED presentations reported for multiple years; Upward arrows (↑): the increase in proportions of MHrED presentations stated by authors; NHAMCS-ED: National Hospital Ambulatory Medical Care Survey – Emergency Department; CAHN: Critical Access Hospitals Network; HCUP: Healthcare Cost and Utilization Project; MHrED: Mental health-related Emergency Department; AAG: All Age-Groups

MHrED Definition:

- (a) NHAMCS-ED Definition I: MH-related RFV, or ICD-9 codes 290-319, or ICD-10 codes F00-F99 or any relevant V-code or E-code, or DSM-IV as one of diagnoses;
 - (b) NHAMCS-ED Definition II: NHAMCS-ED Definition I, but required a mental health code as the primary diagnosis or as one of three reasons for visit
 - (c) NHAMCS-ED Definition III: NHAMCS-ED Definition I, except for ICD-9 code 306
 - (d) NHAMCS-ED Definition IV: NHAMCS-ED Definition III, except for ICD-9 codes 302, 305.1, 307.4, 307.6, 307.7, and 310.2)
 - (e) NHAMCS-ED Definition V: NHAMCS-ED Definition III, except for ICD-9 codes 290, 293, 293, 299, 301, 302, 307-319
 - (f) Based on the presenting complaints recorded in the emergency room visit log by ED staff
- Source:** Larkin GL, et al. (2005);^[50] Larkin GL, et al. (2006);^[113] Hartley D, et al. (2007);^[116] Ku BS, et al. (2010);^[121] Slade EP, et al. (2010);^[49] Chakravarthy B, et al. (2013);^[126] Nalliah RP, et al. (2013);^[48] Nolan JM, et al. (2015);^[140] Watts S (2015).^[143]

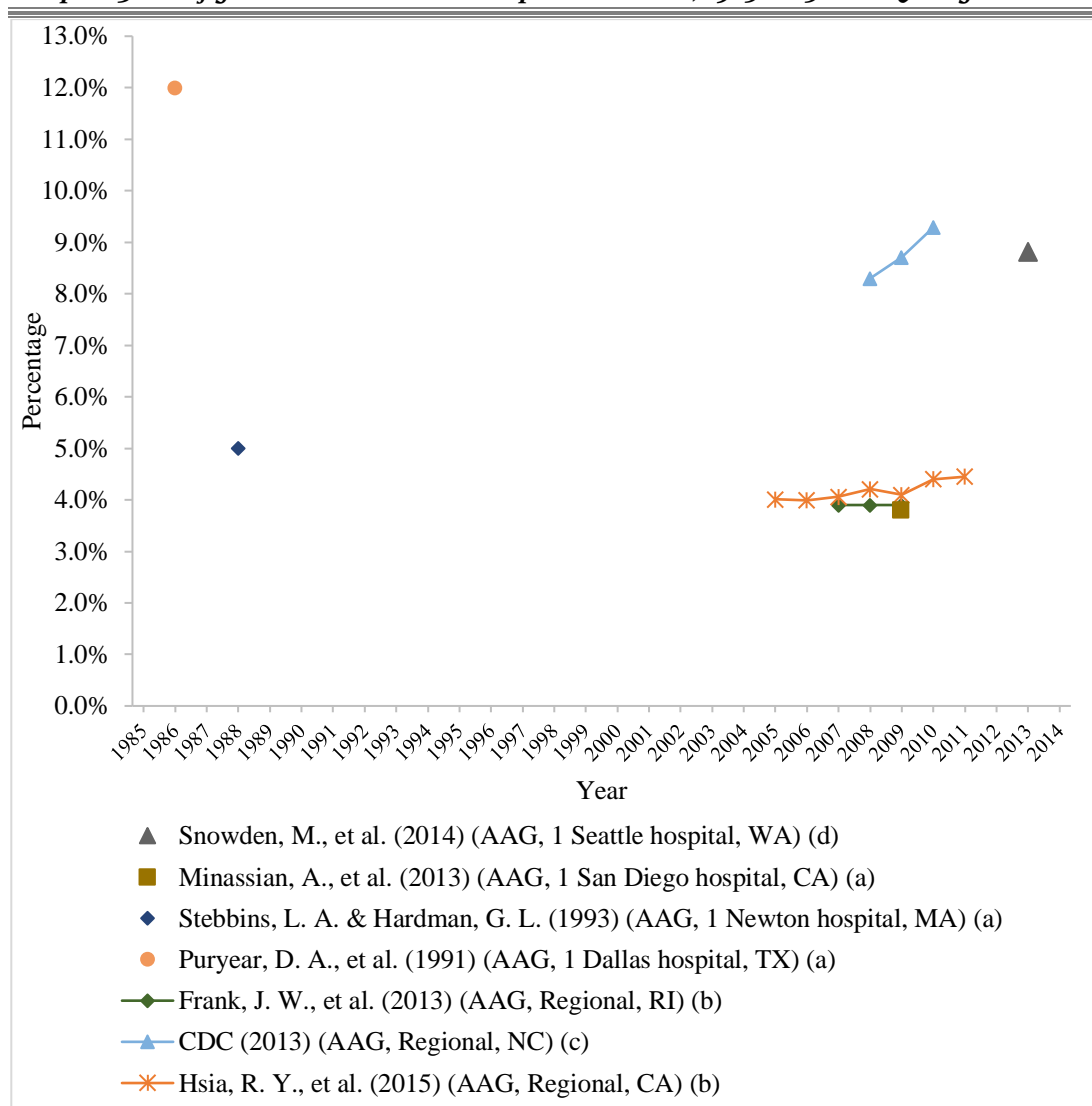


Figure 3.6: Percentage of MHR-ED presentation for all age-groups from individual hospitals' and regional data in the US

Abbreviations and symbols: MHR-ED: Mental Health-related Emergency Department; AAG: All age-groups; WA: Washington; MA: Massachusetts; NC: North Carolina; CA: California; RI: Rhode Island

MHR-ED Definition:

- (a) NHAMCS-ED Definition I: MH-related RFV, or ICD-9 codes 290-319, or ICD-10 codes F00-F99 or any relevant V-code or E-code, or DSM-IV as one of diagnoses;
- (b) NHAMCS-ED Definition II: NHAMCS-ED Definition I, but required a mental health code as the primary diagnosis or as one of three reasons for visit
- (c) Exclude ICD-9 code 291-294, 303-305, 313-319
- (d) Study did not specify the classification used and based on the existence of a MH-related presenting complaint

Source: Puryear DA, et al. (1991);^[105] Stebbins LA, et al. (1993);^[106] CDC (2013);^[47] Frank JW, et al. (2013);^[127] Minassian A, et al. (2013);^[130] Snowden M, et al. (2014);^[134] Hsia RY, et al. (2015).^[138]

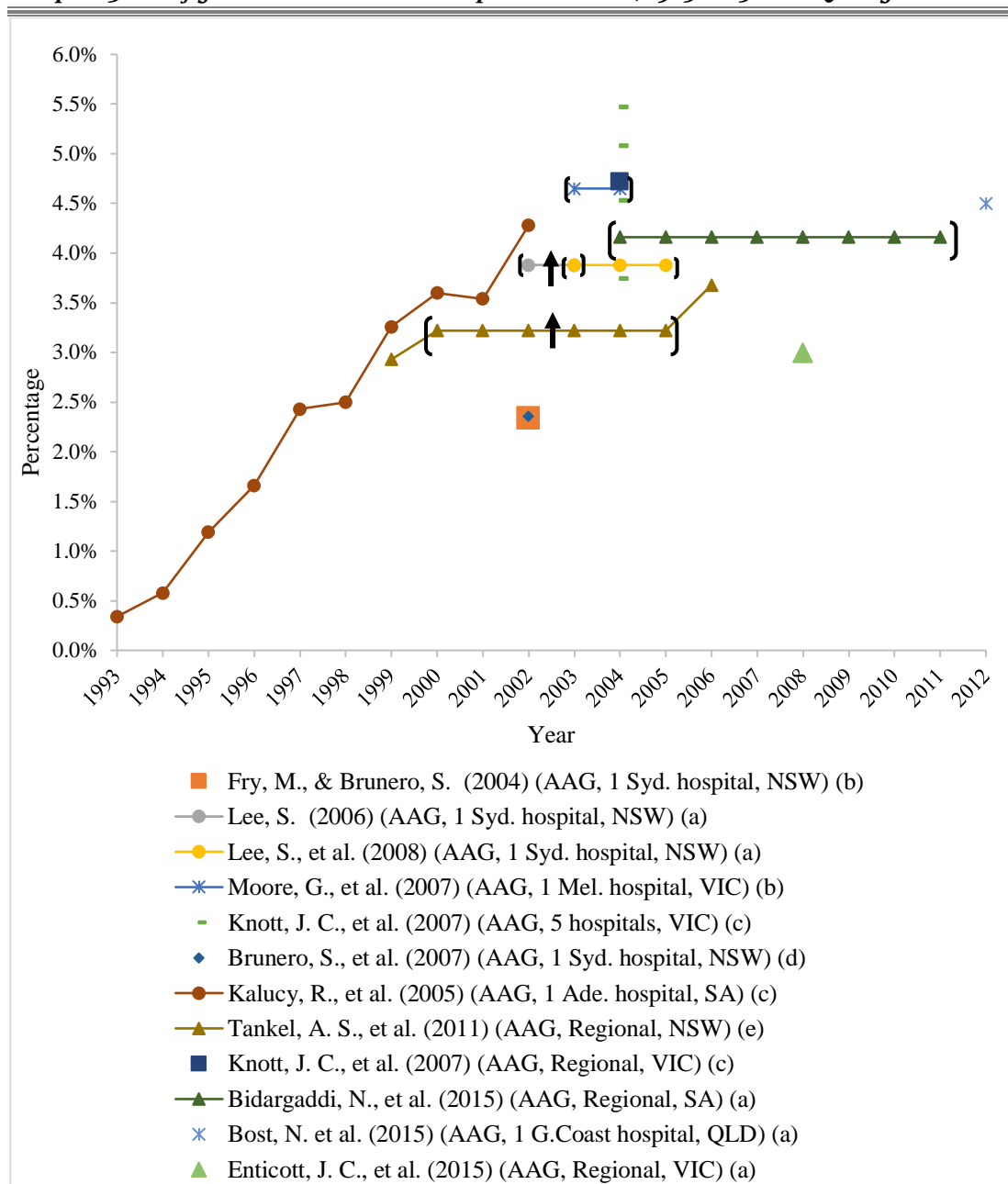


Figure 3.7: Percentage of MHrED presentations for all age-groups from individual hospitals' and regional data in Australia

Abbreviations and symbols: Parentheses ("()"): average proportions of MHrED presentations reported for multiple years; Upward arrows (↑): the increase in proportions of MHrED presentations stated by authors; AAG: All age-groups; NSW: New South Wales; SA: South Australia; VIC: Victoria; MHrED: Mental health-related Emergency Department

MHrED Definition:

- (a) Equivalent to NHAMCS-ED Definition II: NHAMCS-ED Definition I, but required a mental health code as the primary diagnosis or as one of three reasons for visit
- (b) Study did not specify the classification used and based on the existence of a MH-related presenting complaint
- (c) Exclude intoxication, withdrawal syndrome, overdose without mental disorder

(d) Exclude comorbidity or dual diagnosis

(e) Exclude intellectual disabilities (ICD-9 codes 317-319 or ICD-10 codes F70-F79)

Source: Fry M, et al. (2004);^[144] Kalucy R, et al. (2005);^[33] Lee S (2006);^[30] Brunero S, et al. (2007);^[146] Knott JC, et al. (2007);^[32] Moore G, et al. (2007);^[147] Lee S, et al. (2008);^[148] Tankel AS, et al. (2011);^[31] Bidargaddi N, et al. (2015);^[59] Bost N, et al. (2015);^[63] Enticott JC, et al. (2015).^[152]

3.5. Discussion

This study provides the broadest known systematic review of the relative burden of MHR-ED presentations in general hospitals and covered the peer-reviewed literature for over 30 years, 1985 to 2015; 81 studies from 17 countries were included. Most studies were from the US and Australia, followed by Canada. More than nine-tenths of studies were published after 2003, and covered 15 countries, as compared with four countries between 1985 and 2003. The period annual growth rate of the number of publications over the study period was 30.1% with a doubling time of 2.6 years. However, the trajectory has been increasing, the annual average growth 59.3% since 2003, and the doubling time reduced to 1.5 years. This growth rate is more than 5-times the growth of all records in PubMed/Medline between 1997 and 2006, for which the period annual growth rate was 5.6% and the doubling time 13 years.^[178]

There was variation in MH-related coding between studies. Many publications studied presentations to individual hospitals with others reporting state-wide presentations. National figures were only reported from the US, only three of which used the same definition of a MHR-ED presentation (the broad “NHAMCS-ED Definition I”). Most Australian studies employed a definition similar to “NHAMCS-ED Definition II”, being based on primary diagnosis only. The majority of studies included all age-groups with a smaller, but still large number specifically focused on children. Very few studies focused on youth, adults or the elderly.

For all age-groups, there was a variation in the proportion of MHR-ED presentations across individual hospitals and geographical regions in the US and

Australia, as well as between the US and Australia, at least partially due to the coding of presentations. In the US, when the same MHRD definition was employed, variation was also observed between national data for urban and rural hospitals, and whether they were inclusive of Federal, Military, and Veterans Administration hospitals. An increase in the percentage of MHRD presentations was observed for the US and Australia between 1992 and 2010, with the NHAMCS-ED studies showing an increasing average, in the face of more restricted definitions.

For countries other than the US, Australia, and Canada, there were thirteen studies, of which eleven were published after 2003, including six from Europe. The interest from European countries coincided with major MH-policy reform in this region, as reflected by the Mental Health Declaration for Europe and the Mental Health Action Plan for Europe, released in 2005.^[179] These reforms focused on deinstitutionalisation, improving community MH-services and effective integration into primary health care. Given limited publications from individual European countries and anticipated differences in MH systems between countries, we could not generalise the pattern of publications, nor assess trends of MH-related presentations.

Within the US, there has been several notable stages in MH service provision during the study timeframe. These stages included the completion of deinstitutionalisation in 1992,^[12] and ongoing reduction in psychiatric bed numbers thereafter, particularly until the early 2000s. The number of psychiatric beds per 100,000 population reduced from 55 in 1992 to 26 in 2008.^[180] Also occurring during the study timeframe was the “Great Recession” of 2008-2009 triggered by the global economic crisis of 2007-2008.^[181] While the Great Recession has been associated with increased suicide^[182,183] and alcohol and drug use,^[184] only two regional studies^[47,127]

specifically assessed MHrED presentations covering this period, both showed increased MHrED burden, an association needing further investigation.

The US, Australia, and Canada had different patterns of publications. In the US, similar numbers of studies reported data for all age-groups and children, whilst virtually all Australian studies centred on all age-groups. Studies from Canada were focused on all age-groups in the first-third of the systematic review period (1985-1995), then children in the last third (2005-2015). As Canadian Psychiatric Emergency Services (PES) have been held as playing a significant role in minimising MHrED presentations to general hospitals,^[185] we hypothesise that the observed shift in focus to paediatric patients is due to a lack of staff with paediatric psychiatry training in the PES,^[11,155] leading to the transfer of paediatric patients to general hospitals. A lack of paediatric psychiatry training is also a concern in the US PES.^[186]

There was a shift towards a more localised focus for data sources in the US for all age-groups over the study period, while studies in children used a mix of sources throughout. The shift in focus for all age-groups may reflect concerns of a lack of representativeness of national data, sensitivity to regional/local issues and/or funding availability. In contrast there was a shift from individual hospital towards regional data in Australia for both studies for all age-groups and other age groups. In Canada, studies using regional data and individual hospital data were concurrently published.

The burden of MHrED presentations in rural hospitals in the US (9.4% in 2004)^[116] was greater than the national average (6.8% between 2002 and 2008),^[126] even though a narrower definition of MHrED presentation was employed. Consistent with this finding the proportion of MHrED presentations in urban hospitals (2.4% in 2005-06)^[121] was lower than the national average, although the urban assessment did exclude substance-use related disorder. One factor that may be contributing to the

difference in burden between rural and urban areas in the US is differences in insurance coverage. For example, young people in rural areas are more likely to hold public insurance than young people in urban areas and use EDs for their MH needs,^[129] particularly for depression.^[187] Further, publicly insured patients are, in general, more likely to attend EDs for MHCs than patients with private insurance^[132,138] or noninsurance.^[138]

The highest reported percentage of MHR ED presentations across all age-groups in the US nationally was reported using the HCUP dataset (12.5%, 2008) which is inclusive of Federal, Military, and Veterans Administration hospitals.^[48] Meanwhile, the overall national average using the NHAMCS-ED database 6.6% in 2008^[140] is just over half that of the HCUP dataset. These results indicate a higher comparative burden of MHR ED presentations in Federal, Military, and Veterans Administration hospitals.

In similar time periods, the proportion of comparably defined MHR ED presentations in the US appeared to be higher than in Australia. However, most studies from the US employed broader definitions of a MHR ED presentation. One US study^[49] was based on principal diagnosis or one of three reasons for visit, which was most similar to the Australian studies which employed principal diagnosis only. On this basis the proportion of presentations was fairly comparable. Irrespective, there are significant differences in MH-system funding, organisation, and provision that makes direct comparisons problematic.^[25,188,189]

There was an observed increase in the percentage of MHR ED presentations in the US and Australia between 1992 and 2010, with the most marked increase occurring for a South Australian hospital. In the US, studies using the overall national data from the NHAMCS-ED showed that MHR ED presentations as a percentage of total ED presentations increased in the face of a narrowing definition of a MHR ED presentation

from an average of 5.4% between 1992 and 2001^[50] (Definition III), to 6.5% between 1997 and 2003^[113] (Definition IV), to 6.8% between 2002 and 2008^[126] (Definition V). In 2010, the percentage of MHR ED presentations was assessed at 7.3% using a broad definition (NHAMCS-ED Definition I).^[143] Thus, the overall burden of MH related presentations within EDs has increased over time. As mostly averages over time rather than annual rates were reported for the US, the assessment of trends was limited. The observed increase coincided with over a halving of psychiatric bed numbers, from 55 per 100,000 persons in 1992 to 29 per 100,000 persons in 2002 to 26 per 100,000 persons in 2008.^[190]

In the South Australian study of a large public hospital in the capital city Adelaide, the proportion of MHR ED presentations increased from 0.3% in 1992 to 4.3% in 2002.^[33] This increase coincided with large reductions in psychiatric bed numbers after the commencement of deinstitutionalisation in this state. Deinstitutionalisation started in 1991 with psychiatric bed numbers reducing from an equivalent of 53 beds per 100,000 in 1992-93, to 38 beds per 100,000 in 2008-09 and 36 beds per 100,000 in 2010-11.^[191] Further, the ED in the only standalone psychiatric hospital in this city was closed in 1996,^[33] which seemed to lead to a spike in ED presentations the following year, although the overall trend was maintained. An increase in presentations following a reduction in bed numbers was also observed for New South Wales, where the proportion of MHR ED presentations increased from 2.9% to 3.7% between 1999 and 2006,^[31] while bed numbers reduced from an equivalent of 44 beds to 35 beds per 100,000 between 1992-93 and 2007-08.^[191]

Together, the US and Australian results support a potential relationship between the closure and/or reduction in psychiatric facilities and bed numbers on the burden experienced by general hospital EDs. However, further research is required to

identify more fully the reasons behind the apparent increases. For example, another potential factor affecting MHRD presentations, is resourcing of community mental health services, underfunding of the community mental health system identified as a concern in the US.^[192,193]

This study provides the most comprehensive evidence of the MHRD presentations in general EDs internationally. However, given variation in health systems and policies between and within countries, the results should be interpreted in light of this heterogeneity. Our study complements a briefer and narrower systematic review and meta-analysis of MHRD presentations in adults (ICD diagnostic codes F01-F79) in countries with health systems considered comparable to the English National Health System.^[26] Most studies included (12 of 18) were screened in our study of which seven were included. All were from Australia. Six other studies, including two from Canada and one from Australia, were not discovered in our search. We believe this is due to the inclusion of nearness terms in our search strategy (see Table 3.1), each of the undiscovered papers not fulfilling this requirement. Irrespective, each of these six studies was ineligible for our study. In contrast, we identified seven additional studies from Australia, of which three should have been eligible and within the assessment timeframe for Barratt and colleagues.^[147,148,150] The use of an automated screening and identification process by Barratt and colleagues (2016) may be a reason these references were not identified. In their review Barratt and colleagues considered the results from all hospitals, including PESs, and locations equivalently and assessed that the percentage of MHRD presentations was 4% (around 3.5% based on the meta-analysis Forest plot). Given our concerns about heterogeneity, we agree with their conclusion that more prevalence data are required to inform robust health service development. Furthermore, exploring the

characteristics of MHRD presentations should assist in understanding variation observed between regions and individual hospitals. We also note three systematic reviews of studies reporting MHRD presentations by children, one undertaken in the US^[27] and two in Canada.^[28,29] These reviews support the contention of increasing concern regarding paediatric psychiatric emergency department presentations in these countries.

3.6. Limitations

Through our search, we identified some issues in regard to unclear description of outcomes assessed and data sources, that meant potentially relevant data^[142] or studies^[174] were not included. Analysis of trends was compromised because of data limitations, with data for many studies provided as an average across multiple years, or for a single year only. The provision of composite data only was the primary reason behind the exclusion of Hakenewerth and colleagues (2015)^[102] in preference to their earlier study.^[47] Future studies of MHRD presentations are recommended to include a multi-year timeframe, with data provided on a year-by-year basis. Use of different measures limited the studies included. As the focus of this review was MHRD presentations in general hospitals, no studies were included relating to Psychiatric Emergency Services only. Grey literature such as government reports, were not included unless abstracted in the databases searched, thus policy related material was not explicitly considered.

3.7. Conclusion

Prior to 2003 there were minimal publications on the percentage of MHRD presentations in general hospitals. However, there has since been a marked increase in the number of publications, and the number of countries reporting on this topic;

indicating increasing interest internationally. Given greater than expected rate of increase, this interest is believed to reflect clinical concern for studies undertaken at the individual hospital level, and system performance for regional and national studies. However, as national data were only examined in the US, and there has been a shift back towards studies on individual hospitals in this country, the peer-reviewed literature is believed to predominantly reflect clinical concern regarding local burden. This concern includes paediatric MHRd presentations in the US and more recently Canada. Exploring the characteristics of MHRd presentations should assist in understanding variation observed between regions and individual hospitals. Together, the US and Australian data support the need to identify the characteristics of people demanding MHRd care, so that pre-hospital services can be developed and/or improved.

Chapter 4. Emergency department presentations with a mental health diagnosis in Australia, by jurisdiction and by sex, 2004-05 to 2016-17

4.1. Preface

This chapter presents Study 2 of this thesis, an examination of the trends in the proportions of emergency department (ED) presentations with a mental health diagnosis (MH_{dx}) for Australia, each jurisdiction and by sex, between 2004-05 and 2016-17. A manuscript of this study has been published by *Emergency Medicine Australasia* (Appendix 3):

Tran, Q.N., Lambeth, L.G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V., Huckerby, E.J., Neil, A.L., Emergency department presentations with a mental health diagnosis in Australia, by jurisdiction and by sex, 2004–05 to 2016–17. *Emergency Medicine Australasia*, 2020, 32:383-392. DOI: 10.1111/1742-6723.13438

4.2. Introduction

Over the last six decades, deinstitutionalisation and the reduction in psychiatric bed numbers have contributed to significant change in mental health (MH) service provision internationally,^[8-10] including an increased provision of services through emergency departments (EDs).^[9,11,12] For example, national data from the US have shown an increase in the percentage of MH-related ED (MHeD) presentations based on principal diagnosis only from 3.0% in 2001 to 3.5% in 2006;^[49] and based on any diagnosis from 6.6% in 2008^[140] to 7.3% in 2010,^[143] as ascertained in Chapter 3.

In Australia, deinstitutionalisation and reduction in psychiatric bed numbers have occurred over the last three decades^[7] with reduction in psychiatric bed numbers viewed as a potential factor in the current burden of MHR_{ED} presentations.^[22] Australian studies, predominantly from three of eight jurisdictions; New South Wales,^[30,31,148] South Australia^[33] and Victoria (paediatric presentations only),^[51] have shown increases in the proportion of MHR_{ED} presentations for periods between 1992 and 2014. At the national level, the Australian Institute for Health and Welfare (AIHW) has reported the absolute number of ED presentations with a MH-diagnosis (hereafter referred to as “MH_{dx} presentations”) for Australia and each jurisdiction since 2004, using a narrow definition based on *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification* (ICD-10-AM) codes F00-F99.^[34-45] In May 2018, the AIHW also reported the number of MH_{dx} presentations per 10,000 population between 2004-05 and 2016-17, and the proportion of all ED presentations since 2011-12.^[45] No further analysis was undertaken.

This study aims to examine trends in the number, proportion, and rate per 10,000 population, of MH_{dx} presentations in public hospitals, nationally, by jurisdiction and by sex, between 2004-05 and 2016-17.

4.3. Methods

4.3.1. Data sources

ED data were extracted from two AIHW series: *Australian Hospital Statistics* (AHS)^[46,83-94] and *Mental Health Services in Australia* (MHSA),^[34-45] both of which report data from the *National Non-Admitted Patient Emergency Department Care Database* (NNAPEDCD), which includes patients subsequently admitted.^[68] The most

recently published data were extracted for Australia and all jurisdictions. MH_{dx} presentations by jurisdiction were extracted for all years except 2013-14, which were unavailable. Further details are provided in Chapter 2.

For the AHS series, data extracted comprised total number of ED presentations and the number of ED presentations by sex (male/female). For the MHSA series, data extracted comprised the proportion of ED presentations with a principal diagnosis, the total number of ED presentations with a MH principal diagnosis, and the number of ED presentations with a MH principal diagnosis by sex. MH diagnoses, as defined by the AIHW comprised all items within *Chapter 5, Mental and Behavioural Disorders (F00-F99)*, of the ICD-10-AM (Table 2.4).

Data on estimated resident populations for 2004 to 2009 were extracted from *Australian Demographic Statistics 2010*,^[194] and for 2010 to 2017 *Australian Demographic Statistics 2017*.^[195]

Data were entered into Microsoft Excel 2016,^[96] then exported to Stata 14.^[97]

The number of ED presentations with a principal diagnosis (hereafter referred to as “ED_{dx} presentations”) was estimated as the product of the reported number of ED presentations and the percentage with a principal diagnosis. The proportion of MH_{dx} presentations was calculated by dividing the reported number of ED presentations with a MH principal diagnosis by the ED_{dx} presentations. The rate of change in numbers and proportions of presentations were assessed as average annual growth rate (AAGR) and compound annual growth rate (CAGR). The difference (x-fold) was calculated by dividing the number, rate or proportion of presentations in 2016-17 by those in 2004-05. As publicly available secondary data were collated and analysed, ethics approval was not sought.

4.3.2. Statistical analysis

National and jurisdictional trends were assessed using simple linear regression models. Multivariable linear regression was employed to compare the proportions of MH_{dx} presentations across jurisdictions and with the national average. Breakpoints were tested for jurisdictions using statistical goodness of fit tests. Likelihood ratio tests were used to optimise the breakpoint and compare the model with breakpoint to the model with a simple trend. Given that the jurisdictions had significantly different numbers of ED presentations, trend analysis of proportions were weighted by the contribution (%) of each jurisdiction to the total number of Australian ED presentations in each year. Data from SA were excluded in 2004-05 and 2008-09 due to an unexpectedly large proportion of data missing a diagnosis code. Multivariable generalised linear regression models with a log link were employed to model the proportion of MH_{dx} presentations by sex. Sex and year, and an interaction term between these, were included as variables to estimate trend, and to test for a difference in trend between sex. Statistical significance was identified with p-value ≤ 0.05 .

4.4. Results

4.4.1. ED, ED_{dx}, and MH_{dx} presentations, Australia

Between 2004-05 and 2016-17, the total number of ED presentations in Australia increased from 4,529,412 to 7,755,606 (1.7-fold) (Figure 4.1, Table 4.1), while the number of ED_{dx} presentations increased from 4,212,353 to 7,447,262 (1.8-fold). The number of MH_{dx} presentations increased from 138,729 to 276,954 (2.0-fold). The proportion of ED_{dx} presentations that had a MH_{dx} increased from 3.3% to 3.7% (p=0.163) over the same period (Table 4.2) (1.13-fold).

Per 10,000 population, the number of ED presentations in Australia increased steadily between 2004-05 and 2016-17 from 2,220.9 to 3,152.8 (Table 4.1), while MH_{dx} presentations fluctuated between 2004-05 (68.0 presentations per 10,000) and 2010-11 (78.8 presentations per 10,000), before a marked upturn until 2015-16 (112.9 presentations per 10,000) (Table 4.1, Figure 4.2, Table 4.2).

4.4.2. ED, ED_{dx} , and MH_{dx} presentations by jurisdiction

Across all jurisdictions, the absolute and relative numbers (per 10,000 population) of ED_{dx} and MH_{dx} presentations increased over the study period (Table 4.3). The proportion of MH_{dx} presentations ranged from 2.4% (NT, 2007-08) to 6.7% (SA, 2008-09). SA had the highest proportion of MH_{dx} presentations of any jurisdiction in all years except 2011-12 and 2014-15. No jurisdiction consistently had the lowest proportion of MH_{dx} presentations. The average annual proportion of MH_{dx} presentations was statistically significantly higher than the national average in SA, QLD, TAS and WA, lower in VIC and the ACT, and no different in NSW and NT (Table 4.2, multivariable regression).

In any given year, the number of MH_{dx} presentations per 10,000 population in the NT was more than double the national average, and higher than the rate for every other jurisdiction (Figure 4.2).

4.4.3. Trends in MH_{dx} presentations

In Australia, MH_{dx} presentations as a proportion of total ED_{dx} presentations increased on average by 0.04 percentage points annually between 2004-05 and 2016-17 ($p < 0.001$) (Table 4.2). However, a trend line with a breakpoint at 2010-11 provided a significantly better fit to the data. Before 2010, there was no significant change in the rate of MH_{dx} presentations, whereas from 2010-11 to 2016-17, the rate increased by 0.12 percentage points annually ($p < 0.001$). This pattern is echoed within individual

jurisdictions. In most jurisdictions (except NSW, SA, and TAS), there were significant increases in the proportion of MH_{dx} presentations over the whole study period (Table 4.2), with most jurisdictions exhibiting upturns since 2009-10 (Figure 4.2). QLD differed in experiencing growth between 2004-05 and 2008-09.

Table 4.1: Number, annual change (number and percentage) of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) (absolute number and as a proportion of total ED presentations) in Australia, 2004-05 to 2016-17

Year	ED presentations with Episode Level Data (ED _{ep})		ED presentations with a Principal Diagnosis (ED _{dx})			ED presentations with a MH diagnosis (MH _{dx})			MH _{dx} presentations as a proportion of ED _{dx} presentations			Estimated resident population	ED _{ep} presentation per 10,000 population	MH _{dx} presentations per 10,000 population
	(AHS)	(MHSA)	(Estimated)			(MHSA)			(Estimated)			(ADS)	(Estimated)	(Estimated)
	Number	% with a Principal Diagnosis	Number	Annual change	Annual % change	Number	Annual change	Annual % change	%	Annual change	Annual % change	Number	Number	Number
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
2004-05	4,529,412	93	4,212,353	//	//	138,729	//	//	3.29	//	//	20,394,791	2,220.9	68.0
2005-06	4,914,896	92	4,521,704	309,351	7.34	149,566	10,837	7.81	3.31	0.02	0.61	20,697,880	2,374.6	72.3
2006-07	5,287,451	92	4,864,455	342,751	7.58	178,595	29,029	19.41	3.67	0.36	10.88	21,072,452	2,509.2	84.8
2007-08	5,537,196	89	4,928,104	63,650	1.31	162,721	-15,874	-8.89	3.30	-0.37	-10.08	21,498,540	2,575.6	75.7
2008-09	5,742,139	90	5,167,925	239,821	4.87	171,976	9,255	5.69	3.33	0.03	0.91	21,951,736	2,615.8	78.3
2009-10	5,957,961	92	5,481,324	313,399	6.06	172,445	469	0.27	3.15	-0.18	-5.41	22,328,847	2,668.3	77.2
2010-11	6,183,288	92	5,688,625	207,301	3.78	176,016	3,571	2.07	3.09	-0.06	-1.90	22,340,024	2,767.8	78.8
2011-12	6,547,342	92	6,023,555	334,930	5.89	188,739	12,723	7.23	3.13	0.04	1.29	22,742,475	2,878.9	83.0
2012-13	6,712,357	92	6,175,368	151,814	2.52	213,553	24,814	13.15	3.46	0.33	10.54	23,145,901	2,900.0	92.3
2013-14	7,195,903	95	6,813,991	638,623	7.20	241,200	27,647	12.95	3.54	0.08	2.31	23,504,138	3,061.6	102.6
2014-15	7,366,442	94	6,911,611	97,620	1.43	256,178	14,978	6.21	3.71	0.17	4.80	23,850,784	3,088.6	107.4
2015-16	7,465,869	95	7,105,223	193,612	2.80	273,438	17,260	6.74	3.85	0.14	3.77	24,210,809	3,083.7	112.9
2016-17	7,755,606	96	7,447,262	342,039	4.81	276,954	3,516	1.29	3.72	-0.13	-3.38	24,598,933	3,152.8	112.6
<i>x-fold</i>	1.71	1.03	1.77			2.00			1.13			1.21	1.42	1.66
<i>AAGR (%)</i>	4.61	0.28	4.90			6.16			1.18			1.58	2.98	4.51
<i>CAGR (%)</i>	4.58	0.26	4.86			5.93			1.02			1.57	2.96	4.29

Abbreviations and symbols: //: Not applicable; AAGR: Average Annual Growth Rate; ADS: Australian Demographic Statistics; AHS: Australian Hospital Statistics; CAGR: Compound Annual Growth Rate; ED: Emergency Department; ED_{dx} : ED presentations with a principal diagnosis; ED_{ep} : ED presentations with episode-level data; MH_{dx} : Mental Health Diagnosis; MHSA: Mental Health Services in Australia; x-fold: x-fold difference between the last year and the first year;

$$(c) = (a) * (b)$$

$$(d)_{year\ n} = (c)_{year\ n} - (c)_{year\ n-1}$$

$$(e)_{year\ n} = [(c)_{year\ n} - (c)_{year\ n-1}] / (c)_{year\ n-1} * 100\%$$

$$(g)_{year\ n} = (f)_{year\ n} - (f)_{year\ n-1}$$

$$(h)_{year\ n} = [(f)_{year\ n} - (f)_{year\ n-1}] / (f)_{year\ n-1} * 100\%$$

$$(i) = (f)/(c) * 100\%$$

$$(j)_{year\ n} = (i)_{year\ n} - (i)_{year\ n-1}$$

$$(k)_{year\ n} = [(i)_{year\ n} - (i)_{year\ n-1}] / (i)_{year\ n-1} * 100\%$$

$$(m) = (a) / (l) * 10,000$$

$$(n) = (f) / (l) * 10,000$$

Sources: Australian Hospital Statistics,^[46,83-94] Mental Health Services in Australia,^[34-45] Australian Demographic Statistics 2010,^[194] Australian Demographic Statistics 2017.^[195]

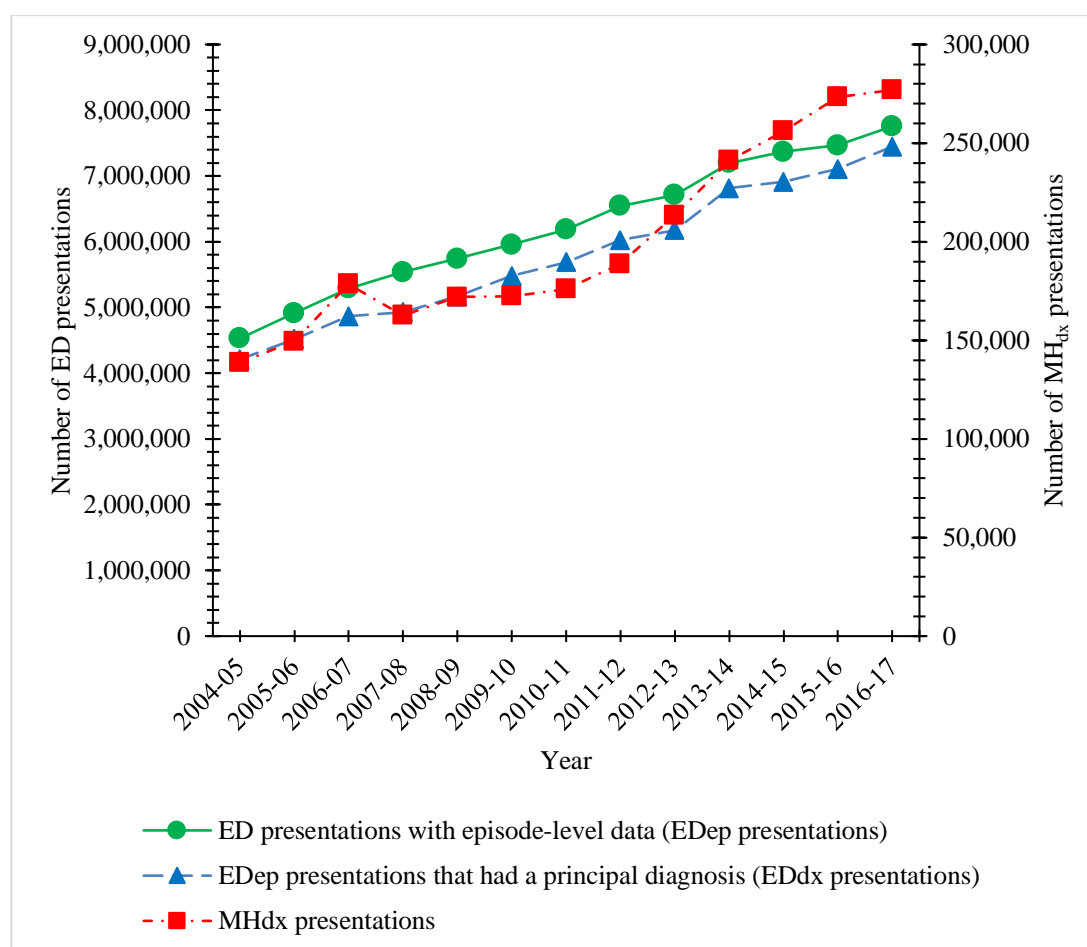


Figure 4.1: Trends of ED presentations, with all diagnoses, and with a MH diagnosis in Australia, 2004-05 to 2016-17

Abbreviations: ED: Emergency Department; EDep: ED presentations with episode-level data; EDdx: EDep with a principal diagnosis; MHdx: Mental Health Diagnosis

Sources: Australian Hospital Statistics,^[46,83-94] Mental Health Services in Australia,^[34-45]

Table 4.2: Generalised linear regression models examining the trend of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) as a proportion of ED presentations with a principal diagnosis, 2004-05 to 2016-17

Univariable regression models†	Models without breakpoint	Models with breakpoint		
Jurisdictions	β_0 ¶	Breakpoint§ (Year _x)	β_1 ¶ (2004-05 to Year _{x-1})	β_2 ¶ (Year _x to 2016-17)
Australia	0.035	2010-11	-0.048	0.117**
NSW	-0.004	2011-12	-0.128*	0.191*
VIC	0.050**	2010-11	-0.017	0.117***
QLD	0.111**	2008-09	0.328***	0.029
WA	0.064**	2009-10	-0.060*	0.142***
SA¶	0.052	2012-13	-0.064*	0.293***
TAS	0.023	2011-12	-0.158***	0.189**
ACT	0.048**	2007-08	0.050	0.071**
NT	0.198**	2009-10	0.055	0.356***
Multivariable regression model‡	Model without breakpoint	Models with breakpoint		
			Year _x =2010-11	Year _x =2011-12
Year				
Across entire period (β_0)	0.045**			
2004-05 to Year _{x-1} (β_1)			-0.038	0.022
Year _x to 2016-17 (β_2)			0.117***	0.137***
Jurisdictions				
NSW	-0.129		-0.133	-0.136
VIC	-0.540***		-0.543***	-0.545***
QLD	0.301*		0.303*	0.300*
WA	0.279**		0.282***	0.280***
SA¶	0.907***		0.916***	0.914***
TAS	0.281*		0.283*	0.280*
ACT	-0.467*		-0.462***	-0.464***
NT	-0.077		-0.077	-0.080
_cons	3.148***		3.441***	3.397***

Abbreviations and symbols: * $0.01 \leq p\text{-value} < 0.05$; ** $0.001 \leq p\text{-value} < 0.01$; *** $p\text{-value} < 0.001$;

_cons: constant component of the model; ACT: Australian Capital Territory; ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Univariable regression model examines the trend of MH_{dx} presentations as a proportion of the estimated ED presentations with a principal diagnosis (ED_{dx} presentations) in Australia, stratified by jurisdiction;

‡ Multi-variable regression model examines the trend of MH_{dx} presentations as a proportion of the estimated ED_{dx} presentations, with a term for jurisdiction to enable a comparison between jurisdictions and Australian national average.

§ Breakpoint is the year when the trend has the most statistically significant structural break;

¶ Beta-coefficients of the regression model provide the magnitudes of the difference of the proportion of ED presentations with a MH diagnosis (MH_{dx} presentations) (in percentage points) over years;

¶ Peak percentage points from SA in 2004-05 and 2008-09 were excluded due to a large proportion of data missing diagnosis code that was inconsistent with other years;

4.4.4. *ED_{dx} and MH_{dx} presentations by sex*

Across the study period, the number of all ED and MH_{dx} presentations for males was greater than for females in each year (3,903,548 ED presentations and 143,956 MH_{dx} presentations compared with 3,851,595 ED presentations and 132,960 MH_{dx} presentations in 2016-17, respectively) (Table 4.4). The corresponding percentages were 50.3% and 49.7% of ED presentations, and 52.0% and 48.0% of MH_{dx} presentations in 2016-17. The rates of all ED presentations were slightly higher for males than females per 10,000 total and sex specific populations in each year (1,586.9 and 1,565.8 presentations per 10,000 total population respectively, and 3,199.2 presentations per 10,000 males and 3,156.6 presentations per 10,000 females in 2016-17). Males also experienced slightly higher rates of MH_{dx} presentations than females per 10,000 total and sex specific populations in each year (58.5 and 54.1 presentations per 10,000 total population respectively, and 118.0 presentations per 10,000 males and 109.0 presentations per 10,000 females in 2016-17) (Figure 4.3). However, when presentations with a MH diagnosis were assessed as a proportion of all ED presentations by sex, females had a higher proportion between 2004-05 and 2012-13 (Figure 4.3).

Over the study period, females experienced greater increases (x-fold, average and compounding annual growth rates) than males in the number, percentage, and rates per 10,000 total and sex-specific populations of all ED presentations (Table 4.4). In

contrast for MH_{dx} presentations, males experienced greater increases except for average annual growth rates. Controlling for year, and sex-year interactions, the proportion of all ED presentations that were MH -related was 8% higher for females than males (Table 4.5).

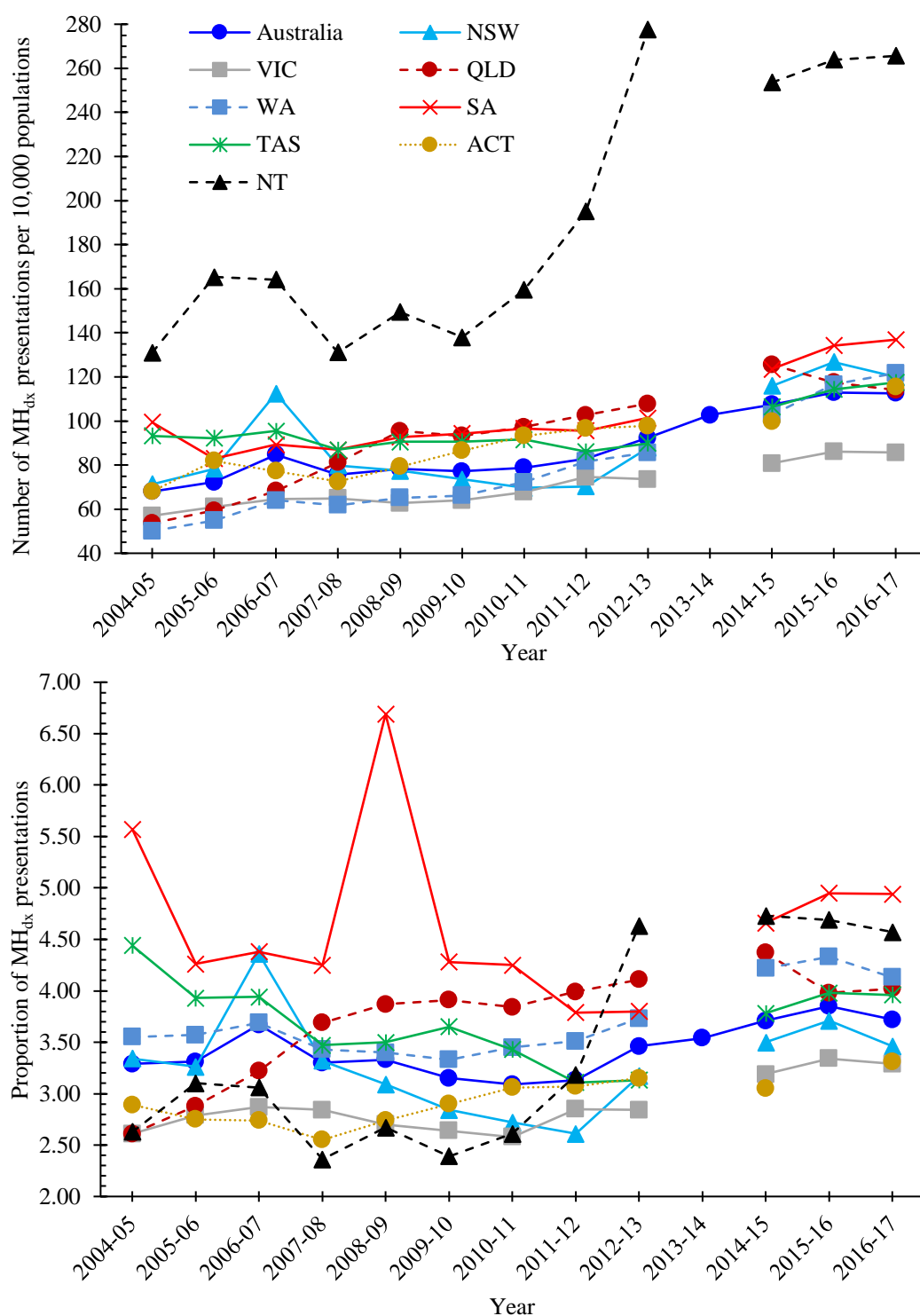


Figure 4.2: Proportions and rates per 10,000 population of ED presentations with a MH diagnosis

(ICD-10-AM F00-F99) in Australia, by jurisdiction, 2004-05 to 2016-17, except for 2013-14 (all states and territories) and 2015-16 (ACT)†

Abbreviations: ACT: Australian Capital Territory; ED: Emergency department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental health; MH_{dx}: Mental Health Diagnosis; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Data for 2013-14 (all states and territories) and 2015-16 (ACT) were not available

Table 4.3: All ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by jurisdiction, 2004-05 to 2016-17

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Australia													
ED _{ep} presentations [†]	4,529,412	4,914,896	5,287,451	5,537,196	5,742,139	5,957,961	6,183,288	6,547,342	6,712,357	7,195,903	7,366,442	7,465,869	7,755,606
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations [‡]	93	92	92	89	90	92	92	92	92	95	94	95	96
Estimated ED _{dx} presentations	4,212,353	4,521,704	4,864,455	4,928,104	5,167,925	5,481,324	5,688,625	6,023,555	6,175,368	6,813,991	6,911,611	7,105,223	7,447,262
Number of MH _{dx} presentations [§]	138,729	149,566	178,595	162,721	171,976	172,445	176,016	188,739	213,553	241,200	256,178	273,438	276,954
Proportion of MH _{dx} presentations (%) [¶]	3.29	3.31	3.67	3.30	3.33	3.15	3.09	3.13	3.46	3.54	3.71	3.85	3.72
Estimated resident population ^{¶¶}	20,394,791	20,697,880	21,072,452	21,498,540	21,951,736	22,328,847	22,340,024	22,742,475	23,145,901	23,504,138	23,850,784	24,210,809	24,598,933
Number of ED _{ep} presentations per 1,000 population	2,221	2,375	2,509	2,576	2,616	2,668	2,768	2,879	2,900	3,062	3,089	3,084	3,153
Number of MH _{dx} presentations per 10,000 population	68	72	85	76	78	77	79	83	92	103	107	113	113
NSW													
ED _{ep} presentations [†]	1,520,621	1,725,509	1,876,615	1,962,496	2,007,863	2,035,783	2,074,098	2,235,455	2,278,591	2,646,415	2,681,466	2,733,520	2,784,545
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations [‡]	95	95	95	86	89	92	89	88	90	93	94	97	98
Estimated ED _{dx} presentations	1,444,590	1,639,234	1,782,784	1,687,747	1,786,998	1,872,920	1,845,947	1,967,200	2,050,732	2,467,410	2,530,026	2,639,803	2,723,654
Number of MH _{dx} presentations [§]	48,223	53,360	77,699	56,001	55,173	53,254	50,301	51,354	65,027	..	88,469	98,024	94,259
Proportion of MH _{dx} presentations (%) [¶]	3.34	3.26	4.36	3.32	3.09	2.84	2.72	2.61	3.17	..	3.50	3.71	3.46
Estimated resident population ^{¶¶}	6,756,457	6,816,087	6,904,942	7,014,887	7,127,168	7,232,589	7,218,529	7,308,205	7,409,082	7,517,195	7,627,418	7,739,274	7,861,068
Number of ED _{ep} presentations per 1,000 population	2,251	2,532	2,718	2,798	2,817	2,815	2,873	3,059	3,075	3,520	3,516	3,532	3,542
Number of MH _{dx} presentations per 10,000 population	71	78	113	80	77	74	70	70	88	..	116	127	120
VIC													
ED _{ep} presentations [†]	1,158,474	1,249,078	1,305,114	1,352,129	1,358,202	1,432,745	1,483,159	1,509,065	1,528,609	1,572,787	1,610,623	1,679,886	1,731,040
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations [‡]	95	90	90	90	93	94	98	98	98	100	95	95	95
Estimated ED _{dx} presentations	1,100,550	1,124,170	1,174,603	1,216,916	1,263,128	1,346,780	1,453,496	1,478,884	1,498,037	1,572,787	1,528,324	1,593,239	1,647,110
Number of MH _{dx} presentations [§]	28,757	31,329	33,743	34,588	34,161	35,510	37,493	42,184	42,515	..	48,711	53,211	54,114
Proportion of MH _{dx} presentations (%) [¶]	2.61	2.79	2.87	2.84	2.70	2.64	2.58	2.85	2.84	..	3.19	3.34	3.29
Estimated resident population ^{¶¶}	5,048,602	5,126,540	5,221,310	5,326,978	5,446,612	5,545,932	5,537,817	5,653,429	5,775,808	5,901,970	6,032,968	6,179,249	6,323,606
Number of ED _{ep} presentations per 1,000 population	2,295	2,436	2,500	2,538	2,494	2,583	2,678	2,669	2,647	2,665	2,670	2,719	2,737
Number of MH _{dx} presentations per 10,000 population	57	61	65	65	63	64	68	75	74	..	81	86	86
QLD													
ED _{ep} presentations [†]	819,126	843,848	888,108	948,921	1,091,076	1,134,092	1,195,325	1,238,522	1,284,158	1,351,573	1,378,883	1,439,143	1,457,083
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations [‡]	100	100	100	100	100	95	95	95	95	100	100	99	96
Estimated ED _{dx} presentations	819,126	843,848	888,108	948,921	1,091,076	1,077,387	1,135,559	1,176,596	1,219,950	1,351,573	1,375,684	1,431,385	1,397,330
Number of MH _{dx} presentations [§]	21,393	24,306	28,608	34,987	42,216	42,114	43,562	46,895	50,183	..	60,108	56,965	56,166
Proportion of MH _{dx} presentations (%) [¶]	2.61	2.88	3.22	3.69	3.87	3.91	3.84	3.99	4.11	..	4.37	3.98	4.02
Estimated resident population ^{¶¶}	3,994,858	4,090,908	4,195,981	4,308,570	4,424,767	4,513,850	4,476,778	4,569,863	4,654,521	4,724,417	4,784,367	4,848,877	4,928,457
Number of ED _{ep} presentations per 1,000 population	2,050	2,063	2,117	2,202	2,466	2,512	2,670	2,710	2,759	2,861	2,882	2,968	2,956
Number of MH _{dx} presentations per 10,000 population	54	59	68	81	95	93	97	103	108	..	126	118	114
WA													
ED _{ep} presentations [†]	401,535	426,809	523,966	560,688	566,411	600,613	649,215	732,351	754,252	742,615	803,821	829,431	835,551
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations [‡]	71	74	70	70	76	76	76	77	76	75	77	83	91
Estimated ED _{dx} presentations	285,090	315,839	366,776	392,482	430,472	456,466	493,403	563,910	573,232	554,788	619,739	689,381	760,534
Number of MH _{dx} presentations [§]	10,114	11,279	13,518	13,455	14,634	15,179	17,021	19,809	21,372	..	26,157	29,827	31,414
Proportion of MH _{dx} presentations (%) [¶]	3.55	3.57	3.69	3.43	3.40	3.33	3.45	3.51	3.73	..	4.22	4.33	4.13
Estimated resident population ^{¶¶}	2,017,088	2,059,381	2,112,967	2,176,980	2,244,436	2,293,510	2,353,409	2,426,846	2,492,951	2,523,100	2,544,267	2,558,951	2,580,354
Number of ED _{ep} presentations per 1,000 population	1,991	2,073	2,480	2,576	2,524	2,619	2,759	3,018	3,026	2,943	3,159	3,241	3,238
Number of MH _{dx} presentations per 10,000 population	50	55	64	62	65	66	72	82	86	..	103	117	122

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
SA													
ED _{ep} presentations†	321,793	335,539	355,295	364,549	357,417	373,700	383,992	427,011	455,220	463,171	469,368	481,889	493,268
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations‡	86	91	91	90	63	97	97	98	98	97	96	96	97
Estimated ED _{dx} presentations	276,742	305,340	323,318	328,094	225,173	362,489	372,472	418,471	446,116	448,091	451,467	464,414	477,260
Number of MH _{dx} presentations§	15,426	12,996	14,164	13,960	15,064	15,513	15,833	15,844	16,949	..	21,036	23,003	23,596
Proportion of MH _{dx} presentations (%)¶	5.57	4.26	4.38	4.25	6.69	4.28	4.25	3.79	3.80	..	4.66	4.95	4.94
Estimated resident population¶¶	1,552,514	1,567,888	1,585,794	1,603,985	1,624,512	1,644,582	1,639,614	1,656,711	1,671,661	1,687,673	1,701,843	1,713,054	1,723,548
Number of ED _{ep} presentations per 1,000 population	2,073	2,140	2,240	2,273	2,200	2,272	2,342	2,577	2,723	2,744	2,758	2,813	2,862
Number of MH _{dx} presentations per 10,000 population	99	83	89	87	93	94	97	96	101	..	124	134	137
TAS													
ED _{ep} presentations†	102,281	114,820	119,451	124,853	130,108	141,630	143,848	141,700	147,064	148,278	150,076	153,541	156,323
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations‡	100	100	100	100	100	89	95	100	100	100	97	97	99
Estimated ED _{dx} presentations	102,281	114,820	119,451	124,853	130,108	126,051	136,656	141,700	147,064	148,278	145,044	148,629	154,736
Number of MH _{dx} presentations§	4,539	4,517	4,704	4,330	4,554	4,603	4,684	4,408	4,605	..	5,484	5,922	6,122
Proportion of MH _{dx} presentations (%)¶	4.44	3.93	3.94	3.47	3.50	3.65	3.43	3.11	3.13	..	3.78	3.98	3.96
Estimated resident population¶¶	486,327	489,951	493,204	497,922	503,292	507,643	511,483	511,848	512,520	513,839	515,396	517,588	520,877
Number of ED _{ep} presentations per 1,000 population	2,103	2,343	2,422	2,507	2,585	2,790	2,812	2,768	2,869	2,886	2,912	2,966	3,001
Number of MH _{dx} presentations per 10,000 population	93	92	95	87	91	91	92	86	90	..	106	114	118
ACT													
ED _{ep} presentations†	93,698	99,616	96,312	98,441	101,897	106,815	112,232	118,396	118,931	125,888	129,961	..	143,860
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations‡	83	100	100	100	100	100	100	100	100	100	100	..	100
Estimated ED _{dx} presentations	77,769	99,616	96,312	98,441	101,897	106,815	112,232	118,396	118,931	125,888	129,961	..	143,500
Number of MH _{dx} presentations§	2,248	2,737	2,635	2,509	2,793	3,102	3,433	3,638	3,751	..	3,958	..	4,743
Proportion of MH _{dx} presentations (%)¶	2.89	2.75	2.74	2.55	2.74	2.90	3.06	3.07	3.15	..	3.05	..	3.31
Estimated resident population¶¶	330,164	334,119	341,054	346,294	352,285	358,571	367,985	376,564	383,652	389,406	396,690	403,468	410,301
Number of ED _{ep} presentations per 1,000 population	2,838	2,981	2,824	2,843	2,892	2,979	3,050	3,144	3,100	3,233	3,276	..	3,506
Number of MH _{dx} presentations per 10,000 population	68	82	77	73	79	87	93	97	98	..	100	..	116
NT													
ED _{ep} presentations†	111,884	119,677	122,590	125,119	129,165	132,583	141,419	144,842	145,532	145,176	142,244	148,459	153,936
Estimated ED _{dx} presentations as a proportion of ED _{ep} presentations‡	92	94	94	98	98	100	100	100	100	100	92	93	93
Estimated ED _{dx} presentations	102,933	112,496	115,235	122,617	126,582	132,583	141,419	144,842	145,532	145,176	131,366	138,372	143,138
Number of MH _{dx} presentations§	2,703	3,482	3,524	2,891	3,381	3,170	3,689	4,607	6,737	..	6,213	6,486	6,540
Proportion of MH _{dx} presentations (%)¶	2.63	3.10	3.06	2.36	2.67	2.39	2.61	3.18	4.63	..	4.73	4.69	4.57
Estimated resident population¶¶	206,373	210,627	214,804	220,503	226,207	229,711	231,292	235,973	242,749	243,632	244,964	245,740	246,105
Number of ED _{ep} presentations per 1,000 population	5,421	5,682	5,707	5,674	5,710	5,772	6,114	6,138	5,995	5,959	5,807	6,041	6,255
Number of MH _{dx} presentations per 10,000 population	131	165	164	131	150	138	160	195	278	..	254	264	266

Abbreviations: ED: Emergency Department; ED_{ep}: ED presentations reported with episode-level data; ED_{dx}: ED_{ep} presentations with a principal diagnosis code; MH_{dx}: ED_{dx} presentations with a MH diagnosis code (F00-F99); ..: Not available / Not provided; //: Not applicable; NNAPEDCD: National Non-Admitted Patients Emergency Department Care Database; AHS: Australian Hospital Statistics; MHSA: Mental Health Services in Australia

† The number of occasions of service reported to the NNAPEDCD; Number of ED presentations for ACT in 2008-09 and 2009-10, TAS in 2009-10, and WA in 2011-12 were updated in AHS 2012-13. The number of ED presentations for WA in 2012-13 was updated in AHS 2013-14

‡ The proportion of ED occasions of service reported at episode-level to the NNAPEDCD that had a diagnosis;

§ Number of MH_{dx} presentations reported in MHSA, except for 2013-14; In 2013-14, the number of MH_{dx} presentations in Australia (but not for the jurisdictions) was reported in AHS 2013-14; The total number of MH_{dx} presentation for Australia in 2004-05 and 2005-06 were updated in MHSA 2007-08; Number of MH_{dx} presentations for WA in 2010-11 were updated in MHSA 2011-12, and for SA in 2012-13 and Australia in 2012-13 and 2013-14 were updated in MHSA 2014-15; Number of MH_{dx} presentations for ACT in 2010-11 were not reported in MHSA 2014-15, but available in AHS 2014-15.

¶ Number of MH_{dx} presentations / estimated ED presentations reported at episode-level with a principal diagnosis code;

¶¶ Estimated resident populations (year and jurisdiction) reported in *Australian Demographic Statistics* 2010 and 2017;

Sources: *Australian Hospital Statistics*,^[46,83-94] *Mental Health Services in Australia*,^[34-45] *Australian Demographic Statistics 2010*,^[194] *Australian Demographic Statistics 2017*.^[195]

Table 4.4: All ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by sex, 2004-05 to 2016-17, except 2013-14†

Sex	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)
Year	2004-05				2005-06				2006-07			
	All ED presentations				All ED presentations				All ED presentations			
Male	2,378,176	52.5	1,166.1	2,348.1	2,561,027	52.1	1,237.3	2,490.7	2,742,565	51.9	1,301.5	2,618.1
Female	2,150,947	47.5	1,054.7	2,123.8	2,353,458	47.9	1,137.1	2,288.8	2,544,571	48.1	1,207.5	2,429.1
Total ‡	4,529,123	100.0	2,220.7	N/A	4,914,485	100.0	2,374.4	N/A	5,287,136	100.0	2,509.0	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
Male	68,558	51.4	33.6	67.7	74,257	51.6	35.9	72.2	90,723	50.8	43.1	86.6
Female	64,734	48.6	31.7	63.9	69,740	48.4	33.7	67.8	87,856	49.2	41.7	83.9
Total ‡	133,292	100.0	65.4	N/A	143,997	100.0	69.6	N/A	178,579	100.0	84.7	N/A
Year	2007-08				2008-09				2009-10			
	All ED presentations				All ED presentations				All ED presentations			
Male	2,872,580	51.9	1,336.2	2,685.6	2,964,666	51.6	1,350.5	2,712.3	3,059,626	51.4	1,370.3	2,752.2
Female	2,664,369	48.1	1,239.3	2,491.0	2,777,223	48.4	1,265.1	2,540.8	2,897,974	48.6	1,297.9	2,606.8
Total ‡	5,536,949	100.0	2,575.5	N/A	5,741,889	100.0	2,615.7	N/A	5,957,600	100.0	2,668.1	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
Male	81,663	50.2	38.0	76.4	87,937	51.1	40.1	80.5	88,039	51.1	39.4	79.2
Female	81,050	49.8	37.7	75.8	84,032	48.9	38.3	76.9	84,378	48.9	37.8	75.9
Total ‡	162,713	100.0	75.7	N/A	171,969	100.0	78.3	N/A	172,417	100.0	77.2	N/A

Sex	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)
Year	2010-11				2011-12				2012-13			
	All ED presentations				All ED presentations				All ED presentations			
Male	3,163,638	51.2	1,416.1	2,845.5	3,340,262	51.1	1,468.7	2,952.6	3,412,597	50.8	1,474.4	2,965.9
Female	3,018,872	48.8	1,351.3	2,715.2	3,200,246	48.9	1,407.2	2,828.8	3,299,187	49.2	1,425.4	2,867.3
Total ‡	6,182,510	100.0	2,767.5	N/A	6,540,508	100.0	2,875.9	N/A	6,711,784	100.0	2,899.8	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
Male	90,612	51.1	40.6	81.5	96,298	51.0	42.3	86.1	106,719	50.6	46.1	92.8
Female	86,715	48.9	38.8	78.0	92,434	49.0	40.6	81.7	104,396	49.4	45.1	90.7
Total ‡	177,327	100.0	79.4	N/A	188,732	100.0	83.0	N/A	211,115	100.0	91.2	N/A
Year	2014-15				2015-16				2016-17			
	All ED presentations				All ED presentations				All ED presentations			
Male	3,722,867	50.5	1,560.9	3,147.6	3,771,023	50.5	1,557.6	3,141.7	3,903,548	50.3	1,586.9	3,199.2
Female	3,643,142	49.5	1,527.5	3,080.2	3,694,433	49.5	1,525.9	3,077.9	3,851,595	49.7	1,565.8	3,156.6
Total ‡	7,366,009	100.0	3,088.4	N/A	7,465,456	100.0	3,083.5	N/A	7,755,143	100.0	3,152.6	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
Male	132,741	51.8	55.7	112.2	142,381	52.1	58.8	118.6	143,956	52.0	58.5	118.0
Female	123,417	48.2	51.7	104.4	131,009	47.9	54.1	109.2	132,960	48.0	54.1	109.0
Total ‡	256,158	100.0	107.4	N/A	273,390	100.0	112.9	N/A	276,916	100.0	112.6	N/A

Sex	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)	No.	%	Rate/10,000 (total)	Rate/10,000 (sex specific)
	x-fold				AAGR (%)				CAGR (%)			
	All ED presentations				All ED presentations				All ED presentations			
Male	1.64	0.96	1.36	1.36	4.24	-0.35	2.62	2.63	4.22	-0.35	2.60	2.61
Female	1.79	1.05	1.48	1.49	5.00	0.37	3.37	3.38	4.97	0.37	3.35	3.36
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
Male	2.10	1.01	1.74	1.74	5.67	-0.14	4.02	4.00	6.38	0.09	4.73	4.74
Female	2.05	0.99	1.70	1.70	6.00	0.15	4.34	4.33	6.18	-0.10	4.54	4.55

Abbreviations and symbols: %: percentage; Rate/10,000 (total): Number of presentations per 10,000 total population; Rate/10,000 (sex specific): Number of presentations per 10,000 sex-specific population; AAGR: Average Annual Growth Rate; CAGR: Compound Annual Growth Rate; ED: Emergency Department; MH: Mental Health; N/A: Not applicable; No.: Number of presentations; x-fold: x-fold difference between the last year and the first year;

† Data on ED presentations with a MH diagnosis for 2013-14 were not available

‡ Total number of presentations with data on sex.

Sources: Australian Hospital Statistics,^[46,83-94] *Mental Health Services in Australia*,^[34-45]

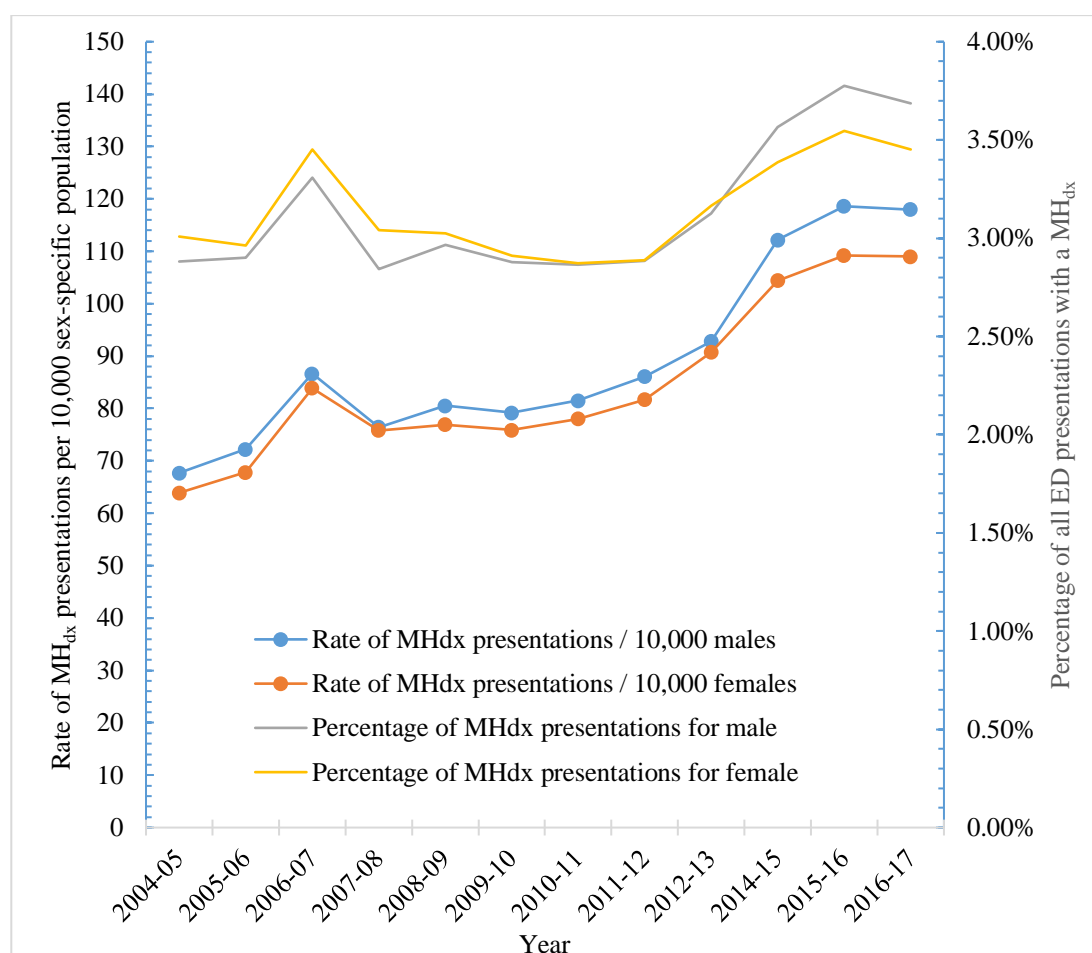


Figure 4.3: Rate (per 10,000 population) and percentage of all ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by sex, 2004-05 to 2016-17, except 2013-14†

Abbreviations and symbols: ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health;

† Data for 2013-14 were not available

Table 4.5: Multivariable generalised linear regression model examining the trend of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) as a proportion of all ED presentations in Australia, by sex, 2004-05 to 2016-17, except 2013-14†

	RR	SE	p (z-test)	95%CI
Male	REF	//	//	//
Female	1.077	0.031	0.010	1.018-1.140
Year	1.023	0.002	< 0.001	1.018-1.028
Female x year ‡	0.990	0.003	0.002	0.983-0.996

Abbreviations and symbols: //: Not applicable; 95%CI: 95% confidence interval of RR; ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; RR: Risk Ratio; SE: Standard Error; p: p-values of z-test; REF: the reference group to which other groups were compared;

† Data for 2013-14 were not available

‡ Interaction term between year (continuous variable) and sex (categorical variable) in the models

4.5. Discussion

This is the first examination of long-term trends in MH_{dx} presentations in Australia, by jurisdiction and by sex; and furthers work presented in Chapters 5 to 7. Between 2004-05 and 2016-17, there was an increase in MH_{dx} presentations in Australian public hospital EDs based upon principal diagnosis in both relative and absolute terms. The proportion of MH_{dx} presentations increased from 3.3% to 3.7%, while the number of MH_{dx} presentations per 10,000 population increased over 65%, from 68.0 to 112.6. Since 2010-11, MH_{dx} presentations have increased by 0.12 percentage points annually. The proportion of MH_{dx} presentations varied between jurisdictions, and was highest in SA in most years, while the NT had the highest level of MH_{dx} presentations per 10,000 population, more than double the Australian average. Significant increases in the proportion of MH_{dx} presentations were found for VIC, QLD, WA, ACT and the NT, although upturns were observed in all jurisdictions, predominantly since 2009-10. Females had higher proportions of ED presentations with a MH diagnosis over the study period, although males had greater numbers of ED_{dx} and MH_{dx} presentations in each year.

The assessed increase in both numbers and proportions of presentations with a MH_{dx} is considered clinically significant, the recent annual increase in the proportion of presentations by 0.12%, corresponding to an additional two patients with a MH condition per hospital per week, on average [(276,954 MH_{dx} presentations x 0.12% increase) / 287 hospitals / 52 weeks]. Patients with a MH_{dx} are known to experience

differential care needs, some with marked impacts on operations within resource constrained EDs. First, patients with a MH_{dx} are more vulnerable and therefore require heightened clinical consideration.^[196,197] Second, patients with a MH_{dx} more frequently require additional staffing^[197] and use of resources for sedation/containment (resuscitation bays, resuscitation monitoring in normal bays, nurses, orderlies and security guards as well as a doctor).^[198] Third, patients with a MH_{dx} stay in ED longer waiting for a ward bed^[62] which is both the wrong environment for their recovery as well as potentially disruptive to the care of other physiologically sick patients within the ED, and the wellbeing of the caregivers of each.^[62,197]

The markedly higher rate of ED use in the NT relative to all other jurisdictions is hypothesised, to be in part, a consequence of the higher disease burden in this jurisdiction^[199] as well as the composition of the NT's health system. For example, the number of full-time working equivalent general practitioners per 100,000 population in the NT is the least across all jurisdictions, and around two-thirds the national average in 2006-07.^[200] Thus, inadequate community services including primary care, may be a critical driver in the use of the ED in general,^[201] and in particular for MH patients.

SA had the highest relative demand for MH_{dx} presentations in most years and experienced a marked increase after 2012-13. Whether the load in SA EDs is reflective of issues particular to that jurisdiction is unknown. However, concerns were raised following the transfer of 10% of acute hospital funding to the community in 2011, which led to a substantial closure of acute hospital psychiatric beds.^[22] By 2014, the number of acute hospital psychiatric beds in SA was 20% below the national average; an additional 30 acute beds were commissioned. Another potential contributor to SA's (and other jurisdictions) increased load of MH_{dx} presentations was the introduction of

the National Emergency Access Target (NEAT). The NEAT, announced in February 2011, was implemented from July 2011 as a part of National Health Reform Agreement,^[202] and has been suggested to lead to increased re-presentations.^[203]

The proportion of MH_{dx} presentations reported in this study, 3.7% in 2016-17, is approximately 0.1% higher than the 2016-17 figure published by the AIHW.^[45] We believe this is due to the use of all ED presentation data as the denominator by the AIHW, rather than presentations with a diagnosis (ED_{dx}) in the current analysis. Our assessment of an average 3.5% of ED presentations between 2004-05 and 2016-17 having a MH_{dx} compares with the 4% for the period 2000-2014, estimated in a meta-analysis of individual hospital and regional data from six countries, including Australia, with health systems comparable to the English National Health System.^[26] However, as the actual estimate was around 3.5% (based on the meta-analysis Forest plot), the findings are consistent, arguably reflecting the inclusion of five Australian studies in the six included in the meta-analysis: three from NSW and two, VIC. Since this meta-analysis, an average 3.0% of all NSW ED presentations have been assessed as MH-related between 2010 and 2014.^[54,204] The results presented in the current study for NSW, 2.7% in 2010 to 3.8% in 2014, are not inconsistent although diagnoses included were narrower in the current study. However, a clearer comparison would have been facilitated if all data were presented by individual year rather than multi-year timeframes.

We also note that the proportion of presentations with a MH diagnosis in Australia was not markedly different from the US in the mid-2000s, when the US data are limited to episodes with a MH primary diagnostic code (3.0% in 2001 to 3.5% in 2006).^[49] Finally, the increasing load of MH_{dx} presentations in general hospital EDs is not just an Australian phenomenon. In the US, studies based on national data^[49,50,126]

have shown an increase in the proportion of MH-related presentations in general hospital EDs between 1992 and 2010.

Across the study period, males had slightly higher numbers of all ED and MH_{dx} presentations than females in each year, while females experienced higher rates of annual increases in both all ED and MH_{dx} presentations per 10,000 population. The increase in the proportion of all ED presentations by females is consistent with a Melbourne study, which found an increase in the proportion of ED presentations by females between 1999-00 and 2008-09.^[205] Regarding MH_{dx} presentations, while we found that there were always more males than females presenting, a higher proportion of females than males presented to a Queensland hospital ED for a mental health condition in 2011-12,^[63] and in NSW between 2010-2014.^[54] We believe that these differences are at least in part due to the broad definition of MH-related presentations used in these jurisdictional studies given that females have been found to experience more presentations due to suicidal ideation/self-harm.^[54,63]

4.6. Strengths and Limitations

This paper provides the most comprehensive evidence on trends in presentations with a MH diagnosis nationally, assessing trends for all jurisdictions over a 13-year period using data from the national collection. While these data are limited by the absence of a national agreement and standards on data collection within EDs and different coding systems across jurisdictions,^[206] the size of the individual collections should maximise the robustness of the intra- and inter-jurisdictional comparisons. The individual collections are also the best available evidence, these administrative data used for other analyses.^[207,208] However, administrative data are also subject to a general lack of understanding of their potential usefulness, and thus the importance of robust coding practices.^[209] Further, as the jurisdictional collections

and NNAPEDCD have historically only recorded one diagnostic code, there is an underestimation of mental health presentations, as self-harm and suicide-related presentations are not coded as an F-code but as X60-X84, and may even be coded as injury (U50-Y98).^[34,45,51,54] The expansion of the NNAPEDCD from 2013-14 from peer group A and B hospitals to all hospitals with an ED may also confound the trend analysis. However, this concern only pertains to NSW, the only jurisdiction in which the number of hospitals included increased, and in turn, Australia. However, as the breakpoints for NSW (2011-12) and Australia (2010-11) occurred prior to this change in data collection, we believe any impact on our findings will be minimal. Other major changes in data collection practices during the study period include the retention of patients who were admitted and remained within the ED environment (e.g. in an observation unit, short-stay unit, ED ward or awaiting a bed in an admitted patient ward of the hospital) until they physically departed the ED in 2012-13,^[72,75] but this will not affect the current assessment of load. The introduction of SNOMED for diagnostic coding in NSW in 2008^[210] could impact findings, if this coding mechanism differs in its ability to capture a presentation with a primary MH diagnosis compared with ICD coding processes. As the usefulness of SNOMED-CT for data analysis has been recently queried,^[211] this may be an issue, particularly for inter-jurisdictional comparisons. Finally, we were unable to either determine the re-presentations rate, or undertake multi-factorial analysis given the aggregated nature of the data reported by the AIHW.

4.7. Conclusion

MH presentations, excluding self-harm and suicide attempt, have given rise to an increasing load within Australian public hospital EDs nationally and in each jurisdiction between 2004-05 and 2016-17. Of particular concern are the markedly

higher rate of presentations in the NT, and the higher relative load in SA public hospitals. However, significant or upwards trends of MH_{dx} presentations across all jurisdictions indicates generic issues necessitating concern and policy development at a national level.

Chapter 5. Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: a secondary data analysis

5.1. Preface

This chapter presents Study 3 of this thesis, an examination of the trends in the rates of emergency department (ED) presentations with a mental health diagnosis (MH_{dx}) for Australia by age group, between 2004-05 and 2016-17. A manuscript of this study has been published by *Emergency Medicine Australasia* (Appendix 4):

Tran, Q.N., Lambeth, L.G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V., Huckerby, E.J., Neil, A.L., Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: a secondary data analysis. *Emergency Medicine Australasia*, 2019, 31:1064-1072. DOI: 10.1111/1742-6723.13323

5.2. Introduction

Emergency departments (EDs) have been experiencing overcrowding due to increasing demand in Australia^[205] and elsewhere,^[212-214] with mental health (MH)-related presentations a particular concern.^[26,215] Globally, there has been a shift in focus towards MH-related ED (MHrED) presentations for children and youth;^[28,216] a shift beginning to be observed within Australia.^[217]

Australian studies with age-breakdowns have been undertaken at state level, particularly Victoria^[51-53] and NSW.^[54] Nationally, ED data by age-group using a narrow definition of MH diagnoses according to the *International Statistical*

Classification of Diseases and Related Health Problems, 10th revision, Australian Modification (ICD-10-AM) codes F00-F99 as the primary diagnosis, MH_{dx}, have been reported annually by the Australian Institute of Health and Welfare (AIHW) for 2004-05 to 2016-17,^[34-45] but no trends have been assessed. Given that mental illness is chronic, and different age groups, such as children (0-14 years), youth (15-24 years) and older people (65 years and over) require different MH and treatment strategies,^[55-58] information on trends of MH-related presentations by age-group may be useful for service planning within EDs and the broader health system.

This study aims to explore for Australia (1) the trends of ED presentations with a MH diagnosis by age group; and (2) whether those trends differ from all ED presentations between 2004-05 and 2016-17.

5.3. Methods

5.3.1. Data sources

ED data were extracted from two AIHW series: *Australian Hospital Statistics* (AHS) and *Mental Health Services in Australia* (MHSA). AHS comprises *Australian Hospital Statistics* for 2004-05 to 2012-2013,^[46,84-91] *Australian Hospital Statistics: Emergency department care 2013-14*,^[83] and *Emergency department care: Australian Hospital Statistics* for 2014-15 to 2016-17.^[92-94] MHSA comprises data for 2004-05 to 2016-17^[34-45] with the exception of 2013-14 which was not available. Both series report data from the *National Non-Admitted Patient Emergency Department Care Database* (NNAPEDCD), comprised of data on presentations to public hospital EDs since 2003-04, limited to peer groups A (principal referral and specialist women's and children's hospitals) and B (large hospitals) until 2012-13.^[83] To be classified as peer group B, hospitals needed to have more than 10,000 annual acute casemix-adjusted

separations in a major city, more than 8,000 in a regional area, and more than 5,000 in a remote area. The MHSA series is limited to ICD-10-AM F-codes (Table 2.4) while diagnostic information in the overarching AHS series has only been provided since 2013-14, and then only at the ICD-10-AM chapter level, e.g. U50-Y98 (External causes of morbidity and mortality). As coding of suicide- and self-harm-related ED presentations may occur at the 3-character level (e.g. X60-X84, Intentional self-harm) or even under an injury code, MH presentations in this study were necessarily limited to those with a principal diagnosis assigned an ICD-10 F00-F99.

Total number of ED presentations and the number of ED presentations by age group were extracted from the AHS and MHSA series at the national level. Age groups employed comprised 0-14 (children), 15-24 (youth), 25-34 (younger adults), 35-44, 45-54, 55-64, and ≥ 65 (older people) years of age, as per the MHSA series.

Data on estimated resident population for Australia in total and by age-group were extracted from the *Australian Demographic Statistics* series.^[194,218]

Total change (absolute and percentage change), average annual growth rate (AAGR) and compound annual growth rate (CAGR) in the absolute number of presentations and the rate of presentations per 10,000 population (total and age-group specific), for all ED and MH_{dx} presentations were assessed. For MH_{dx} presentations, AAGRs were assessed excluding rates pertaining to 2013-14. For each year, also assessed were (i) the proportion of MH_{dx} presentations by age group and (ii) MH_{dx} presentations as a proportion of all ED presentations (in percentage points) for each age group. As publicly available secondary data were collated and analysed, ethics approval was not sought.

Data were entered into Microsoft Excel 2016,^[96] then, exported to Stata 14.^[97]

5.3.2. *Statistical analysis*

Multivariable generalised linear regression models with a log link were employed to model the proportion of all ED presentations with a MH diagnosis. Age group and year, and an interaction term between these, were included as variables to estimate trend, and to test for a difference in trend between the age groups. Statistical significance was identified with $p\text{-value} \leq 0.05$.

5.4. Results

5.4.1. *ED and MH_{dx} presentations by age group*

Between 2004-05 and 2016-17, across all age-groups, the greatest number of all ED presentations and rate of presentations per 10,000 total population in each year were for children (0-14 years) reaching 1,650,641 presentations and 671.0 presentations per 10,000 total population in 2016-17. The second highest was for older persons (≥ 65 years) reaching 1,636,008 presentations and 665.1 presentations per 10,000 total population in 2016-17 (Table 5.1, Figure 5.1, Figure 5.2). The lowest number of all ED presentations and rate of presentations per 10,000 total population in each year were for people aged 55-64 years (714,857 and 290.6 in 2016-17, respectively). The highest age-specific rate was for older persons (4,455.1 presentations per 10,000 older persons) followed by children (3,609.9 presentations per 10,000 children), with the lowest age-specific rate for people aged 45-54 years (2,529.6 presentations per 10,000 people age 45-54 years in 2016-17).

For MH_{dx} presentations, presentations for youth (15-24 years) (61,328 presentations, 24.9 presentations per 10,000 total population, and 193.5 presentations per 10,000 youth in 2016-17) predominated, followed by younger adults (25-34 years) (58,475 presentations, 23.8 presentations per 10,000 total population, and 162.1

presentations per 10,000 younger adults in 2016-17) and persons aged 35-44 years (53,533 presentations, 21.8 presentations per 10,000 total population, and 165.5 presentations per 10,000 people aged 35-44 years in 2016-17) (Table 5.2, Figure 5.2). Children had the lowest number of MH_{dx} presentations and rate of presentations per 10,000 total population in each year across the study period (11,478 presentations, 4.7 presentations per 10,000 total population, and 25.1 presentations per 10,000 children in 2016-17).

For MH_{dx} presentations as a proportion of all ED presentations, people aged 35-44 years had the highest proportion in each year (6.2% in 2016-17). Between 2004-05 and 2011-12, the second highest proportion was for younger adults (ranging between 4.5% and 4.9%) and since 2012-13, youth (ranging between 4.9% and 5.9%), except for 2014-15 when the proportion was marginally higher for younger adults (5.5% versus 5.4%) (Figure 5.3). Children had the lowest proportion, <1% in each year while older persons had the second lowest, <2% in each year.

5.4.2. Trends for all ED and MH_{dx} presentations by age group

Across all age-groups, the absolute number and relative number (per 10,000 total population) of all ED presentations increased over the study period, except for youth, which experienced a very slight decrease in the relative number of ED presentations after 2011-12 (Table 5.1, Figure 5.1). However, this was not reflected at the age-group level (Figure 5.4). The greatest increase in relative number of presentations (presentations per 10,000 total population) (1.7-fold) was for older persons, equating to an AAGR of 5.2% and CAGR of 4.5%. The smallest increase was for youth (1.2-fold, 2.0% AAGR, 1.8% CAGR) (Table 5.1). Within the context of age-group specific rates, the greatest increase in relative number of presentations (1.6-fold, 4.6% AAGR, 4.0% CAGR) was for people aged 45-54 years, while the smallest was

for younger adults (1.3-fold, 2.3% AAGR, 2.0% CAGR). Between 2014-15 to 2016-17, the age-group specific rates for children, youth and young adults were stable (Figure 5.4).

For MH_{dx} presentations, the greatest increase in the number of presentations per 10,000 total population was for children (2.5-fold, 9.3% AAGR, 7.8% CAGR), and the smallest for younger adults (1.5-fold, 2.3% AAGR, 3.3% CAGR) (Table 5.1). There were marked increases in presentation rates since 2010-11 for youth and younger adults, and from 2011-12 for all other groups, particularly those aged 35-44 and 45-54 years. However, rates decreased for younger adults and those aged 35-44 years between 2015-16 and 2016-17. Within the context of age-group specific rates, the greatest increase in relative number of MH_{dx} presentations remained children (2.6-fold, 9.9% AAGR, 8.3% CAGR), and the smallest, younger adults (1.4-fold, 2.2% AAGR, 2.9% CAGR).

Multivariable regression (Table 5.3) showed that MH_{dx} presentations as a proportion of ED presentations by age group was lowest in children, and highest in those aged 35-44 years (13.2 times higher than for children). For each age-group the risk ratio increased at 5% annually, with the trends similar across age groups, but highest for children and youth.

Table 5.1: Summary of numbers and rates per 10,000 population (total and age-group specific) for all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99), by age group, 2004-05 to 2016-17, except 2013-14[†]

Age group	2004-05	2016-17	Total change‡		Period	AAGR¶	CAGR¶	2004-05	2016-17	Total change‡		Period	AAGR¶	CAGR¶
			n	%	mean§					n	%	mean§		
Number of all ED presentations								Rate of all ED presentations per 10,000 total population						
0–14	1,034,308	1,650,641	616,333	59.6 %	1,359,799	4.7 %	4.0 %	507.1	671.0	163.9	32.3 %	604.3	3.0 %	2.4 %
15–24	698,266	1,040,898	342,632	49.1 %	916,948	3.7 %	3.4 %	342.4	435.4	80.8	23.6 %	408.0	2.0 %	1.8 %
25–34	667,574	1,057,134	389,560	58.4 %	858,509	4.5 %	3.9 %	327.3	429.8	102.4	31.3 %	381.4	2.8 %	2.3 %
35–44	537,233	857,355	320,122	59.6 %	716,634	4.5 %	4.0 %	263.4	350.7	85.1	32.3 %	318.4	2.8 %	2.4 %
45–54	434,157	797,679	363,522	83.7 %	616,997	5.8 %	5.2 %	212.9	324.3	111.4	52.3 %	273.4	4.1 %	3.6 %
55–64	359,996	714,857	354,861	98.6 %	531,091	6.7 %	5.9 %	176.5	290.6	114.1	64.6 %	235.0	4.9 %	4.2 %
≥65	797,756	1,636,008	838,252	105.1 %	1,165,569	7.0 %	6.2 %	391.2	665.1	273.9	70.0 %	515.4	5.2 %	4.5 %
Number of ED presentations with a MH diagnosis								Rate of ED presentations with a MH diagnosis per 10,000 total population						
0–14	3,844	11,478	7,634	198.6 %	7,014	11.1 %	9.5 %	1.9	4.7	2.8	147.6 %	3.1	9.3 %	7.8 %
15–24	28,943	61,328	32,385	111.9 %	43,577	6.9 %	6.5 %	14.2	24.9	10.7	75.7 %	19.3	5.2 %	4.8 %
25–34	33,024	58,475	25,451	77.1 %	43,083	4.0 %	4.9 %	16.2	24.7	7.6	46.8 %	19.1	2.3 %	3.3 %
35–44	26,855	53,533	26,678	99.3 %	39,289	5.0 %	5.9 %	13.2	23.3	8.6	65.3 %	17.4	3.3 %	4.3 %
45–54	17,619	39,935	22,316	126.7 %	27,552	6.6 %	7.1 %	8.6	16.2	7.6	87.9 %	12.2	5.0 %	5.4 %
55–64	9,550	21,619	12,069	126.4 %	14,733	6.3 %	7.1 %	4.7	8.8	4.1	87.7 %	6.5	4.6 %	5.4 %
≥65	13,531	30,516	16,985	125.5 %	20,306	6.6 %	7.0 %	6.6	12.4	5.8	87.0 %	9.0	4.9 %	5.4 %

Age group	2004-05	2016-17	Total change‡		Period	AAGR¶	CAGR¶	2004-05	2016-17	Total change‡		Period	AAGR¶	CAGR¶
			n	%	mean§					n	%	mean§		
Rate of all ED presentations per 10,000 population (age-group specific)								Rate of ED presentations with a MH diagnosis per 10,000 population (age-group specific)						
0–14	2,580.5	3,609.9	1,029.4	39.9 %	3,205.5	3.4 %	2.8 %	9.6	25.1	15.5	161.5 %	16.4	9.9 %	8.3 %
15–24	2,506.8	3,284.4	777.6	31.0 %	3,025.3	2.5 %	2.3 %	103.9	193.5	89.6	86.2 %	143.3	5.6 %	5.3 %
25–34	2,314.8	2,929.7	614.9	26.6 %	2,703.8	2.3 %	2.0 %	114.5	162.1	47.6	41.6 %	135.1	2.2 %	2.9 %
35–44	1,786.0	2,650.9	864.9	48.4 %	2,279.3	3.8 %	3.3 %	89.3	165.5	76.2	83.3 %	124.8	4.3 %	5.3 %
45–54	1,573.8	2,529.6	955.8	60.7 %	2,057.1	4.6 %	4.0 %	63.9	126.6	62.7	98.1 %	91.7	5.4 %	5.9 %
55–64	1,713.3	2,570.7	857.4	50.0 %	2,129.5	4.0 %	3.4 %	45.4	77.7	32.3	77.2 %	58.9	3.7 %	4.6 %
≥65	3,089.9	4,455.1	1,365.2	44.2 %	3,796.4	3.6 %	3.1 %	52.4	83.1	30.7	58.6 %	65.9	3.6 %	3.9 %

Abbreviations and symbols: AAGR: Average Annual Growth Rate; CAGR: Compound Annual Growth Rate; ED: Emergency Department; MH: Mental Health; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*;

† Data for 2013-14 were not available

‡ Absolute total change was calculated as the difference between the 2016-17 and 2004-05 values, and the percentage total change as the absolute total change divided by the 2004-05 value.

§ Period mean of the whole study period (2004-05 to 2016-17)

¶ AAGR was calculated by averaging the annual percentage increases across the study period. For ED presentations with a MH diagnosis, given the lack of data for 2013-14, growth rates between 2012-13 and 2014-15 were not included in this assessment.

¶ CAGR was calculated using the compound interest formula between the first and last years.

Source: *Australian Hospital Statistics*,^[46,83-94] *Mental Health Services in Australia*.^[34-45]

Table 5.2: Numbers, percentage, rates per 10,000 population (total and age-group specific) for all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by age group, 2004-05 to 2016-17, except 2013-14†

Age	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§
Year	2004-05				2005-06				2006-07			
	All ED presentations				All ED presentations				All ED presentations			
≤14	1,034,308	22.8	507.1	2,580.5	1,132,373	23.0	547.1	2,815.4	1,192,542	22.6	565.9	2,944.2
15–24	698,266	15.4	342.4	2,506.8	767,222	15.6	370.7	2,705.8	833,672	15.8	395.6	2,887.6
25–34	667,574	14.7	327.3	2,314.8	714,617	14.5	345.3	2,474.9	754,924	14.3	358.3	2,608.8
35–44	537,233	11.9	263.4	1,786.0	584,219	11.9	282.3	1,931.1	632,921	12.0	300.4	2,070.1
45–54	434,157	9.6	212.9	1,573.8	469,482	9.6	226.8	1,674.5	511,961	9.7	243.0	1,792.7
55–64	359,996	7.9	176.5	1,713.3	389,807	7.9	188.3	1,785.5	429,686	8.1	203.9	1,900.6
≥65	797,756	17.6	391.2	3,089.9	856,938	17.4	414.0	3,249.0	930,727	17.6	441.7	3,456.5
Total‡	4,529,290	100.0	2,220.8	N/A	4,914,658	100.0	2,374.5	N/A	5,286,433	100.0	2,508.7	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
≤14	3,844	2.9	1.9	9.6	4,357	3.0	2.1	10.8	6,120	3.4	2.9	15.1
15–24	28,943	21.7	14.2	103.9	31,736	22.0	15.3	111.9	39,314	22.0	18.7	136.2
25–34	33,024	24.8	16.2	114.5	34,843	24.2	16.8	120.7	40,427	22.6	19.2	139.7
35–44	26,855	20.1	13.2	89.3	29,243	20.3	14.1	96.7	36,539	20.5	17.3	119.5
45–54	17,619	13.2	8.6	63.9	19,220	13.3	9.3	68.6	24,914	14.0	11.8	87.2
55–64	9,550	7.2	4.7	45.4	10,283	7.1	5.0	47.1	13,032	7.3	6.2	57.6
≥65	13,531	10.1	6.6	52.4	14,316	9.9	6.9	54.3	18,189	10.2	8.6	67.6
Total‡	133,366	100.0	65.4	N/A	143,998	100.0	69.6	N/A	178,535	100.0	84.7	N/A

Age	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§
Year	2007-08				2008-09				2009-10			
	All ED presentations				All ED presentations				All ED presentations			
≤14	1,282,693	23.2	596.6	3,141.1	1,281,434	22.3	583.8	3,102.4	1,329,251	22.3	595.3	3,173.0
15–24	855,102	15.4	397.7	2,892.8	896,959	15.6	408.6	2,956.3	918,202	15.4	411.2	2,950.7
25–34	765,965	13.8	356.3	2,613.2	794,168	13.8	361.8	2,641.1	820,226	13.8	367.3	2,640.9
35–44	658,428	11.9	306.3	2,129.4	681,738	11.9	310.6	2,185.0	704,774	11.8	315.6	2,240.2
45–54	540,162	9.8	251.3	1,855.5	568,665	9.9	259.1	1,919.7	599,537	10.1	268.5	1,990.8
55–64	453,814	8.2	211.1	1,944.2	482,096	8.4	219.6	1,997.3	508,549	8.5	227.8	2,054.1
≥65	980,813	17.7	456.2	3,548.2	1,036,867	18.1	472.3	3,662.7	1,077,163	18.1	482.4	3,695.4
Total‡	5,536,977	100.0	2,575.5	N/A	5,741,927	100.0	2,615.7	N/A	5,957,702	100.0	2,668.2	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
≤14	5,143	3.2	2.4	12.6	5,803	3.4	2.6	14.0	6,275	3.6	2.8	15.0
15–24	35,963	22.1	16.7	121.7	38,346	22.3	17.5	126.4	39,293	22.8	17.6	126.3
25–34	36,545	22.5	17.0	124.7	37,715	21.9	17.2	125.4	37,215	21.6	16.7	119.8
35–44	34,090	21.0	15.9	110.2	35,534	20.7	16.2	113.9	35,241	20.4	15.8	112.0
45–54	22,707	14.0	10.6	78.0	24,824	14.4	11.3	83.8	24,224	14.0	10.8	80.4
55–64	12,164	7.5	5.7	52.1	12,824	7.5	5.8	53.1	13,031	7.6	5.8	52.6
≥65	16,106	9.9	7.5	58.3	16,924	9.8	7.7	59.8	17,163	10.0	7.7	58.9
Total‡	162,718	100.0	75.7	N/A	171,970	100.0	78.3	N/A	172,442	100.0	77.2	N/A

Age	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§
Year	2010-11				2011-12				2012-13			
	All ED presentations				All ED presentations				All ED presentations			
≤14	1,346,160	21.8	602.6	3,206.1	1,416,578	21.7	622.9	3,346.0	1,442,860	21.5	623.4	3,355.1
15–24	944,204	15.3	422.7	3,080.5	990,150	15.1	435.4	3,230.4	1,001,227	14.9	432.6	3,246.9
25–34	852,920	13.8	381.8	2,728.9	901,714	13.8	396.5	2,822.9	929,080	13.8	401.4	2,825.9
35–44	728,119	11.8	325.9	2,320.6	764,574	11.7	336.2	2,418.7	776,221	11.6	335.4	2,431.9
45–54	626,092	10.1	280.3	2,076.3	663,221	10.1	291.6	2,184.6	682,958	10.2	295.1	2,234.5
55–64	540,905	8.7	242.1	2,161.2	573,814	8.8	252.3	2,239.7	587,477	8.8	253.8	2,268.2
≥65	1,143,904	18.5	512.0	3,830.0	1,230,314	18.8	541.0	3,984.3	1,291,800	19.2	558.1	4,014.3
Total‡	6,182,304	100.0	2,767.4	N/A	6,540,365	100.0	2,875.8	N/A	6,711,623	100.0	2,899.7	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
≤14	6,035	3.4	2.7	14.4	6,868	3.6	3.0	16.2	8,366	4.0	3.6	19.5
15–24	39,863	22.5	17.8	130.1	43,921	23.3	19.3	143.3	49,372	23.4	21.3	160.1
25–34	38,182	21.5	17.1	122.2	40,621	21.5	17.9	127.2	45,024	21.3	19.5	136.9
35–44	35,618	20.1	15.9	113.5	36,901	19.6	16.2	116.7	40,436	19.2	17.5	126.7
45–54	25,184	14.2	11.3	83.5	25,842	13.7	11.4	85.1	29,772	14.1	12.9	97.4
55–64	13,836	7.8	6.2	55.3	14,579	7.7	6.4	56.9	15,759	7.5	6.8	60.8
≥65	18,656	10.5	8.4	62.5	19,992	10.6	8.8	64.7	22,394	10.6	9.7	69.6
Total‡	177,374	100.0	79.4	N/A	188,724	100.0	83.0	N/A	211,123	100.0	91.2	N/A

Age	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§	No.	%	Rate/10,000 (total)¶	Rate/10,000 (age-group specific)§
Year	2014-15				2015-16				2016-17			
	All ED presentations				All ED presentations				All ED presentations			
≤14	1,587,358	21.6	665.5	3,589.2	1,621,395	21.7	669.7	3,603.5	1,650,641	21.3	671.0	3,609.9
15-24	1,031,769	14.0	432.6	3,301.3	1,025,706	13.7	423.7	3,260.2	1,040,898	13.4	423.1	3,284.4
25-34	1,014,174	13.8	425.2	2,934.1	1,029,611	13.8	425.3	2,909.9	1,057,134	13.6	429.7	2,929.7
35-44	836,518	11.4	350.7	2,593.6	837,508	11.2	345.9	2,594.4	857,355	11.1	348.5	2,650.9
45-54	749,146	10.2	314.1	2,416.0	760,907	10.2	314.3	2,437.4	797,679	10.3	324.3	2,529.6
55-64	658,662	8.9	276.2	2,449.9	673,432	9.0	278.2	2,468.8	714,857	9.2	290.6	2,570.7
≥65	1,488,116	20.2	623.9	4,305.5	1,516,426	20.3	626.3	4,266.4	1,636,008	21.1	665.1	4,455.1
Total‡	7,365,743	100.0	3,088.3	N/A	7,464,985	100.0	3,083.3	N/A	7,754,572	100.0	3,152.4	N/A
	ED presentations with a MH diagnosis				ED presentations with a MH diagnosis				ED presentations with a MH diagnosis			
≤14	9,494	3.7	4.0	21.5	10,387	3.8	4.3	23.1	11,478	4.1	4.7	25.1
15-24	55,428	21.6	23.2	177.3	59,418	21.7	24.5	188.9	61,328	22.1	24.9	193.5
25-34	55,252	21.6	23.2	159.8	59,670	21.8	24.6	168.6	58,475	21.1	23.8	162.1
35-44	51,201	20.0	21.5	158.7	56,279	20.6	23.2	174.3	53,533	19.3	21.8	165.5
45-54	37,069	14.5	15.5	119.5	39,314	14.4	16.2	125.9	39,935	14.4	16.2	126.6
55-64	19,959	7.8	8.4	74.2	20,165	7.4	8.3	73.9	21,619	7.8	8.8	77.7
≥65	27,750	10.8	11.6	80.3	28,134	10.3	11.6	79.2	30,516	11.0	12.4	83.1
Total‡	256,153	100.0	107.4	N/A	273,367	100.0	112.9	N/A	276,884	100.0	112.6	N/A

Abbreviations and symbols: %: percentage; ACT: Australian Capital Territory; ED: Emergency Department; MH: Mental Health; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; No.: Number of presentations; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Data were not available

‡ Total number of presentations with age-related data

¶ Rates of presentation per 10,000 total population

§ Rates of presentations per 10,000 population (age-group specific)

Source: *Australian Hospital Statistics*,^[46,83-94] *Mental Health Services in Australia*.^[34-45]

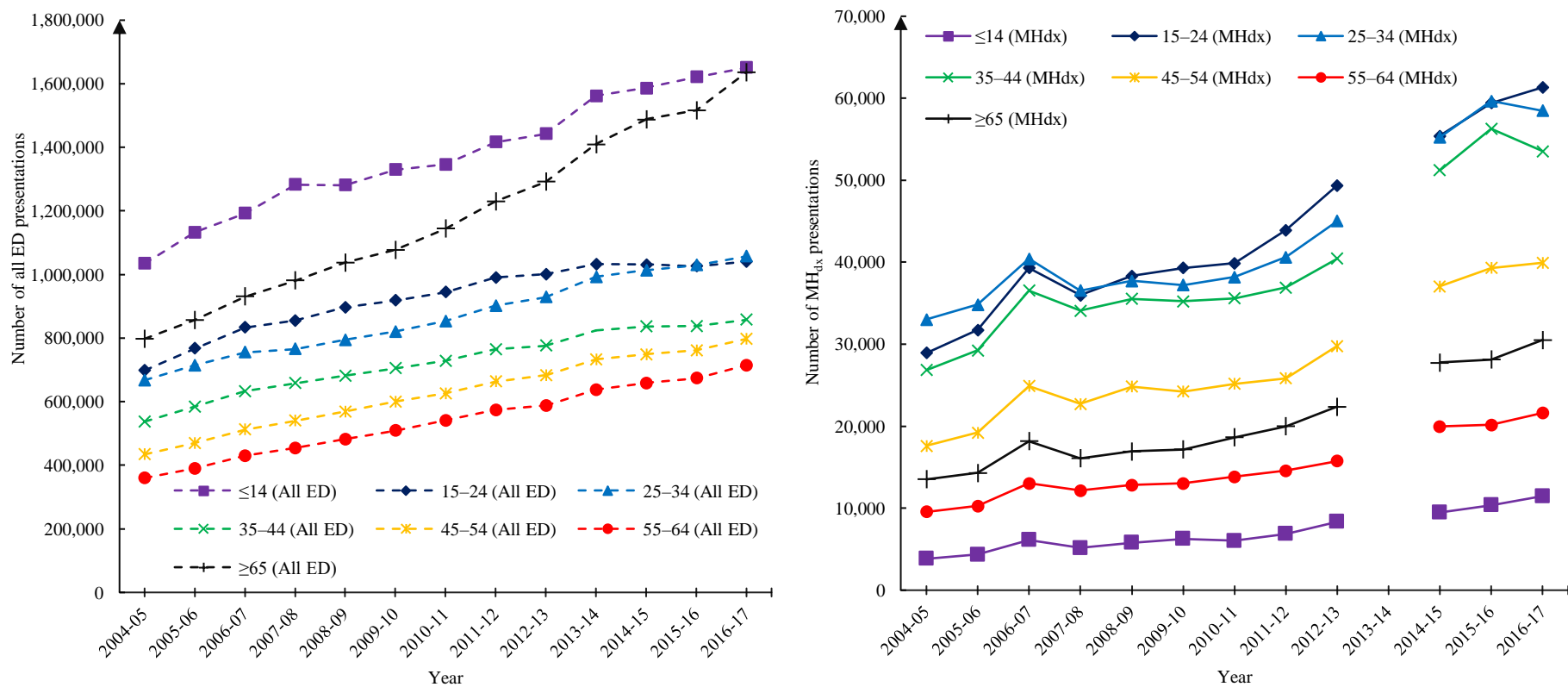


Figure 5.1: Number of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) in Australia, by age group, 2004-05 to 2016-17, except for 2013-14†

Abbreviations and symbols: ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; MHdx: Mental Health diagnosis;

† Data for 2013-14 were not available

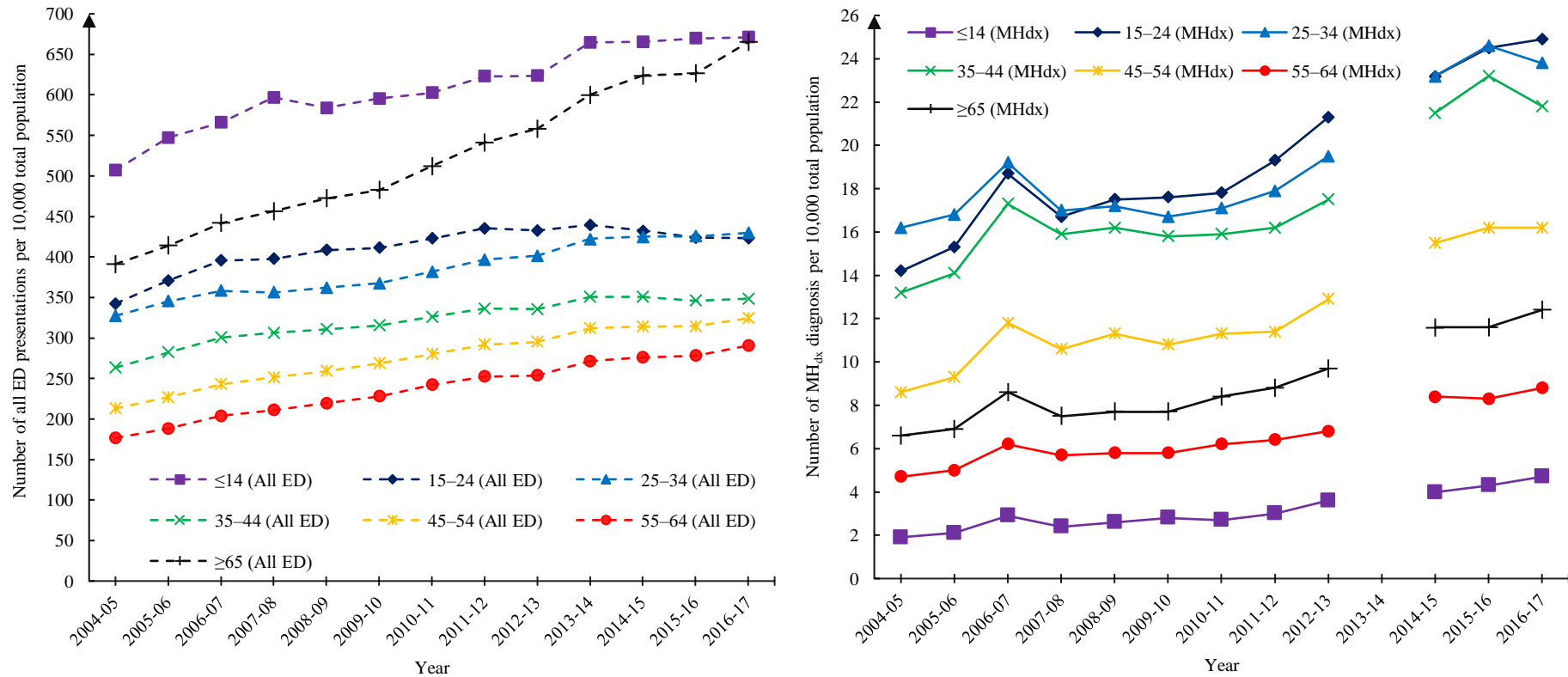


Figure 5.2: Number of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 total population, by age group, Australia, 2004-05 to 2016-17, except for 2013-14†.

Abbreviations and symbols: ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; MHdx: Mental Health diagnosis;

† Data for 2013-14 was not available

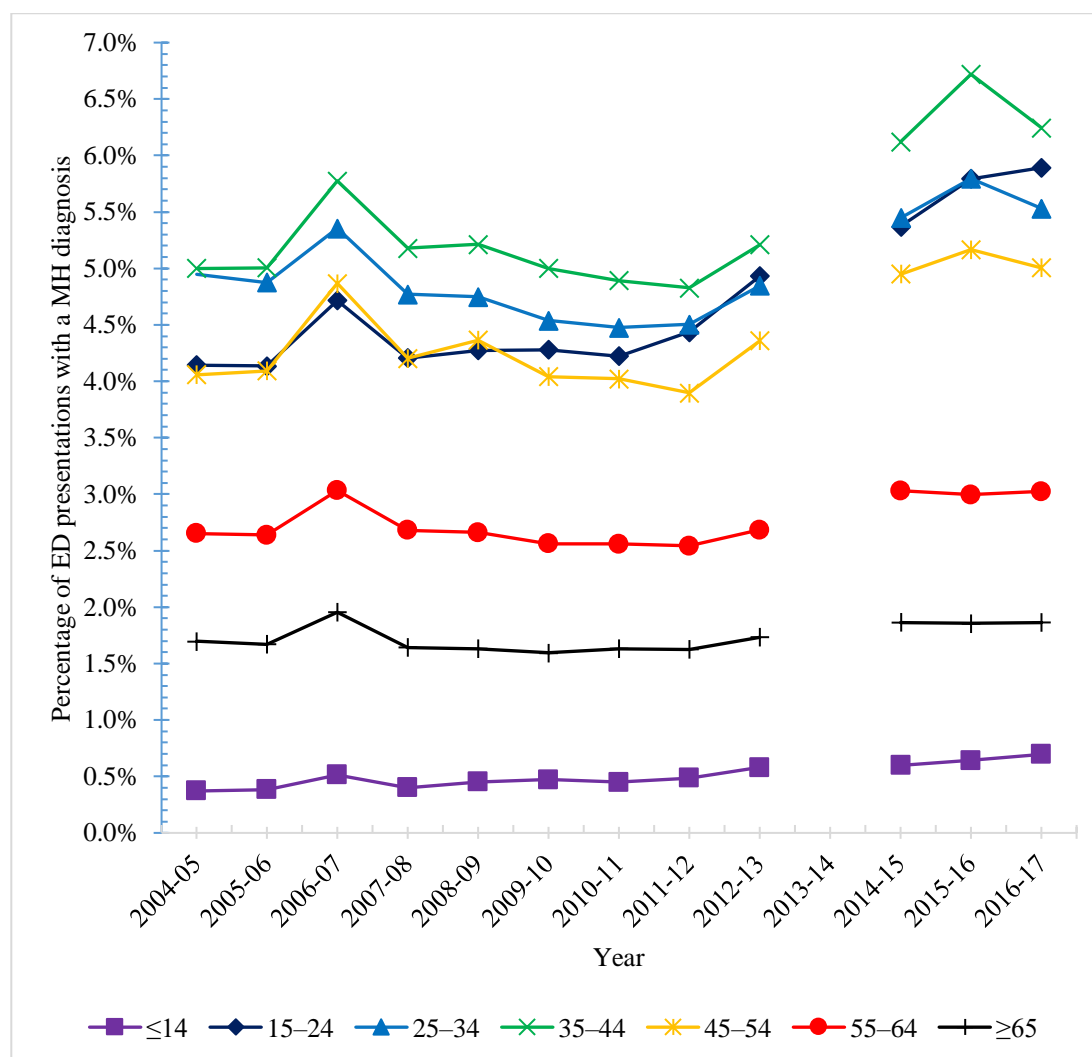


Figure 5.3: Percentage of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) by age group, Australia 2004-05 to 2016-17, except for 2013-14†.

Abbreviations: ED: Emergency Department, MH: Mental Health; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems*, 10th revision, Australian Modification

† Data for 2013-14 was not available

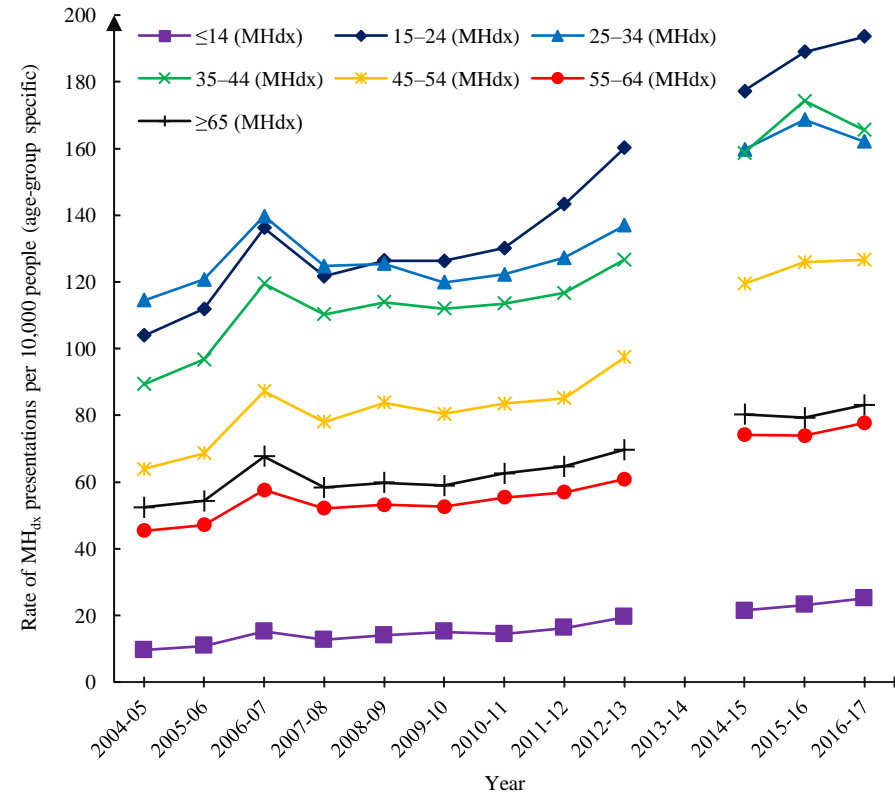
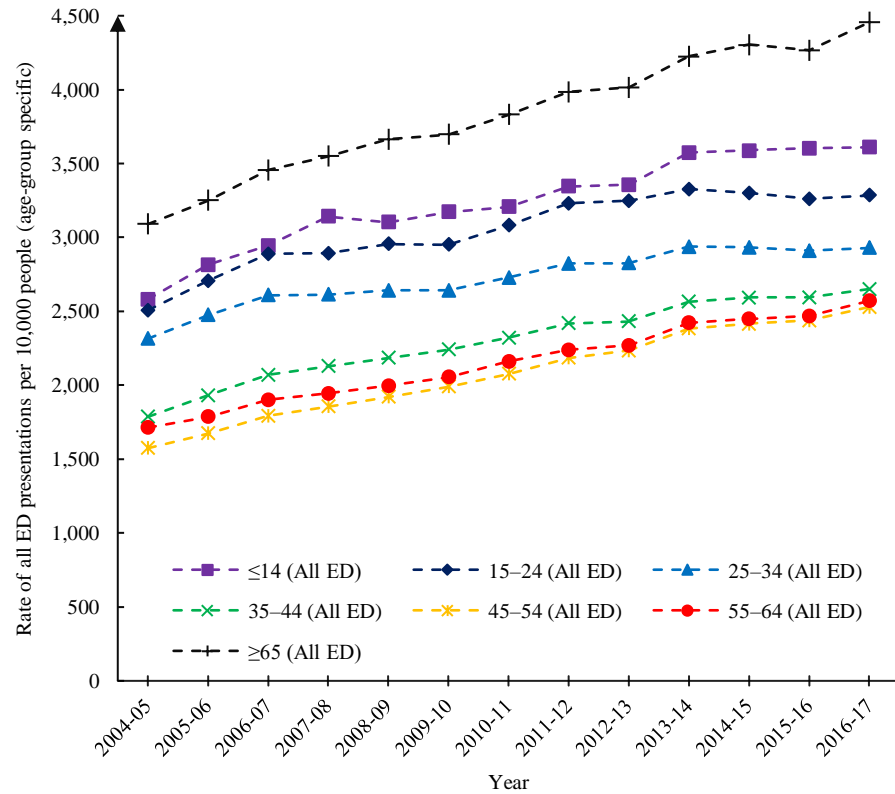


Figure 5.4: Rates of all ED presentations and ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 people (age-group specific), by age group, 2004-05 to 2016-17, except for 2013-14†

Abbreviations and symbols: ED: Emergency Department; MH: Mental Health; MHdx: Mental Health diagnosis; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems*, 10th revision, Australian Modification;

† Data for 2013-14 were not available

Table 5.3: Multivariable generalised linear regression models examining the trend of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) as a proportion of all ED presentations in Australia, by age group, 2004-05 to 2016-17, except 2013-14†

	RR	SE	p (z-test)	95%CI
Age groups				
0-14	REF	//	//	//
15-24	10.577	0.913	< 0.001	8.931-12.526
25-34	12.799	1.101	< 0.001	10.813-15.151
35-44	13.169	1.142	< 0.001	11.110-15.609
45-54	10.970	0.982	< 0.001	9.205-13.074
55-64	7.174	0.694	< 0.001	5.935-8.671
≥65	4.567	0.423	< 0.001	3.809-5.477
Year	1.050	0.010	< 0.001	1.031-1.069
Age group x year‡				
0-14	REF	//	//	//
15-24	0.983	0.010	0.079	0.964-1.002
25-34	0.965	0.010	< 0.001	0.947-0.984
35-44	0.973	0.010	0.005	0.954-0.992
45-54	0.969	0.010	0.002	0.950-0.989
55-64	0.963	0.011	0.001	0.942-0.984
≥65	0.961	0.010	< 0.001	0.941-0.981

Abbreviations and symbols: //: Not applicable; 95%CI: 95% confidence interval of RR; ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; p: p-values of z-test; REF: the reference group to which other groups were compared; RR: Risk Ratio; SE: Standard Error;

† Data for 2013-14 were not available

‡ Interaction term between year (continuous variable) and age group (categorical variable) in the models

5.5. Discussion

This study provides the longest trajectory and trend analysis of Australian national ED presentation data for all presentations and those with a MH diagnosis by age, and furthers work presented in Chapter 4, Chapter 6 and Chapter 7. Between 2004-05 and 2016-17, across all age-groups, the greatest number of ED presentations was for children, followed by older persons, each age-group giving rise to over 1.6 million presentations, 660 presentations per 10,000 total population, and equating to just over

one-presentation for every three children and almost one presentation per two older persons in 2016-17. In contrast, the greatest number of ED presentations with a MH diagnosis were for either youth or younger adults. However, as a proportion of all ED presentations, presentations with a MH diagnosis were highest in those aged 35-44 years, followed by younger adults or youth, and lowest in children.

Overall, the number and rates of presentations per 10,000 total and age-group specific populations increased more for presentations with a MH diagnosis than for all ED presentations in all age-groups, reaching almost 4-times higher for children, although the difference was minimal for younger adults. However, youth gave rise to the greatest absolute and relative increase in ED presentations with a MH diagnosis. These findings are consistent with findings from NSW.^[54] Perera and colleagues found that between 2010 and 2014 across all age-groups assessed (0-9 years to ≥ 80 years), the greatest absolute increase in age-specific rates of MH-related presentations was for persons aged 15-19 years, followed by those aged 20-24 years. However, the greatest relative increase in age-specific rates was for people aged 10-14 years with a CAGR of 13.8%.

Regarding children, between 2004-05 and 2016-17, compounding annual growth in the number of ED presentations was assessed to be 4.0%, and 4.2% when limited to 2010-11 to 2014-15. For children in Victoria, based on data reported by Hiscock and colleagues,^[51] there was a CAGR of 3.2%, between 2010-11 to 2014-15, indicating higher growth in ED presentations in other jurisdictions for this age-group. Among children in Victoria, there was a higher rate of growth in the number of ED presentations for children under 10 years (3.6%) than for children aged 10-14 years (2.1%).

Children were also found to experience the greatest rate of increase in the number of MH_{dx} ED presentations across all age-groups across the entire study period, with a CAGR of 9.5%, and 12.0% when limited to 2010-11 and 2014-15. A similar CAGR, 11.7%, was found for MHR_{ED} presentations for Victorian children (0-14 years) during the period 2010-11 to 2014-15. However, among Victorian children and youth, children 10-14 years had the highest growth at 11.7%. The 10-14 years age-group was also identified as giving rise to the greatest growth in MHR_{ED} presentations per 100,000 population (age-specific) in NSW between 2010 to 2014 with a CAGR of 13.8%.^[54] For Victoria, Hiscock and colleagues identified potential reasons behind the rapid increase in the number of presentations in children and youth as both an increase in prevalence of depression and anxiety in this age-group based on findings from the second Australian Child and Adolescent Survey of Mental Health and Wellbeing^[219] and inadequate provision of community-based care. Perera and colleagues did not identify a specific reason behind the increase in NSW, but considered it likely to be multifactorial and not necessarily due to an increase in prevalence. Together, these findings indicate the importance of employing detailed age-breakdowns in assessments and undertaking jurisdictional based assessments.

Differences in the rates of MHR_{ED} presentations in children during 2010-2014 in the New South Wales study may reflect differences in coding. NSW uses the SNOMED coding system which has been identified as creating difficulty in diagnostic categorisation.^[204,220] Another example of the potential impact of coding differences are the rates of MHR_{ED} presentations by adolescents (15-19 years) in NSW in 2014 (2,167 per 100,000 people 15-19 years),^[54] just over 12.0% higher than the age-group specific rate for youth (15-24 years) assessed herein (193.5 per 10,000 youth). Potential reasons behind this difference are that the current study was limited to ICD-

10 F-codes only, whereas the NSW study (and Victorian study^[51]) included suicidal and self-harming behaviour; which accounted for 17.0% of MH-related separations across all age-groups in NSW between 2010 and 2014 and 22.5% of presentations in Victorian children and young people during a similar period (2010-11 to 2014-15).^[51] We also note that the current study was limited to peer group “A” and “B” hospitals until 2012-13 as compared with almost all hospitals within the NSW analysis,^[54] which may lead to higher assessed growth between 2010-11 and 2014-15 in this study. Care must therefore be taken in making comparisons between studies on MHeD presentations due to potential differences in inclusion criteria.

In 2006-07, there was a spike in ED presentations with a MH diagnosis in this study which was underpinned by an unexplained 30% increase in the number of MH-related presentations in NSW at this time. ^[34-45] In regard to the peak in the burden of MH_{dx} presentations for people aged 25-34 and 35-44 years in 2015-16, any underpinning factors are uncertain, with further data required for confirmation of its association with the end of the study period.

Given the trends in ED utilisation by age-group, these findings suggest that age-specific policies and healthcare strategies need to be considered for pre-hospital and ED care. For example, given the greatest relative increase in the number of presentations per 10,000 total population for children, these results strongly suggest that more resources are required for community-based MH services for children. Further, given that the greatest absolute increase in the population rate of ED presentations with a MH diagnosis was for youth, special importance should be placed on the development of policies and services for this age-group. In particular, specific consideration should be given to the transition between late adolescence and early adulthood, when difficulty may be experienced in accessing child or adult service

providers as new patients.^[57,58] Government policies may also be needed to encourage the establishment of mobile community teams with age-appropriate skills across the life-span to provide early intervention with the aim of preventing multiple initial and subsequent ED presentations. Furthermore, ensuring EDs have access to age-appropriate MH professionals to comprehensively evaluate and recommend management for people presenting with a MH problem is crucial given different MH management and treatment strategies required.^[55,56]

5.6. Limitations

The major limitations of this study arise from coding practices and reporting. First, only the principal diagnostic code is used in determining MH presentations in EDs in Australia.^[63] Further, the AIHW only reports on a narrow definition of MHeD presentations while clinical interest extends beyond F-codes. Both situations will lead to an underestimation of the actual MH burden in EDs. Another potential limitation is changes to data collection practices, with the inclusion of all public hospitals since 2013-14, that may confound the trend analysis, and the lack of MH data by age-group in 2013-14. Given the aggregated nature of the data reported by the AIHW, it is not possible to determine the actual number of individuals seeking care, or the extent of re-presentations.

5.7. Conclusion

Between 2004-05 and 2016-17, absolute ED utilisation by children was the greatest across all age-groups, followed by older persons, while presentations with a MH diagnosis were greatest for youth and younger adults. People aged 35-44 years had the highest proportion of ED presentations with a MH diagnosis, and children the lowest. Of concern is the disproportionate increase in MH presentations per 10,000

total population for all age-groups, the greatest absolute increase in youth, and the greatest relative increase for children. Assessments were constrained by the available data, and consideration should be given to how the AIHW could broaden its definition of MH diagnoses to better identify the impact of mental health on urgency and emergency presentations. Finally, healthcare planning strategies for urgent and emergency care in Australia must prioritise the burden of ED presentations for MH complaints and in doing so, cannot afford to overlook the growing impact of MH presentations in children or older people.

Chapter 6. Trend of emergency department presentations with a mental health diagnosis in Australia by diagnostic group, 2004-05 to 2016-17

6.1. Preface

This chapter presents Study 4 of this thesis, an examination of the trends in the rates of emergency department (ED) presentations with a mental health diagnosis (MH_{dx}) for Australia and each jurisdiction by diagnostic group, between 2004-05 and 2016-17. A manuscript of this study has been published by *Emergency Medicine Australasia* (Appendix 5):

Tran, Q.N., Lambeth, L.G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V., Huckerby, E.J., Neil, A.L., Trend of emergency department presentations with a mental health diagnosis in Australia by diagnostic group, 2004-05 to 2016-17. *Emergency Medicine Australasia*, 2020, 32:190-201. DOI: 10.1111/1742-6723.13451

6.2. Introduction

Mental health (MH)-related emergency department (ED) presentations are increasingly being identified as a burden in EDs in the US,^[9,12,50,221] Australia^[30,31,33,51,148,206] and Canada.^[11,104,156,157] In the US, mood disorders, anxiety, and alcohol- and drug-related mental disorders have been identified as the major diagnostic groups among MH-related ED (MHrED) presentations between 1992 and 2001.^[50] In Australia, neurotic, stress-related and somatoform disorders predominated within MHrED presentations in NSW between 1999 and 2006^[31] and SA between 2004 and 2011,^[59] with stress and anxiety-related diagnoses and substance-use,

particularly alcohol-related presentations driving an increase in presentations in metropolitan Perth, WA between 2002-03 to 2016-17.^[60] In VIC, depression, self-harm ideation, self-harm overdose then psychosis were identified as the primary (non-mutually exclusive) MH reasons for visit across five EDs in 2004.^[32] Intentional self-harm and psychoactive substance use were the leading diagnoses of MH-related presentations among Victorian children and youth (0-19 years), between 2008-09 and 2014-15, with intentional self-harm highest from 2012-13.^[51] In comparison, in children and youth (0-17 years of age) in Alberta, Canada, between 2002 and 2008, stress-related disorder predominated followed by substance use-related disorder, mood disorders, and intentional self-harm.^[156,157] Together these findings suggest the potential for variability in reasons for presentation over time.

In Australia, the Australian Institute for Health and Welfare (AIHW) has reported the number of ED presentations with a MH-diagnosis by diagnostic group according to the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification* (ICD-10-AM) codes F00-F99 across all age-groups at the national level (and by jurisdiction) since 2004-05.^[46,84-91] In 2016-17, the AIHW identified that the major MH diagnostic groupings were mental and behavioural disorders due to psychoactive substance use (F10-F19) then neurotic, stress-related and somatoform disorders (F40-F49). However, there is no information available on the long-term trend of ED presentations by MH diagnostic group in Australia nationally, and limited information at the jurisdictional level although this information should be useful for service planning within EDs and the community, helping to identify specific areas of current and future need.

This study aims to examine trends in the absolute number and number of ED presentations per 10,000 population by MH diagnostic group in public hospitals, nationally and by jurisdiction, between 2004-05 and 2016-17.

6.3. Methods

6.3.1. Data sources

Data on ED presentations with a MH diagnosis (MH_{dx}) were extracted from *Mental Health Services in Australia* (MHSA)^[34-45] series which reports on presentations from the *National Non-Admitted Patient Emergency Department Care Database* (NNAPEDCD) with an ICD-10-AM principal diagnosis falling within *Chapter 5, Mental and Behavioural Disorders (F00-F99)*. Additional information on the NNAPEDCD and the MHSA series is detailed in Chapter 2. The most recently published data on number of MH_{dx} presentations by diagnostic group were extracted for Australia and all jurisdictions, except 2013-14, which were unavailable. Diagnoses were grouped according to ICD-10-AM (see Table 2.4).

Data on estimated resident populations for 2004 to 2009 were extracted from *Australian Demographic Statistics 2010*,^[194] and for 2010 to 2017, *Australian Demographic Statistics 2017*.^[195]

Data were entered into Microsoft Excel 2016, then exported to Stata 14.

6.3.2. Analyses

For each jurisdiction, the proportion of presentations for each MH diagnostic group was calculated by dividing the presentations for each MH diagnostic group by the total number of MH_{dx} presentations. The rate of change in numbers and proportions of presentations were assessed as average annual growth rate (AAGR) and compound annual growth rate (CAGR). The difference (x-fold) was calculated by dividing the

number of presentations in the final year by the number of presentations in the first year. As publicly available secondary data were collated and analysed, ethics approval was not sought.

6.4. Results

In Australia, presentations in each MH diagnostic group increased over the study period, except for mental retardation (F70-F79), which decreased, and disorders of psychological development (F80-F89), which exhibited some fluctuation (Figure 6.1). The greatest absolute increase was for mental and behavioural disorders due to psychoactive substance use, including alcohol use (F10-F19), which increased from 27,841 presentations (13.7 presentations per 10,000 population) in 2004-05 to 74,373 presentations (30.2 presentations per 10,000 population) in 2016-17, the highest number of presentations per diagnostic group at this time (Table 6.1). The greatest relative increase was for unspecified mental disorder (F99), which increased nearly 7-fold over the study period (Table 6.2). The major principal diagnostic group across the study period was neurotic, stress-related and somatoform disorders (F40-F49), which accounted for over a quarter of MH_{dx} presentations (27.5%) followed by substance use disorders (F10-F19) (24.8%), mood disorders (F30-F39) (15.4%), and psychotic disorders (F20-F29) (13.3%). The period mean population rates for these diagnostic groups were 23.8, 21.8, 13.0 and 11.3 presentations per 10,000 population respectively (Table 6.1, Table 6.3).

Jurisdictions gave rise to different patterns of MH_{dx} presentations when ICD-10-AM diagnostic groups were considered (Figure 6.2). Rates of presentations for organic mental disorders (F00-F09), substance use disorders (F10-F19), and stress-related disorders (F40-F49) per 10,000 population increased in all jurisdictions, with the rate of increase highest in the ACT (F00-F09), NT (F10-F19) and QLD (F40-F49)

(Table 6.1, Table 6.2). Presentations for psychotic disorders (F20-F29), mood disorders (F30-F39), and mental disorders associated with physiological disturbances and physical factors (F50-F59) increased or were largely stable in most jurisdictions, except for NSW and TAS (F20-F29), SA (F30-F39), and NT (F50-F59) (Table 6.2). The greatest increase for F20-F29 was in WA, in which the number of presentations per 10,000 population increased 2.4-fold. For F50-F59, the greatest increase was in SA with a 3.5-fold increase in presentations per 10,000 population. Presentations for disorders of adult personality and behaviour (F60-F69) increased in most jurisdictions, except QLD, SA, NT, with the greatest increase in presentations per 10,000 population in NSW (4.2-fold). There were widely divergent but comparatively small numbers of presentations for mental retardation (F70-F79) (increase in VIC, decrease in QLD and SA) and disorders of psychological development (F80-F89) (increase in ACT, decrease in QLD). Behavioural and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98) increased in every jurisdiction except NSW, with the greatest increase in presentations per 10,000 population in the NT (3.4-fold). The most marked increase observed in absolute and relative terms, was presentations for unspecified mental disorder (F99) in NSW (401.13-fold increase in presentations per 10,000 population), as compared with a decrease in TAS.

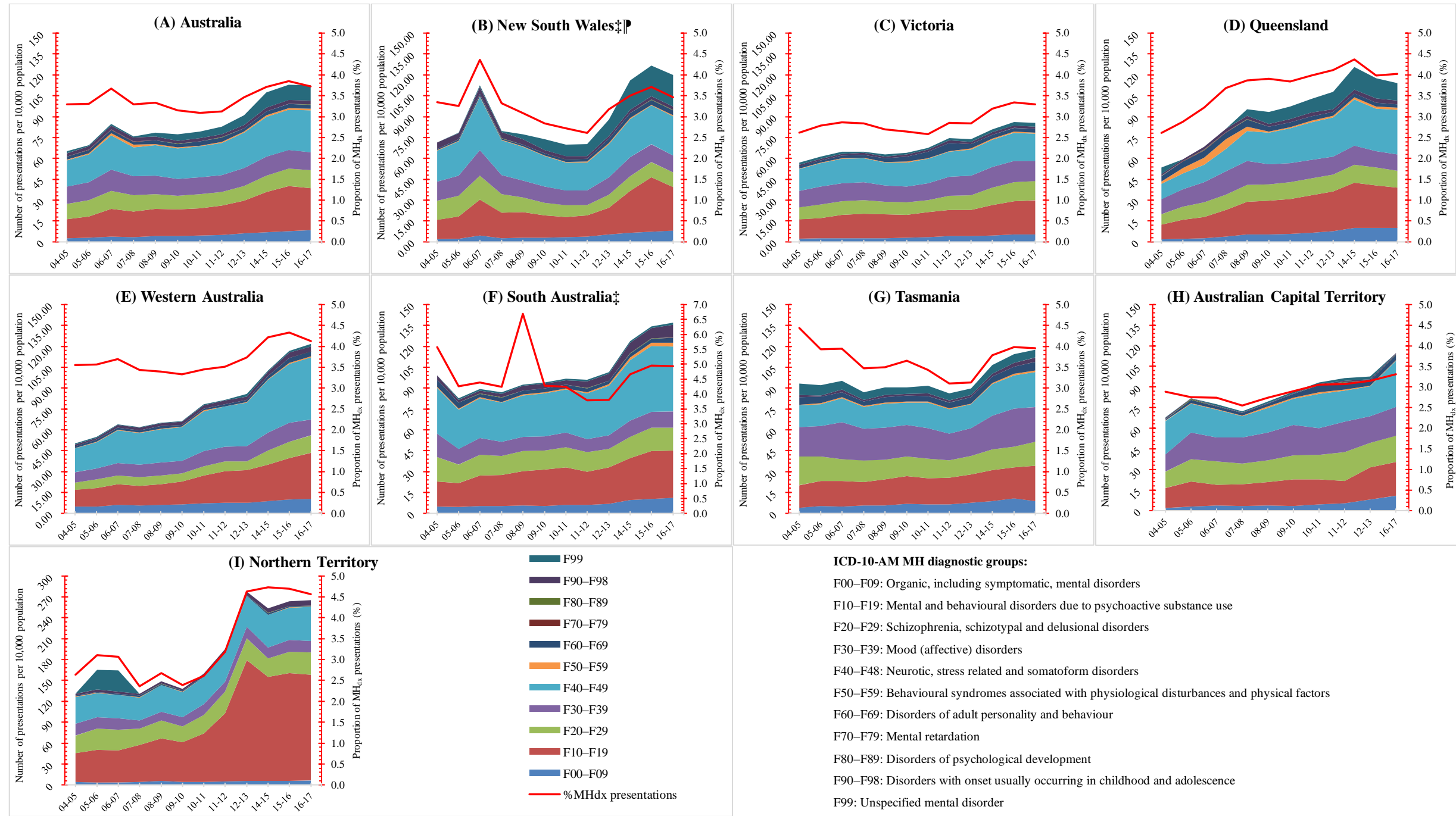


Figure 6.1: Number of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 population†, by jurisdiction and diagnostic group, 2004-05 to 2016-17, except for 2013-14 (all jurisdictions) and 2014-15 and 2015-16 (ACT)††

Abbreviations and symbols: ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; MH_{dx}: MH diagnosis;

† Differences (x-fold) and rates of change were calculated from raw data. Re-calculation for presentations per 10,000 population will lead to differences due to the impact of rounding

†† Data for 2013-14 (all jurisdictions) and 2014-15 and 2015-16 (ACT) were not available

‡ NSW used a combination of ICD-9-CM and ICD-10-AM. SA used ICD-9-CM before 2007-08. Since 2007-08, SA has used a combination of ICD-9-CM and ICD-10-AM. A mapping of the relevant ICD-9-CM codes to the ICD-10-AM code blocks is provided by AIHW (see also Table 2.4)

‡‡ In 2007-08, MH_{dx} presentations are under-reported in NSW due to the implementation of a new ED information system.

Sources: *Mental Health Services in Australia*.^[34-45]

Table 6.1: ED presentations with a MH diagnosis (ICD-10 AM F00-F99) in Australia and jurisdictions by diagnostic group, 2004-05 to 2015-16, except 2013-14 (all jurisdictions) and 2013-14 to 2015-16 (ACT)†

	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000
Australia	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	5,349	3.86	4.17	2.62	6,029	4.03	4.34	2.91	8,134	4.55	4.71	3.86	7,631	4.69	4.87	3.55	8,827	5.13	5.32	4.02	9,005	5.22	5.37	4.03
F10–F19	27,841	20.07	21.71	13.65	31,836	21.29	22.91	15.38	42,090	23.57	24.39	19.97	39,544	24.30	25.26	18.39	43,215	25.13	26.03	19.69	42,940	24.90	25.59	19.23
F20–F29	22,503	16.22	17.55	11.03	24,320	16.26	17.51	11.75	26,970	15.10	15.63	12.80	24,838	15.26	15.87	11.55	23,388	13.60	14.09	10.65	22,013	12.77	13.12	9.86
F30–F39	25,233	18.19	19.68	12.37	26,942	18.01	19.39	13.02	31,538	17.66	18.27	14.97	29,140	17.91	18.61	13.55	28,687	16.68	17.28	13.07	27,454	15.92	16.36	12.30
F40–F49	38,427	27.70	29.96	18.84	40,732	27.23	29.32	19.68	52,722	29.52	30.55	25.02	45,009	27.66	28.75	20.94	48,023	27.92	28.93	21.88	48,685	28.23	29.02	21.80
F50–F59	1,208	0.87	0.94	0.59	2,180	1.46	1.57	1.05	3,074	1.72	1.78	1.46	3,748	2.30	2.39	1.74	2,288	1.33	1.38	1.04	1,253	0.73	0.75	0.56
F60–F69	4,373	3.15	3.41	2.14	4,769	3.19	3.43	2.30	5,042	2.82	2.92	2.39	4,877	3.00	3.12	2.27	5,596	3.25	3.37	2.55	5,751	3.33	3.43	2.58
F70–F79	100	0.07	//	0.05	125	0.08	//	0.06	143	0.08	//	0.07	169	0.10	//	0.08	98	0.06	//	0.04	39	0.02	//	0.02
F80–F89	149	0.11	//	0.07	219	0.15	//	0.11	284	0.16	//	0.13	242	0.15	//	0.11	172	0.10	//	0.08	112	0.06	//	0.05
F90–F98	4,906	3.54	//	2.41	4,731	3.16	//	2.29	5,571	3.12	//	2.64	5,761	3.54	//	2.68	5,689	3.31	//	2.59	4,521	2.62	//	2.02
F99	3,314	2.39	2.58	1.62	2,123	1.42	1.53	1.03	3,027	1.69	1.75	1.44	1,762	1.08	1.13	0.82	5,983	3.48	3.60	2.73	10,672	6.19	6.36	4.78
Australia	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	10,093	5.73	5.86	4.52	11,655	6.18	6.36	5.12	13,926	6.52	6.76	6.02	17,046	6.65	6.83	7.15	18,810	6.88	7.06	7.77	20,671	7.46	7.68	8.40
F10–F19	44,160	25.09	25.62	19.77	47,296	25.06	25.79	20.80	54,488	25.51	26.45	23.54	68,257	26.64	27.34	28.62	78,151	28.58	29.35	32.28	74,373	26.85	27.62	30.23
F20–F29	22,379	12.71	12.98	10.02	23,049	12.21	12.57	10.13	24,807	11.62	12.04	10.72	28,416	11.09	11.38	11.91	30,583	11.18	11.48	12.63	31,696	11.44	11.77	12.89
F30–F39	26,842	15.25	15.57	12.02	27,551	14.60	15.02	12.11	29,755	13.93	14.44	12.86	32,908	12.85	13.18	13.80	32,360	11.83	12.15	13.37	32,056	11.57	11.90	13.03
F40–F49	49,807	28.30	28.90	22.29	52,453	27.79	28.60	23.06	58,400	27.35	28.34	25.23	67,794	26.46	27.16	28.42	70,082	25.63	26.32	28.95	73,837	26.66	27.42	30.02
F50–F59	1,400	0.80	0.81	0.63	1,686	0.89	0.92	0.74	1,849	0.87	0.90	0.80	2,323	0.91	0.93	0.97	2,364	0.86	0.89	0.98	2,550	0.92	0.95	1.04
F60–F69	6,473	3.68	3.76	2.90	7,311	3.87	3.99	3.21	6,344	2.97	3.08	2.74	7,035	2.75	2.82	2.95	7,497	2.74	2.82	3.10	7,534	2.72	2.80	3.06
F70–F79	50	0.03	//	0.02	65	0.03	//	0.03	69	0.03	//	0.03	62	0.02	//	0.03	91	0.03	//	0.04	78	0.03	//	0.03
F80–F89	119	0.07	//	0.05	161	0.09	//	0.07	111	0.05	//	0.05	156	0.06	//	0.07	185	0.07	//	0.08	278	0.10	//	0.11
F90–F98	4,872	2.77	//	2.18	5,119	2.71	//	2.25	4,919	2.30	//	2.13	6,329	2.47	//	2.65	6,847	2.50	//	2.83	7,298	2.64	//	2.97
F99	11,205	6.37	6.50	5.02	12,393	6.57	6.76	5.45	16,471	7.71	7.99	7.12	25,852	10.09	10.36	10.84	26,466	9.68	9.94	10.93	26,583	9.60	9.87	10.81
NSW‡‡	2004-05				2005-06				2006-07				2007-08§				2008-09				2009-10			
F00–F09	1,324	2.75	2.93	1.96	1,558	2.92	3.10	2.29	3,044	3.92	4.10	4.41	1,953	3.49	3.70	2.78	2,208	4.00	4.22	3.10	2,122	3.98	4.12	2.93
F10–F19	9,343	19.37	20.71	13.83	10,827	20.29	21.54	15.88	17,845	22.97	24.02	25.84	12,775	22.81	24.22	18.21	13,151	23.84	25.11	18.45	11,588	21.76	22.49	16.02
F20–F29	9,434	19.56	20.91	13.96	10,061	18.85	20.02	14.76	11,840	15.24	15.93	17.15	9,373	16.74	17.77	13.36	7,542	13.67	14.40	10.58	6,573	12.34	12.76	9.09
F30–F39	9,039	18.74	20.03	13.38	9,864	18.49	19.62	14.47	12,758	16.42	17.17	18.48	9,550	17.05	18.10	13.61	8,640	15.66	16.50	12.12	8,472	15.91	16.44	11.71
F40–F49	15,158	31.43	33.59	22.43	16,998	31.86	33.82	24.94	26,431	34.02	35.57	38.28	17,537	31.32	33.24	25.00	17,239	31.25	32.91	24.19	15,868	29.80	30.79	21.94
F50–F59	203	0.42	0.45	0.30	240	0.45	0.48	0.35	464	0.60	0.62	0.67	184	0.33	0.35	0.26	230	0.42	0.44	0.32	252	0.47	0.49	0.35
F60–F69	582	1.21	1.29	0.86	643	1.21	1.28	0.94	960	1.24	1.29	1.39	762	1.36	1.44	1.09	867	1.57	1.66	1.22	1,142	2.14	2.22	1.58
F70–F79	11	0.02	//	0.02	22	0.04	//	0.03	8	0.01	//	0.01	10	0.02	//	0.01	12	0.02	//	0.02	9	0.02	//	0.01
F80–F89	55	0.11	//	0.08	73	0.14	//	0.11	85	0.11	//	0.12	62	0.11	//	0.09	40	0.07	//	0.06	45	0.08	//	0.06
F90–F98	3,036	6.30	//	4.49	3,002	5.63	//	4.40	3,304	4.25	//	4.78	3,176	5.67	//	4.53	2,742	4.97	//	3.85	1,669	3.13	//	2.31
F99	38	0.08	0.08	0.06	72	0.13	0.14	0.11	960	1.24	1.29	1.39	619	1.11	1.17	0.88	2,502	4.53	4.78	3.51	5,514	10.35	10.70	7.62
NSW‡‡	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	2,319	4.61	4.77	3.21	2,816	5.48	5.65	3.85	3,976	6.11	6.25	5.37	5,015	5.67	5.78	6.57	5,644	5.76	5.87	7.29	6,489	6.88	7.05	8.25
F10–F19	10,707	21.29	22.04	14.83	11,073	21.56	22.21	15.15	14,097	21.68	22.17	19.03	22,958	25.95	26.47	30.10	30,307	30.92	31.54	39.16	24,390	25.88	26.49	31.03
F20–F29	6,004	11.94	12.36	8.32	5,562	10.83	11.16	7.61	7,081	10.89	11.14	9.56	8,139	9.20	9.38	10.67	8,339	8.51	8.68	10.77	8,281	8.79	8.99	10.53
F30–F39	7,604	15.12	15.65	10.53	7,537	14.68	15.12	10.31	9,167	14.10	14.42	12.37	10,400	11.76	11.99	13.64	9,941</							

	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000
VIC	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	1,181	4.11	4.18	2.34	1,329	4.24	4.31	2.59	1,415	4.19	4.27	2.71	1,478	4.27	4.36	2.77	1,524	4.46	4.56	2.80	1,667	4.69	4.80	3.01
F10–F19	6,973	24.25	24.67	13.81	7,491	23.91	24.32	14.61	8,802	26.09	26.58	16.86	9,367	27.08	27.65	17.58	9,296	27.21	27.83	17.07	9,201	25.91	26.50	16.59
F20–F29	4,367	15.19	15.45	8.65	5,053	16.13	16.40	9.86	5,074	15.04	15.32	9.72	5,217	15.08	15.40	9.79	4,975	14.56	14.90	9.13	4,793	13.50	13.80	8.64
F30–F39	5,990	20.83	21.19	11.86	6,501	20.75	21.10	12.68	6,691	19.83	20.21	12.81	6,832	19.75	20.17	12.83	6,376	18.66	19.09	11.71	6,420	18.08	18.49	11.58
F40–F49	7,941	27.61	28.09	15.73	8,546	27.28	27.74	16.67	9,257	27.43	27.96	17.73	9,185	26.56	27.12	17.24	8,909	26.08	26.68	16.36	9,593	27.01	27.63	17.30
F50–F59	129	0.45	0.46	0.26	198	0.63	0.64	0.39	182	0.54	0.55	0.35	172	0.50	0.51	0.32	203	0.59	0.61	0.37	263	0.74	0.76	0.47
F60–F69	907	3.15	3.21	1.80	928	2.96	3.01	1.81	928	2.75	2.80	1.78	1,042	3.01	3.08	1.96	1,379	4.04	4.13	2.53	2,031	5.72	5.85	3.66
F70–F79	6	0.02	//	0.01	13	0.04	//	0.03	28	0.08	//	0.05	16	0.05	//	0.03	30	0.09	//	0.06	29	0.08	//	0.05
F80–F89	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00
F90–F98	481	1.67	//	0.95	510	1.63	//	0.99	602	1.78	//	1.15	701	2.03	//	1.32	734	2.15	//	1.35	758	2.13	//	1.37
F99	782	2.72	2.77	1.55	760	2.43	2.47	1.48	764	2.26	2.31	1.46	578	1.67	1.71	1.09	735	2.15	2.20	1.35	755	2.13	2.17	1.36
VIC	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	1,935	5.16	5.28	3.49	2,345	5.56	5.69	4.15	2,376	5.59	5.73	4.11	2,759	5.66	5.80	4.57	3,298	6.20	6.34	5.34	3,456	6.39	6.53	5.47
F10–F19	9,868	26.32	26.94	17.82	10,655	25.26	25.85	18.85	10,975	25.81	26.45	19.00	13,205	27.11	27.77	21.89	14,680	27.59	28.20	23.76	15,400	28.46	29.08	24.35
F20–F29	4,895	13.06	13.36	8.84	5,674	13.45	13.77	10.04	5,922	13.93	14.27	10.25	7,489	15.37	15.75	12.41	8,445	15.87	16.22	13.67	8,836	16.33	16.68	13.97
F30–F39	6,732	17.96	18.38	12.16	7,791	18.47	18.90	13.78	8,122	19.10	19.57	14.06	9,068	18.62	19.07	15.03	9,421	17.70	18.10	15.25	9,159	16.93	17.29	14.48
F40–F49	9,632	25.69	26.29	17.39	10,092	23.92	24.48	17.85	10,975	25.81	26.45	19.00	11,657	23.93	24.52	19.32	12,539	23.56	24.09	20.29	12,314	22.76	23.25	19.47
F50–F59	247	0.66	0.67	0.45	390	0.92	0.95	0.69	437	1.03	1.05	0.76	530	1.09	1.11	0.88	612	1.15	1.18	0.99	522	0.96	0.99	0.83
F60–F69	2,584	6.89	7.05	4.67	3,251	7.71	7.89	5.75	1,695	3.99	4.08	2.93	1,625	3.34	3.42	2.69	1,572	2.95	3.02	2.54	1,553	2.87	2.93	2.46
F70–F79	33	0.09	//	0.06	25	0.06	//	0.04	56	0.13	//	0.10	41	0.08	//	0.07	62	0.12	//	0.10	38	0.07	//	0.06
F80–F89	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	1	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00
F90–F98	829	2.21	//	1.50	939	2.23	//	1.66	960	2.26	//	1.66	1,124	2.31	//	1.86	1,091	2.05	//	1.77	1,113	2.06	//	1.76
F99	738	1.97	2.01	1.33	1,022	2.42	2.48	1.81	997	2.35	2.40	1.73	1,212	2.49	2.55	2.01	1,491	2.80	2.86	2.41	1,723	3.18	3.25	2.72
QLD	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	724	3.38	3.48	1.81	990	4.07	4.18	2.42	1,168	4.08	4.24	2.78	1,651	4.72	4.89	3.83	2,289	5.42	5.58	5.17	2,353	5.59	5.72	5.21
F10–F19	4,229	19.77	20.34	10.59	5,588	22.99	23.62	13.66	6,398	22.36	23.22	15.25	8,183	23.39	24.23	18.99	10,484	24.83	25.54	23.69	11,017	26.16	26.76	24.41
F20–F29	3,001	14.03	14.43	7.51	3,800	15.63	16.06	9.29	4,347	15.20	15.78	10.36	4,852	13.87	14.37	11.26	5,354	12.68	13.04	12.10	5,206	12.36	12.65	11.53
F30–F39	4,265	19.94	20.51	10.68	5,146	21.17	21.75	12.58	6,029	21.07	21.88	14.37	7,155	20.45	21.19	16.61	7,680	18.19	18.71	17.36	6,617	15.71	16.07	14.66
F40–F49	4,433	20.72	21.32	11.10	4,655	19.15	19.67	11.38	5,310	18.56	19.27	12.65	6,853	19.59	20.29	15.91	9,364	22.18	22.81	21.16	10,231	24.29	24.85	22.67
F50–F59	669	3.13	3.22	1.67	1,552	6.39	6.56	3.79	2,155	7.53	7.82	5.14	3,104	8.87	9.19	7.20	1,538	3.64	3.75	3.48	405	0.96	0.98	0.90
F60–F69	1,531	7.16	7.36	3.83	1,894	7.79	8.01	4.63	2,128	7.44	7.72	5.07	1,975	5.64	5.85	4.58	2,170	5.14	5.29	4.90	1,468	3.49	3.57	3.25
F70–F79	65	0.30	//	0.16	84	0.35	//	0.21	102	0.36	//	0.24	133	0.38	//	0.31	50	0.12	//	0.11	0	0.00	//	0.00
F80–F89	76	0.36	//	0.19	90	0.37	//	0.22	165	0.58	//	0.39	139	0.40	//	0.32	74	0.18	//	0.17	17	0.04	//	0.04
F90–F98	459	2.15	//	1.15	472	1.94	//	1.15	788	2.75	//	1.88	942	2.69	//	2.19	1,041	2.47	//	2.35	928	2.20	//	2.06
F99	1,941	9.07	9.33	4.86	35	0.14	0.15	0.09	18	0.06	0.07	0.04	0	0.00	0.00	0.00	2,172	5.14	5.29	4.91	3,872	9.19	9.41	8.58
QLD	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	2,546	5.84	6.00	5.69	3,035	6.47	6.65	6.64	3,664	7.30	7.44	7.87	4,866	8.10	8.27	10.17	4,877	8.56	8.78	10.06	5,040	8.97	9.21	10.23
F10–F19	11,223	25.76	26.46	25.07	12,214	26.05	26.75	26.73	13,121	26.15	26.64	28.19	15,478	25.75	26.31	32.35	14,713	25.83	26.49	30.34	14,143	25.18	25.84	28.70
F20–F29	5,505	12.64	12.98	12.30	5,618	11.98	12.30	12.29	5,805	11.57	11.78	12.47	6,149	10.23	10.45	12.85	6,360	11.16	11.45	13.12	6,046	10.76	11.05	12.27
F30–F39	6,020	13.82	14.19	13.45	5,988	12.77	13.11	13.10	5,923	11.80	12.02	12.73	6,602	10.98	11.22	13.80	5,711	10.03	10.28	11.78	5,705	10.16	10.42	11.58
F40–F49	11,160	25.62	26.31	24.93	12,457	26.56	27.28	27.26	13,147	26.20	26.69	28.25	15,842	26.36	26.93	33.11	14,728	25.85	26.52	30.37	15,812	28.15	28.89	32.08
F50–F59	486	1.12	1.15	1.09	542	1.16	1.19	1.19	595	1.19	1.21	1.28	794	1.32	1.35	1.66	701	1.23	1.26	1.45	835	1.49	1.53	1.69
F60–F69	1,485	3.41	3.50	3.32	1,365	2.91	2.99	2.99	1,207	2.41	2.45	2.59	1,327	2.21	2.26	2.77	1,413	2.48	2.54	2.91	1,103	1.96	2.02	2.24
F70–F79	2	0.00	//	0.00	9	0.02	//	0.02	..	//	//	//	..	//	//	//	3	0.01	//	0.01	1	0.00	//	0.00
F80–F89	9	0.02	//	0.02	27	0.06	//	0.06	..	//	//	//	..	//	//	//	3	0.01	//	0.01	16	0.03	//	0.03
F90–F98	1,131	2.60	//	2.53	1,197	2.55	//	2.62	923	1.84	//	1.98	1,283	2.13	//	2.68	1,414	2.48	//	2.92	1,410	2.51	//	2.86
F99	3,995	9.17	9.42	8.92	4,443	9.47	9.73	9.72	5,798	11.55	11.77	12.46	7,767	12.92	13.20	16.23	7,042	12.36	12.68	14.52	6,055	10.78	11.06	12.29

	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000
WA	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	1,016	10.05	10.32	5.04	998	8.85	9.09	4.85	1,258	9.31	9.57	5.95	1,235	9.18	9.47	5.67	1,376	9.40	9.71	6.13	1,438	9.47	9.78	6.27
F10–F19	2,379	23.52	24.16	11.79	2,766	24.52	25.19	13.43	3,134	23.18	23.85	14.83	3,066	22.79	23.51	14.08	3,316	22.66	23.41	14.77	3,851	25.37	26.19	16.79
F20–F29	1,059	10.47	10.75	5.25	1,241	11.00	11.30	6.03	1,336	9.88	10.17	6.32	1,379	10.25	10.57	6.33	1,373	9.38	9.69	6.12	1,288	8.49	8.76	5.62
F30–F39	1,524	15.07	15.48	7.56	1,642	14.56	14.95	7.97	1,913	14.15	14.56	9.05	1,899	14.11	14.56	8.72	2,152	14.71	15.19	9.59	2,066	13.61	14.05	9.01
F40–F49	3,429	33.90	34.82	17.00	3,880	34.40	35.33	18.84	4,957	36.67	37.73	23.46	4,943	36.74	37.89	22.71	5,299	36.21	37.41	23.61	5,532	36.45	37.63	24.12
F50–F59	47	0.46	0.48	0.23	48	0.43	0.44	0.23	88	0.65	0.67	0.42	99	0.74	0.76	0.45	130	0.89	0.92	0.58	130	0.86	0.88	0.57
F60–F69	266	2.63	2.70	1.32	300	2.66	2.73	1.46	324	2.40	2.47	1.53	336	2.50	2.58	1.54	406	2.77	2.87	1.81	292	1.92	1.99	1.27
F70–F79	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	1	0.01	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00
F80–F89	5	0.05	//	0.02	11	0.10	//	0.05	12	0.09	//	0.06	10	0.07	//	0.05	12	0.08	//	0.05	19	0.13	//	0.08
F90–F98	261	2.58	//	1.29	287	2.54	//	1.39	367	2.71	//	1.74	400	2.97	//	1.84	456	3.12	//	2.03	458	3.02	//	2.00
F99	128	1.27	1.30	0.63	106	0.94	0.97	0.51	129	0.95	0.98	0.61	87	0.65	0.67	0.40	114	0.78	0.80	0.51	105	0.69	0.71	0.46
WA	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	1,732	10.18	9.71	7.36	1,806	9.12	9.41	7.44	1,911	8.94	9.21	7.67	2,194	8.39	8.65	8.62	2,510	8.42	8.71	9.81	2,697	8.59	8.84	10.45
F10–F19	4,679	27.49	26.22	19.88	5,519	27.86	28.76	22.74	5,810	27.19	28.00	23.31	6,670	25.50	26.29	26.22	7,651	25.65	26.54	29.90	8,518	27.12	27.91	33.01
F20–F29	1,594	9.36	8.93	6.77	1,727	8.72	9.00	7.12	1,604	7.51	7.73	6.43	2,611	9.98	10.29	10.26	2,997	10.05	10.39	11.71	3,218	10.24	10.54	12.47
F30–F39	2,566	15.08	14.38	10.90	2,539	12.82	13.23	10.46	2,757	12.90	13.29	11.06	3,254	12.44	12.83	12.79	3,502	11.74	12.15	13.69	2,950	9.39	9.66	11.43
F40–F49	6,690	39.30	37.49	28.43	7,013	35.40	36.54	28.90	7,767	36.34	37.43	31.16	9,691	37.05	38.20	38.09	10,821	36.28	37.53	42.29	11,553	36.78	37.85	44.77
F50–F59	140	0.82	0.78	0.59	85	0.43	0.44	0.35	96	0.45	0.46	0.39	124	0.47	0.49	0.49	181	0.61	0.63	0.71	176	0.56	0.58	0.68
F60–F69	323	1.90	1.81	1.37	359	1.81	1.87	1.48	357	1.67	1.72	1.43	610	2.33	2.40	2.40	875	2.93	3.03	3.42	933	2.97	3.06	3.62
F70–F79	0	0.00	//	0.00	1	0.01	//	0.00	1	0.00	//	0.00	0	0.00	//	0.00	2	0.01	//	0.01	2	0.01	//	0.01
F80–F89	13	0.08	//	0.06	22	0.11	//	0.09	7	0.03	//	0.03	11	0.04	//	0.04	17	0.06	//	0.07	17	0.05	//	0.07
F90–F98	546	3.21	//	2.32	593	2.99	//	2.44	612	2.86	//	2.45	775	2.96	//	3.05	975	3.27	//	3.81	872	2.78	//	3.38
F99	122	0.72	0.68	0.52	145	0.73	0.76	0.60	450	2.11	2.17	1.81	217	0.83	0.86	0.85	296	0.99	1.03	1.16	478	1.52	1.57	1.85
SA‡‡	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	767	4.97	5.15	4.94	726	5.59	5.74	4.63	809	5.71	5.86	5.10	823	5.90	6.09	5.13	889	5.90	6.14	5.47	864	5.57	5.79	5.25
F10–F19	2,781	18.03	18.68	17.91	2,694	20.73	21.29	17.18	3,503	24.73	25.39	22.09	3,602	25.80	26.64	22.46	4,045	26.85	27.95	24.90	4,271	27.53	28.61	25.97
F20–F29	2,718	17.62	18.26	17.51	2,092	16.10	16.54	13.34	2,367	16.71	17.15	14.93	2,196	15.73	16.24	13.69	2,303	15.29	15.91	14.18	2,288	14.75	15.32	13.91
F30–F39	2,640	17.11	17.74	17.00	1,739	13.38	13.75	11.09	1,905	13.45	13.81	12.01	1,652	11.83	12.22	10.30	1,668	11.07	11.52	10.27	1,637	10.55	10.96	9.95
F40–F49	5,106	33.10	34.31	32.89	4,449	34.23	35.17	28.38	4,501	31.78	32.62	28.38	4,460	31.95	32.99	27.81	4,849	32.19	33.50	29.85	5,102	32.89	34.17	31.02
F50–F59	116	0.75	0.78	0.75	90	0.69	0.71	0.57	123	0.87	0.89	0.78	118	0.85	0.87	0.74	115	0.76	0.79	0.71	138	0.89	0.92	0.84
F60–F69	756	4.90	5.08	4.87	674	5.19	5.33	4.30	435	3.07	3.15	2.74	491	3.52	3.63	3.06	449	2.98	3.10	2.76	476	3.07	3.19	2.89
F70–F79	16	0.10	//	0.10	5	0.04	//	0.03	3	0.02	//	0.02	7	0.05	//	0.04	..	//	//	//	..	//	//	//
F80–F89	10	0.06	//	0.06	21	0.16	//	0.13	17	0.12	//	0.11	23	0.16	//	0.14	..	//	//	//	..	//	//	//
F90–F98	516	3.35	//	3.32	319	2.45	//	2.03	346	2.44	//	2.18	410	2.94	//	2.56	547	3.63	//	3.37	562	3.62	//	3.42
F99	0	0.00	0.00	0.00	187	1.44	1.48	1.19	155	1.09	1.12	0.98	178	1.28	1.32	1.11	155	1.03	1.07	0.95	154	0.99	1.03	0.94
SA‡‡	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	980	6.19	6.41	5.98	1,008	6.36	6.71	6.08	1,158	6.83	7.20	6.93	1,611	7.66	8.17	9.47	1,775	7.72	8.18	10.36	1,929	8.18	8.77	11.19
F10–F19	4,440	28.04	29.06	27.08	3,938	24.85	26.20	23.77	4,340	25.61	26.97	25.96	5,161	24.53	26.17	30.33	5,860	25.47	27.00	34.21	5,850	24.79	26.58	33.94
F20–F29	2,374	14.99	15.54	14.48	2,316	14.62	15.41	13.98	2,270	13.39	14.11	13.58	2,597	12.35	13.17	15.26	2,904	12.62	13.38	16.95	2,846	12.06	12.93	16.51
F30–F39	1,732	10.94	11.34	10.56	1,534	9.68	10.20	9.26	1,606	9.48	9.98	9.61	1,943	9.24	9.85	11.42	1,955	8.50	9.01	11.41	1,991	8.44	9.05	11.55
F40–F49	5,031	31.78	32.93	30.68	5,452	34.41	36.27	32.91	5,968	35.21	37.09	35.70	7,406	35.21	37.56	43.52	8,102	35.22	37.33	47.30	8,061	34.16	36.63	46.77
F50–F59	155	0.98	1.01	0.95	171	1.08	1.14	1.03	174	1.03	1.08	1.04	361	1.72	1.83	2.12	375	1.63	1.73	2.19	445	1.89	2.02	2.58
F60–F69	411	2.60	2.69	2.51	438	2.76	2.91	2.64	378	2.23	2.35	2.26	445	2.12	2.26	2.61	506	2.20	2.33	2.95	625	2.65	2.84	3.63
F70–F79	4	0.03	//	0.02	10	0.06	//	0.06	3	0.02	//	0.02	9	0.04	//	0.05	7	0.03	//	0.04	10	0.04	//	0.06
F80–F89	18	0.11	//	0.11	30	0.19	//	0.18	45	0.27	//	0.27	35	0.17	//	0.21	29	0.13	//	0.17	32	0.14	//	0.19
F90–F98	532	3.36	//	3.24	771	4.87	//	4.65	810	4.78	//	4.85	1,272	6.05	//	7.47	1,261	5.48	//	7.36	1,548	6.56	//	8.98
F99	156	0.99	1.02	0.95	176	1.11	1.17	1.06	197	1.16	1.22	1.18	196	0.93	0.99	1.15	229	1.00	1.06	1.34	259	1.10	1.18	1.50

	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000
TAS	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	194	4.27	4.34	3.99	254	5.62	5.68	5.18	232	4.93	5.02	4.70	275	6.35	6.44	5.52	280	6.15	6.25	5.56	343	7.45	7.57	6.76
F10–F19	794	17.49	17.78	16.33	882	19.53	19.74	18.00	916	19.47	19.81	18.57	843	19.47	19.76	16.93	951	20.88	21.22	18.90	1,012	21.99	22.34	19.94
F20–F29	1,007	22.19	22.55	20.71	874	19.35	19.56	17.84	776	16.50	16.79	15.73	772	17.83	18.09	15.50	703	15.44	15.69	13.97	719	15.62	15.87	14.16
F30–F39	1,013	22.32	22.69	20.83	1,067	23.62	23.88	21.78	1,307	27.78	28.27	26.50	1,128	26.05	26.44	22.65	1,156	25.38	25.80	22.97	1,148	24.94	25.34	22.61
F40–F49	758	16.70	16.98	15.59	771	17.07	17.25	15.74	854	18.15	18.47	17.32	787	18.18	18.44	15.81	879	19.30	19.62	17.47	824	17.90	18.19	16.23
F50–F59	25	0.55	0.56	0.51	28	0.62	0.63	0.57	34	0.72	0.74	0.69	37	0.85	0.87	0.74	31	0.68	0.69	0.62	35	0.76	0.77	0.69
F60–F69	267	5.88	5.98	5.49	231	5.11	5.17	4.71	181	3.85	3.92	3.67	155	3.58	3.63	3.11	211	4.63	4.71	4.19	208	4.52	4.59	4.10
F70–F79	1	0.02	//	0.02	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	..	//	//		0	0.00	//	0.00
F80–F89	2	0.04	//	0.04	1	0.02	//	0.02	0	0.00	//	0.00	4	0.09	//	<0.01	..	//	//		5	0.11	//	0.10
F90–F98	71	1.56	//	1.46	47	1.04	//	0.96	81	1.72	//	1.64	59	1.36	//	1.18	70	1.54	//	1.39	68	1.48	//	1.34
F99	407	8.97	9.12	8.37	362	8.01	8.10	7.39	323	6.87	6.99	6.55	270	6.24	6.33	5.42	270	5.93	6.03	5.36	241	5.24	5.32	4.75
TAS	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	323	6.90	7.04	6.31	336	7.62	7.76	6.56	395	8.58	8.72	7.71	455	8.30	8.46	8.83	562	9.49	9.71	10.86	468	7.64	7.85	8.98
F10–F19	966	20.62	21.06	18.89	970	22.01	22.41	18.95	1,039	22.56	22.94	20.27	1,138	20.75	21.16	22.08	1,143	19.30	19.74	22.08	1,315	21.48	22.05	25.25
F20–F29	718	15.33	15.65	14.04	639	14.50	14.76	12.48	680	14.77	15.01	13.27	779	14.20	14.48	15.11	779	13.15	13.46	15.05	896	14.64	15.03	17.20
F30–F39	1,118	23.87	24.37	21.86	985	22.35	22.75	19.24	1,021	22.17	22.54	19.92	1,252	22.83	23.28	24.29	1,420	23.98	24.53	27.43	1,297	21.19	21.75	24.90
F40–F49	940	20.07	20.49	18.38	899	20.39	20.77	17.56	876	19.02	19.34	17.09	1,166	21.26	21.68	22.62	1,234	20.84	21.32	23.84	1,312	21.43	22.00	25.19
F50–F59	37	0.79	0.81	0.72	35	0.79	0.81	0.68	32	0.69	0.71	0.62	44	0.80	0.82	0.85	43	0.73	0.74	0.83	59	0.96	0.99	1.13
F60–F69	207	4.42	4.51	4.05	212	4.81	4.90	4.14	234	5.08	5.17	4.57	228	4.16	4.24	4.42	278	4.69	4.80	5.37	321	5.24	5.38	6.16
F70–F79	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	4	0.07	//	0.08
F80–F89	1	0.02	//	0.02	3	0.07	//	0.06	2	0.04	//	0.04	1	0.02	//	0.02	2	0.03	//	0.04	2	0.03	//	0.04
F90–F98	96	2.05	//	1.88	76	1.72	//	1.48	73	1.59	//	1.42	105	1.91	//	2.04	131	2.21	//	2.53	153	2.50	//	2.94
F99	278	5.94	6.06	5.44	253	5.74	5.84	4.94	253	5.49	5.58	4.94	316	5.76	5.88	6.13	330	5.57	5.70	6.38	295	4.82	4.95	5.66
ACT	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	63	2.80	2.84	1.91	99	3.62	3.68	2.96	133	5.05	5.08	3.90	122	4.86	4.91	3.52	128	4.58	4.61	3.63	123	3.97	3.99	3.43
F10–F19	483	21.49	21.81	14.63	606	22.14	22.51	18.14	510	19.35	19.48	14.95	542	21.60	21.79	15.65	603	21.59	21.74	17.12	688	22.18	22.32	19.19
F20–F29	393	17.48	17.74	11.90	551	20.13	20.47	16.49	582	22.09	22.23	17.06	528	21.04	21.23	15.25	556	19.91	20.04	15.78	624	20.12	20.25	17.40
F30–F39	412	18.33	18.60	12.48	640	23.38	23.77	19.15	592	22.47	22.61	17.36	659	26.27	26.50	19.03	718	25.71	25.88	20.38	798	25.73	25.89	22.26
F40–F49	806	35.85	36.39	24.41	706	25.79	26.23	21.13	685	26.00	26.17	20.08	529	21.08	21.27	15.28	630	22.56	22.71	17.88	693	22.34	22.49	19.33
F50–F59	8	0.36	0.36	0.24	15	0.55	0.56	0.45	19	0.72	0.73	0.56	15	0.60	0.60	0.43	31	1.11	1.12	0.88	22	0.71	0.71	0.61
F60–F69	32	1.42	1.44	0.97	75	2.74	2.79	2.24	62	2.35	2.37	1.82	62	2.47	2.49	1.79	73	2.61	2.63	2.07	103	3.32	3.34	2.87
F70–F79	0	0.00	//	0.00	1	0.04	//	0.03	2	0.08	//	0.06	2	0.08	//	0.06	0	0.00	//	0.00	..	//	//	//
F80–F89	1	0.04	//	0.03	22	0.80	//	0.66	4	0.15	//	0.12	3	0.12	//	0.09	0	0.00	//	0.00	..	//	//	//
F90–F98	32	1.42	//	0.97	22	0.80	//	0.66	11	0.42	//	0.32	17	0.68	//	0.49	19	0.68	//	0.54	17	0.55	//	0.47
F99	18	0.80	0.81	0.55	0	0.00	0.00	0.00	35	1.33	1.34	1.03	30	1.20	1.21	0.87	35	1.25	1.26	0.99	31	1.00	1.01	0.86
ACT	2010-11				2011-12				2012-13				2014-15†				2015-16†				2016-17			
F00–F09	164	4.78	4.82	4.46	197	5.42	5.49	5.23	312	8.32	8.40	8.13	..	//	//	//	..	//	//	//	442	9.32	9.49	10.77
F10–F19	671	19.55	19.71	18.23	610	16.77	17.01	16.20	891	23.75	23.98	23.22	..	//	//	//	..	//	//	//	1,010	21.29	21.68	24.62
F20–F29	662	19.28	19.45	17.99	789	21.69	22.00	20.95	689	18.37	18.54	17.96	..	//	//	//	..	//	//	//	787	16.59	16.90	19.18
F30–F39	718	20.91	21.09	19.51	841	23.12	23.45	22.33	752	20.05	20.24	19.60	..	//	//	//	..	//	//	//	860	18.13	18.46	20.96
F40–F49	919	26.77	27.00	24.97	853	23.45	23.79	22.65	825	21.99	22.20	21.50	..	//	//	//	..	//	//	//	1,374	28.97	29.50	33.49
F50–F59	40	1.17	1.18	1.09	36	0.99	1.00	0.96	23	0.61	0.62	0.60	..	//	//	//	..	//	//	//	27	0.57	0.58	0.66
F60–F69	191	5.56	5.61	5.19	186	5.11	5.19	4.94	141	3.76	3.79	3.68	..	//	//	//	..	//	//	//	158	3.33	3.39	3.85
F70–F79	1	0.03	//	0.03	1	0.03	//	0.03	0	0.00	//	0.00	..	//	//	//	..	//	//	//	0	0.00	//	0.00
F80–F89	7	0.20	//	0.19	21	0.58	//	0.56	9	0.24	//	0.23	..	//	//	//	..	//	//	//	10	0.21	//	0.24
F90–F98	21	0.61	//	0.57	30	0.82	//	0.80	26	0.69	//	0.68	..	//	//	//	..	//	//	//	37	0.78	//	0.90
F99	39	1.14	1.15	1.06	74	2.03	2.06	1.97	83	2.21	2.23	2.16	..	//	//	//	..	//	//	//	442	9.32	9.49	10.77

	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000	No.	%††	%‡	Rate/10,000
NT	2004-05				2005-06				2006-07				2007-08				2008-09				2009-10			
F00–F09	80	2.96	3.02	3.88	75	2.15	2.20	3.56	75	2.13	2.17	3.49	94	3.25	3.32	4.26	133	3.93	4.05	5.88	95	3.00	3.06	4.14
F10–F19	859	31.78	32.39	41.62	982	28.20	28.81	46.62	982	27.87	28.46	45.72	1,166	40.33	41.14	52.88	1,369	40.49	41.66	60.52	1,312	41.39	42.24	57.12
F20–F29	524	19.39	19.76	25.39	648	18.61	19.01	30.77	648	18.39	18.78	30.17	521	18.02	18.38	23.63	582	17.21	17.71	25.73	522	16.47	16.81	22.72
F30–F39	350	12.95	13.20	16.96	343	9.85	10.06	16.28	343	9.73	9.94	15.97	265	9.17	9.35	12.02	297	8.78	9.04	13.13	296	9.34	9.53	12.89
F40–F49	796	29.45	30.02	38.57	727	20.88	21.33	34.52	727	20.63	21.07	33.84	715	24.73	25.23	32.43	854	25.26	25.99	37.75	842	26.56	27.11	36.65
F50–F59	11	0.41	0.41	0.53	9	0.26	0.26	0.43	9	0.26	0.26	0.42	19	0.66	0.67	0.86	10	0.30	0.30	0.44	8	0.25	0.26	0.35
F60–F69	32	1.18	1.21	1.55	24	0.69	0.70	1.14	24	0.68	0.70	1.12	54	1.87	1.91	2.45	41	1.21	1.25	1.81	31	0.98	1.00	1.35
F70–F79	1	0.04	//	0.05	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	..	//	//	//
F80–F89	0	0.00	//	0.00	1	0.03	//	0.05	1	0.03	//	0.05	1	0.03	//	0.05	5	0.15	//	0.22	..	//	//	//
F90–F98	50	1.85	//	2.42	72	2.07	//	3.42	72	2.04	//	3.35	56	1.94	//	2.54	80	2.37	//	3.54	61	1.92	//	2.66
F99	0	0.00	0.00	0.00	601	17.26	17.63	28.53	643	18.25	18.63	29.93	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00
NT	2010-11				2011-12				2012-13				2014-15				2015-16				2016-17			
F00–F09	94	2.55	2.61	4.06	112	2.43	2.48	4.75	134	1.99	2.03	5.52	146	2.35	2.41	5.96	144	2.22	2.29	5.86	150	2.29	2.37	6.09
F10–F19	1,606	43.53	44.56	69.44	2,317	50.29	51.22	98.19	4,215	62.56	63.72	173.64	3,647	58.70	60.32	148.88	3,797	58.54	60.27	154.51	3,747	57.29	59.24	152.25
F20–F29	627	17.00	17.40	27.11	724	15.72	16.00	30.68	756	11.22	11.43	31.14	652	10.49	10.78	26.62	759	11.70	12.05	30.89	786	12.02	12.43	31.94
F30–F39	352	9.54	9.77	15.22	336	7.29	7.43	14.24	407	6.04	6.15	16.77	389	6.26	6.43	15.88	410	6.32	6.51	16.68	400	6.12	6.32	16.25
F40–F49	900	24.40	24.97	38.91	1,006	21.84	22.24	42.63	1,076	15.97	16.27	44.33	1,146	18.45	18.95	46.78	1,149	17.72	18.24	46.76	1,206	18.44	19.07	49.00
F50–F59	9	0.24	0.25	0.39	13	0.28	0.29	0.55	9	0.13	0.14	0.37	11	0.18	0.18	0.45	8	0.12	0.13	0.33	9	0.14	0.14	0.37
F60–F69	16	0.43	0.44	0.69	16	0.35	0.35	0.68	18	0.27	0.27	0.74	55	0.89	0.91	2.25	33	0.51	0.52	1.34	27	0.41	0.43	1.10
F70–F79	0	0.00	//	0.00	0	0.00	//	0.00	0	0.00	//	0.00	1	0.02	//	0.04	2	0.03	//	0.08	..	//	//	//
F80–F89	2	0.05	//	0.09	2	0.04	//	0.08	0	0.00	//	0.00	3	0.05	//	0.12	9	0.14	//	0.37	11	0.17	//	0.45
F90–F98	83	2.25	//	3.59	81	1.76	//	3.43	122	1.81	//	5.03	163	2.62	//	6.65	175	2.70	//	7.12	202	3.09	//	8.21
F99	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00	..	//	//	//

Abbreviations and symbols: .. : Not available /Not provided; // : Not applicable; ED: Emergency Department; MH: Mental Health; MH_{dx}: Mental Health Diagnosis (F00-F99);

† Data were not available for 2013-14 for all jurisdictions and 2013-14 to 2015-16 for ACT

†† Proportion of presentations of each diagnostic group of total MH_{dx} presentations;

‡ Proportion of presentations of each diagnostic group of MH_{dx} presentations excluding the diagnostic group ICD-10-AM F70-F98

‡‡ NSW used a combination of ICD-9-CM and ICD-10-AM. SA used ICD-9-CM before 2007-08. Since 2007-08, SA has used a combination of ICD-9-CM and ICD-10-AM. A mapping of the relevant ICD-9-CM codes to the ICD-10-AM code blocks is provided by AIHW (see also Table 2.4).

§ In 2007-08, MH_{dx} presentations are under-reported in NSW due to the implementation of a new ED information system.

ICD-10-AM MH diagnostic groups:

F00–F09: Organic, including symptomatic, mental disorders

F10–F19: Mental and behavioural disorders due to psychoactive substance use

F20–F29: Schizophrenia, schizotypal and delusional disorders

F30–F39: Mood (affective) disorders

F40–F48: Neurotic, stress related and somatoform disorders

F50–F59: Behavioural syndromes associated with physiological disturbances and physical factors

F60–F69: Disorders of adult personality and behaviour

F70–F79: Mental retardation

F80–F89: Disorders of psychological development

F90–F98: Disorders with onset usually occurring in childhood and adolescence

F99: Unspecified mental disorder

Sources: Mental Health Services in Australia.^[34-45]

Table 6.2: Differences (x-fold)[†] and annual rates of change (AAGR and CAGR)[†] in absolute number and number per 10,000 populations of ED presentations with a MH diagnosis (ICD-10-AM F00-F99), between 2004-05 and 2016-17, by jurisdiction and diagnostic group

Jurisdictions	AUS	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	AUS	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
	Absolute number of presentations									Number of presentations per 10,000 population								
MH Diagnostic group	Difference (x-fold)									Difference (x-fold)								
F00-F09	3.86	4.90	2.93	6.96	2.65	2.51	2.41	7.02	1.88	3.20	4.21	2.34	5.64	2.08	2.27	2.25	5.65	1.57
F10-F19	2.67	2.61	2.21	3.34	3.58	2.10	1.66	2.09	4.36	2.21	2.24	1.76	2.71	2.80	1.89	1.55	1.68	3.66
F20-F29	1.41	0.88	2.02	2.01	3.04	1.05	0.89	2.00	1.50	1.17	0.75	1.62	1.63	2.38	0.94	0.83	1.61	1.26
F30-F39	1.27	1.07	1.53	1.34	1.94	0.75	1.28	2.09	1.14	1.05	0.92	1.22	1.08	1.51	0.68	1.20	1.68	0.96
F40-F49	1.92	1.46	1.55	3.57	3.37	1.58	1.73	1.70	1.52	1.59	1.26	1.24	2.89	2.63	1.42	1.62	1.37	1.27
F50-F59	2.11	2.35	4.05	1.25	3.74	3.84	2.36	3.38	0.82	1.75	2.02	3.23	1.01	2.93	3.46	2.20	2.72	0.69
F60-F69	1.72	4.84	1.71	0.72	3.51	0.83	1.20	4.94	0.84	1.43	4.16	1.37	0.58	2.74	0.74	1.12	3.97	0.71
F70-F79	0.78	1.91	6.33	0.02	//	//	//	//	//	0.65	1.64	5.06	0.01	//	//	//	//	//
F80-F89	1.87	3.45	//	0.21	3.40	3.20	//	//	//	1.55	2.97	//	0.17	2.66	2.88	//	//	//
F90-F98	1.49	0.65	2.31	3.07	3.34	3.00	2.15	1.16	4.04	1.23	0.56	1.85	2.49	2.61	2.70	2.01	0.93	3.39
F99	8.02	466.71	2.20	3.12	3.73	1.39††	0.72	4.61††	//	6.65	401.13	1.76	2.53	2.92	1.26††	0.68	3.97††	//
	Average annual growth rates (AAGR, %)									Average annual growth rates (AAGR, %)								
F00-F09	12.64	18.58	9.89	18.92	9.08	6.30	8.77	24.51	7.25	10.88	17.15	7.92	16.70	6.65	5.40	8.08	22.19	5.40
F10-F19	8.40	7.90	6.39	11.70	12.25	6.38	4.47	9.47	19.77	6.70	6.58	4.48	9.61	9.75	5.46	3.81	7.47	17.67
F20-F29	2.29	-1.58	5.05	6.98	6.86	-0.37	-2.13	8.34	6.54	0.70	-2.78	3.15	5.03	4.50	-1.23	-2.74	6.34	4.82
F30-F39	1.62	0.54	3.35	2.57	5.64	-3.72	0.98	9.47	2.55	0.03	-0.68	1.50	0.65	3.25	-4.54	0.35	7.49	0.86
F40-F49	5.66	4.42	3.95	12.06	10.72	2.67	2.94	1.64	3.86	4.01	3.15	2.08	9.99	8.25	1.78	2.29	-0.29	2.13
F50-F59	11.07	16.49	15.21	13.95	15.38	7.46	6.56	25.81	3.70	9.36	15.09	13.12	11.86	12.85	6.54	5.88	23.48	1.94
F60-F69	4.84	17.12	9.49	-2.76	8.85	-1.95	3.49	29.31	-4.25	3.21	15.70	7.58	-4.52	6.47	-2.80	2.84	26.96	-6.07
F70-F79	5.22	18.12	39.94	12.75	//	17.89	//	//	//	3.64	16.71	37.41	//	//	//	//	//	//
F80-F89	7.74	9.04	//	68.56	21.48	33.73	//	//	//	6.09	7.80	//	//	//	//	//	//	//
F90-F98	1.95	-4.38	7.24	10.37	10.75	9.15	8.51	3.45	14.79	0.37	-5.54	5.33	8.37	8.27	8.18	7.82	1.49	12.87
F99	33.41	177.34	7.56	-16.33	33.84	//	-4.88	14.83	//	31.20	173.78	5.59	-17.58	30.88	3.59	-5.47	0.60	//
	Compound annual growth rates (CAGR, %)									Compound annual growth rates (CAGR, %)								
F00-F09	11.92	14.16	9.36	17.55	8.48	7.99	7.61	17.63	5.38	10.19	12.73	7.33	15.51	6.27	7.05	7.00	15.52	3.84
F10-F19	8.53	8.32	6.83	10.58	11.21	6.39	4.29	6.34	13.06	6.85	6.97	4.84	8.67	8.96	5.47	3.70	4.43	11.41
F20-F29	2.90	-1.08	6.05	6.01	9.70	0.38	-0.97	5.96	3.44	1.30	-2.32	4.08	4.17	7.48	-0.49	-1.53	4.06	1.93
F30-F39	2.01	0.58	3.60	2.45	5.66	-2.32	2.08	6.32	1.12	0.43	-0.68	1.68	0.68	3.51	-3.17	1.50	4.42	-0.35
F40-F49	5.59	3.23	3.72	11.18	10.65	3.88	4.68	4.55	3.52	3.96	1.94	1.80	9.25	8.40	2.98	4.08	2.67	2.01
F50-F59	6.42	7.38	12.35	1.86	11.63	11.86	7.42	10.67	-1.66	4.77	6.03	10.27	0.10	9.36	10.89	6.81	8.68	-3.09
F60-F69	4.64	14.03	4.58	-2.70	11.02	-1.57	1.55	14.23	-1.41	3.02	12.60	2.64	-4.38	8.77	-2.43	0.97	12.18	-2.84
F70-F79	-2.05	5.54	16.63	-29.38	//	-3.84	//	//	//	-3.57	4.21	14.46	//	//	//	//	//	//
F80-F89	5.33	10.88	//	-12.18	10.74	10.18	//	//	//	3.70	9.49	//	//	//	//	//	//	//
F90-F98	3.36	-3.57	7.24	9.80	10.57	9.59	6.61	1.22	12.34	1.76	-4.78	5.25	7.90	8.33	8.64	6.00	-0.60	10.70
F99	18.95	66.89	6.80	9.94	11.61	//	-2.65	21.05	//	17.10	64.79	4.82	8.04	9.34	2.12	-3.20	18.80	//

Abbreviations and symbols: //: Data was not available / provided / ≤ 10 cases in most years; AAGR: Average Annual Growth Rate; ACT: Australian Capital Territory; AUS: Australia; CAGR: Compound Annual Growth Rate; ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Differences (x-fold) and rates of change were calculated from raw data. Re-calculation for presentations per 10,000 population will lead to differences due to the impact of rounding.

†† The comparisons were made between the data for the latest year and the earliest year, which were not necessarily 2016-17 and 2004-05, due to unavailable data or “0” cases.

Red numbers highlight increases with greater-than-1.1-fold between the first and the last year;

Blue numbers highlight decreases with smaller-than-0.9-fold between the first and the last year;

Yellow highlights indicate the greatest increase within the respective diagnostic group;

Green highlights indicate the greatest decrease within the respective diagnostic group.

ICD-10-AM MH diagnostic groups:

F00–F09: Organic, including symptomatic, mental disorders

F10–F19: Mental and behavioural disorders due to psychoactive substance use

F20–F29: Schizophrenia, schizotypal and delusional disorders

F30–F39: Mood (affective) disorders

F40–F48: Neurotic, stress related and somatoform disorders

F50–F59: Behavioural syndromes associated with physiological disturbances and physical factors

F60–F69: Disorders of adult personality and behaviour

F70–F79: Mental retardation

F80–F89: Disorders of psychological development

F90–F98: Disorders with onset usually occurring in childhood and adolescence

F99: Unspecified mental disorder

Table 6.3: Number of ED presentations with a MH diagnosis (ICD-10-AM F00-F99) per 10,000 population† by jurisdiction and diagnostic group, 2004-05, 2016-17, and period mean††

		F00-F09	F10-F19	F20-F29	F30-F39	F40-F49	F50-F59	F60-F69	F70-F79	F80-F89	F90-F98	F99
2004-05	Australia	2.62	13.65	11.03	12.37	18.84	0.59	2.14	0.05	0.07	2.41	1.62
	NSW	1.96	13.83	13.96	13.38	22.43	0.30	0.86	0.02	0.08	4.49	0.06
	VIC	2.34	13.81	8.65	11.86	15.73	0.26	1.80	0.01	<0.01	0.95	1.55
	QLD	1.81	10.59	7.51	10.68	11.10	1.67	3.83	0.16	0.19	1.15	4.86
	WA	5.04	11.79	5.25	7.56	17.00	0.23	1.32	<0.01	0.02	1.29	0.63
	SA	4.94	17.91	17.51	17.00	32.89	0.75	4.87	0.10	0.06	3.32	<0.01
	TAS	3.99	16.33	20.71	20.83	15.59	0.51	5.49	0.02	0.04	1.46	8.37
	ACT	1.91	14.63	11.90	12.48	24.41	0.24	0.97	<0.01	0.03	0.97	0.55
	NT	3.88	41.62	25.39	16.96	38.57	0.53	1.55	0.05	<0.01	2.42	<0.01
2016-17	Australia	8.40	30.23	12.89	13.03	30.02	1.04	3.06	0.03	0.11	2.97	10.81
	NSW	8.25	31.03	10.53	12.33	28.25	0.61	3.58	0.03	0.24	2.50	22.56
	VIC	5.47	24.35	13.97	14.48	19.47	0.83	2.46	0.06	<0.01	1.76	2.72
	QLD	10.23	28.70	12.27	11.58	32.08	1.69	2.24	<0.01	0.03	2.86	12.29
	WA	10.45	33.01	12.47	11.43	44.77	0.68	3.62	0.01	0.07	3.38	1.85
	SA	11.19	33.94	16.51	11.55	46.77	2.58	3.63	0.06	0.19	8.98	1.50
	TAS	8.98	25.25	17.20	24.90	25.19	1.13	6.16	0.08	0.04	2.94	5.66
	ACT	10.77	24.62	19.18	20.96	33.49	0.66	3.85	<0.01	0.24	0.90	0.00
	NT	6.09	152.25	31.94	16.25	49.00	0.37	1.10	0.00	0.45	8.21	0.00
Period mean†	Australia	5.00	21.80	11.33	13.04	23.84	0.97	2.68	0.04	0.08	2.47	5.21
	NSW	4.34	21.46	11.36	12.98	25.37	0.47	2.07	0.02	0.11	3.12	8.99
	VIC	3.61	18.52	10.41	13.19	17.86	0.56	2.88	0.05	0.00	1.44	1.69
	QLD	5.99	23.16	11.45	13.56	22.57	2.54	3.59	0.09	0.12	2.20	7.72
	WA	7.11	20.06	7.54	10.19	28.61	0.47	1.89	0.00	0.06	2.31	0.83
	SA	6.71	25.48	14.86	11.20	34.60	1.19	3.10	0.04	0.13	4.45	1.03
	TAS	6.75	19.68	15.42	22.92	18.57	0.72	4.50	0.01	0.04	1.69	5.94
	ACT	4.80	18.19	17.00	19.31	22.07	0.65	2.94	0.02	0.21	0.64	0.95
	NT	4.79	91.78	28.06	15.19	40.18	0.46	1.35	0.01	0.12	4.33	4.87

Abbreviations and symbols: ACT: Australian Capital Territory; ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH: Mental Health; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Vitoria; WA: Western Australia;

† Differences (x-fold) and rates of change were calculated from raw data. Re-calculation for presentations per 10,000 population will lead to differences due to the impact of rounding.

†† Period mean of the whole study period (2004-05 to 2016-17), excluding 2013-14 (all jurisdictions) and 2013-14 to 2015-16 (ACT), for which data were not available

ICD-10-AM MH diagnostic groups:

- F00–F09: Organic, including symptomatic, mental disorders

F10–F19: Mental and behavioural disorders due to psychoactive substance use

F20–F29: Schizophrenia, schizotypal and delusional disorders

F30–F39: Mood (affective) disorders

F40–F48: Neurotic, stress related and somatoform disorders

F50–F59: Behavioural syndromes associated with physiological disturbances and physical factors
- F60–F69: Disorders of adult personality and behaviour

F70–F79: Mental retardation

F80–F89: Disorders of psychological development

F90–F98: Disorders with onset usually occurring in childhood and adolescence

F99: Unspecified mental disorder

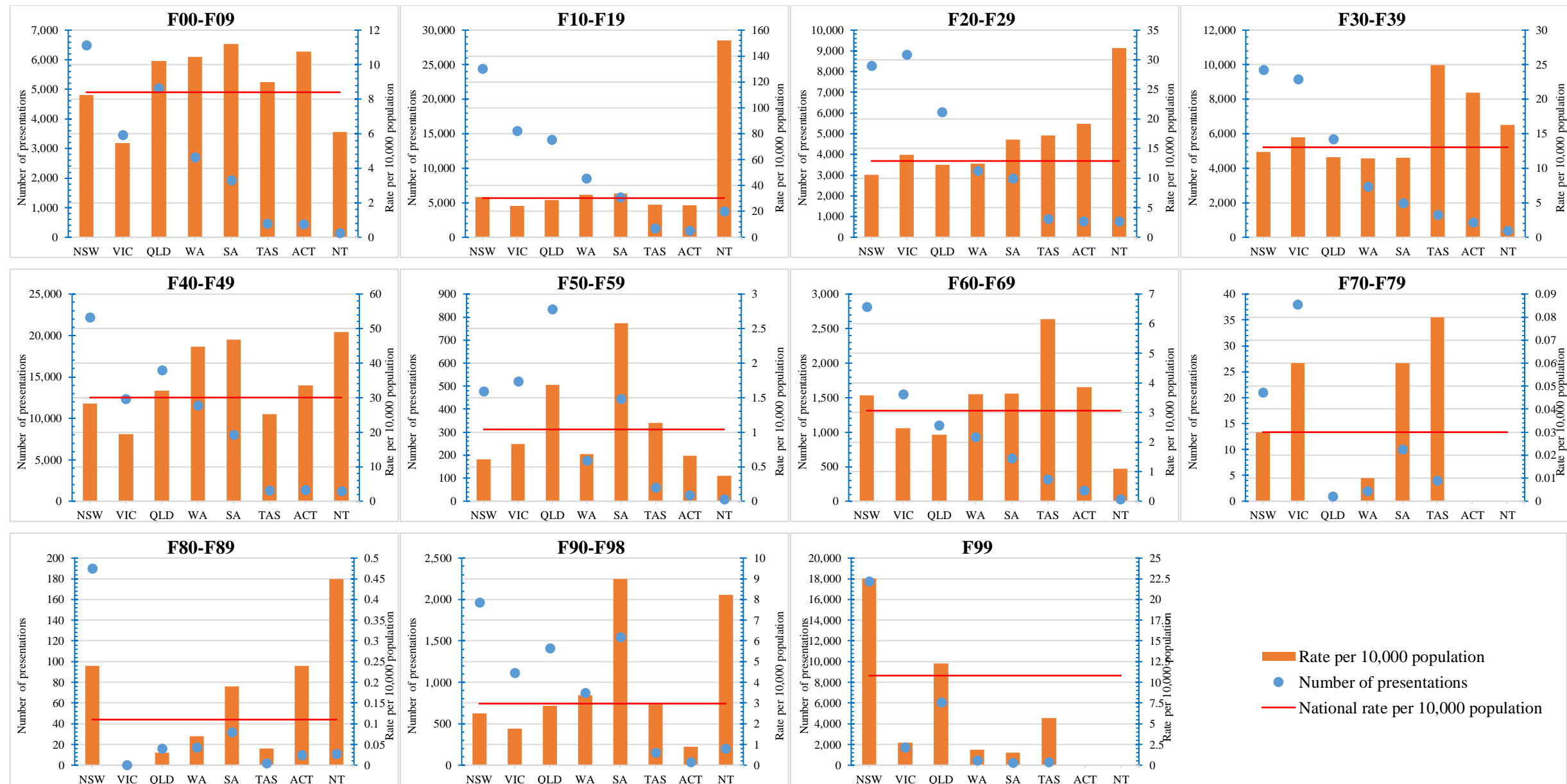


Figure 62: Absolute number and rate per 10,000 population of ED presentations† with a MH diagnosis in Australia and jurisdictions by diagnostic group, 2016-17, except F70-F79 and F99 for ACT and NT††

Abbreviations and symbols: ACT: Australian Capital Territory; ED: Emergency Department; ICD-10-AM: *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*; MH:

Mental Health; NSW: New South Wales; NT: Northern Territory; SA: Queensland; South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Differences (x-fold) and rates of change were calculated from raw data. Re-calculation for presentations per 10,000 population will lead to differences due to the impact of rounding.

†† No detailed data available

ICD-10-AM MH diagnostic groups

F00–F09: Organic, including symptomatic, mental disorders

F10–F19: Mental and behavioural disorders due to psychoactive substance use

F20–F29: Schizophrenia, schizotypal and delusional disorders

F30–F39: Mood (affective) disorders

F40–F48: Neurotic, stress related and somatoform disorders

F50–F59: Behavioural syndromes associated with physiological disturbances and physical factors

F60–F69: Disorders of adult personality and behaviour

F70–F79: Mental retardation

F80–F89: Disorders of psychological development

F90–F98: Disorders with onset usually occurring in childhood and adolescence

F99: Unspecified mental disorder

Sources: *Mental Health Services in Australia*.^[34-45]

In 2016-17, the highest rate of presentation for F00-F09 per 10,000 population was in SA, followed by ACT, WA, and QLD; and the lowest VIC, then NT (Figure 6.2). NT was the jurisdiction with the highest rate of presentations per 10,000 population for F10-F19 and F20-F29, which were more than 7.0-fold and about 2.5-fold greater than the national rates, respectively. The rates of presentations for F30-F39 were not much different from the national rate except TAS (nearly double) and ACT (more than 1.5-fold). NT had the greatest rate of presentations for F40-F49, followed by SA and WA, while the lowest was VIC, and second lowest TAS. Most jurisdictions had lower rates of presentations than the national average for F50-F59, except SA (2.5-fold greater), followed by QLD (more than 1.5-fold greater). The rate of presentations for F60-F69 was greatest in TAS (double the national rate), and smallest in the NT (one-third the national rate) with the other jurisdictions consistent with the national rate. For F90-F98, the rates of presentations in NSW, QLD, WA, and TAS were not very different from the national rate, whilst SA and NT were much greater (3.0-fold and 2.7-fold greater respectively), while the rates for VIC and ACT were smaller (a half and one-third, respectively). The rate of presentations for F99 was greatest in NSW (double the rate in QLD and the national rate), and were otherwise limited (SA, WA, VIC) or not available (ACT, NT). Given that the rates of presentations for F70-F79 and F80-F89 were very small across all jurisdictions, with missing data from ACT and NT (F70-F79), and VIC (F80-F89), interstate comparisons for these diagnoses may not be reliable.

6.5. Discussion

This is the first examination of long-term trends in MH_{dx} presentations by diagnostic group in Australia nationally and at jurisdiction level, and furthers work presented in Chapter 4, Chapter 5 and Chapter 7. With reference to a two-fold increase

in the number of MH_{dx} presentations between 2004-05 and 2016-17,^[222] this paper found increases in most MH diagnostic groups (F00-F99), but particularly presentations for psychoactive substance use (F10-F19), which increased nearly three-fold. The other notable increase was in unspecified mental disorder (F99) in NSW, for which the number of presentations increased more than 400-fold.

Presentations for mental and behavioural disorders due to psychoactive substance use (F10-F19) increased more than three-fold per 10,000 population between 2010-11 and 2015-16, coinciding with a three-fold increase in the proportion of individuals who nominated methamphetamine as the first drug for which they had a specific problem, to almost half of all surveyed drug users (16.3%, 2010; 46.4%, 2016).^[223] During this period, crystal/ice became the main form of methamphetamine used in Australia (21.7%, 2010; 57.3%, 2016), and there was an increase in more regular and dependent use and a smaller reduction in overall use. Specifically, recent users and at least weekly use among methamphetamine users more than doubled (0.4%, 2010; 0.8%, 2016; and 9.3%, 2010; 20.4%, 2016, respectively), while overall rates of methamphetamine use reduced by one-third (2.1%, 2010; 1.4%, 2016). During 2010-11 to 2015-16, there was also increased use of cocaine and inhalants, and the misuse of pharmaceuticals, especially pain-killers/analgesics and opioids;^[223] increases that appear unabated.^[224] It is hypothesised that these changes in substance use are reflected in the increase in presentations for substance use disorder, which would be consistent with international findings.^[126,128,130,225] In Australia, increased hospital admissions due to the misuse of cannabis, amphetamine, and opioids between 1993 and 2012 have been previously identified.^[226] Importantly, as presentations due to psychoactive substance use are associated with acute behavioural disturbance, and

thus resourcing and safety implications,^[227] the increase in these presentations represents a significant increasing burden for EDs.

Among the jurisdictions, the increase in presentations for substance use disorder was most marked in the NT in both absolute and relative terms, especially after 2009. This finding is arguably reflecting the higher levels of risky alcohol consumption and illicit drug use in the NT compared to the other jurisdictions.^[223] In WA, which had the second highest increase in substance-use related presentations, alcohol has been identified as the primary driver behind an increase in this diagnostic group among metropolitan Perth residents between 2002-03 to 2016-17.^[60] However, increased alcohol-related presentations have not been found in NSW^[228] or QLD,^[229] highlighting the importance of non-alcohol related presentations for some jurisdictions. It is also noted that in the Perth study, substance use presentations increased 2.1-fold, as compared with nearly three-fold across the entire state between 2004-05 to 2016-17 as assessed herein, supporting differences in presentation characteristics between urban and rural areas.^[140] These findings also contrast with similar levels of presentations for psychoactive substance use among children and youth (0-19 years) to VIC EDs between 2008-09 and 2014-15,^[51] further indicating the importance of jurisdiction and age-specific investigation. In NSW, increase in methamphetamine use has been associated with a 10-fold increase in methamphetamine-related ED presentations.^[230] Psychological counselling, educational/informational interventions, and referral and follow up at community level have been identified as potential mechanisms to reduce ED presentations for MH conditions due to alcohol and drug use.^[231] Policing initiatives to manage people with aggressive and agitated behaviour due to drug use, and improved accessibility to treatment facilities and options for existing drug users have been recommended to

reduce ED use.^[232,233] These finding particularly focused on methamphetamine use and people aged 15-24 years.

The importance of age, and likely impact of the ageing population is also suggested from the diagnostic data given the increase in presentations for organic mental disorders (F00-F09), which includes dementia. The increase occurred across all jurisdictions, particularly the ACT and QLD. Meanwhile, TAS, SA and WA consistently experienced rates of presentation above the national rate, TAS and SA are the jurisdictions with the oldest populations on average.^[195]

The increased use of the diagnostic code for unspecified mental disorder (F99) was also identified, particularly in NSW. This increase may be the result of difficulty in assigning a single diagnostic code,^[234] as per the requirements of the Australian ED minimum dataset for most of the study period,^[72-74] and/or due to patient complexity in which dual-diagnosis or a pre-existing formal diagnosis can lead to problems in assigning a single diagnosis. The large increase in NSW may also be due to its coding system.^[204,235] If so, differences in coding mechanisms may limit the extent to which inter-jurisdiction comparisons can be undertaken. Further, coding practices within EDs, particularly the ability of non-clinicians^[204,235] or non-treating clinicians to assign diagnostic codes and a general lack of understanding of the potential usefulness of administrative data and thus the importance of robust coding practices are also of concern.

The largest diagnostic group in Australia and all jurisdictions throughout the study period was stress-related disorders (F40-F49) with over a quarter of presentations, consistent with findings from WA (Perth) during the period 2002-03 to 2016-17,^[60] SA during the period 2004 to 2011^[59] and earlier findings from NSW (1999 to 2006)^[31] and the high prevalence of this condition in the community.^[236]

However, low prevalence disorders, including psychotic disorders (F20-F29), comprised 13.6% of presentations on average, and experienced a 14.6% increase in the number of presentations per 10,000 population over the study period. A 4.9-fold increase in the average number of non-admitted MHEd presentations by patients with psychotic disorders between 1997 and 2010 has been estimated previously.^[70] Together these findings may reflect the impact of inadequate resourcing and/or lack of improvements in community mental health service provision in the face of mental health reform, including reduced psychiatric bed numbers.^[22]

The rate of ED presentations for mood disorders (F30-F39) in Australia and in half the jurisdictions, remained comparatively constant over the course of the study period, in contrast to most other diagnostic groups, including other “high prevalence disorders” (anxiety/stress-related – F40-F49 and substance use – F10-F19) which increased. It is possible that the stability for mood disorder presentations, leading to a relative decrease in presentations among mental health diagnoses, may reflect the change in the provision of primary care services. For example, increased provision of psychological therapies from the early 2000s under the Access to Allied Psychological Services Initiative (2003) and Better Access Initiative (2006)^[237,238] as well as the introduction of Selective Serotonin Reuptake Inhibitors (SSRIs) may be impacting the relative rate of people experiencing acute events. The introduction of SSRIs contributed to an increase in daily antidepressant usage by 352% between 1990 to 2002,^[7] and 95% between 2000 and 2011.^[239] Overall, the 12-month treatment rate for mental disorders in the community increased from 37% to 46% between 2006–07 and 2009–10.^[240] It is noted, however, that an absolute reduction in presentations for mood disorders would have provided more definitive proof of this hypothesis.

The higher levels of neurotic, stress-related and somatoform disorders (F40-F49) over the study period, followed by psychoactive substance use (F10-F19), averaging 27.7% and 24.9% of MH_{dx} presentations is markedly different to the utilisation profile in the US. In the US “substance abuse” gave rise to 30.5% of MHEd presentations between 2002 and 2008, followed by mood disorders (24.0%), unspecified mental disorders (22.9%), and anxiety (20.7%),^[126] even when including self-harm and suicide presentations. These differences in utilisation profiles between Australia and the US, reflect the importance of country-specific analyses.

6.6. Strengths and Limitations

This study presents the most robust and comprehensive evidence available on MH_{dx} presentations in EDs in Australia and its jurisdictions by MH diagnostic group over time, using data from the national collection. While these data are limited by the absence of a national agreement and standards on data collection within EDs and different coding systems across jurisdictions,^[206] the use of broad diagnostic groups and size of the individual state collections should maximise the robustness of the intra- and inter-jurisdictional comparisons. Even so, the marked increase in presentations for unspecified mental disorder (F99) in NSW warrants further investigation. Further, as the jurisdictional collections and NNAPEDCD have historically only recorded one diagnostic code, there is an underestimation of the burden of mental health presentations, as self-harm and suicide-related presentations were coded as X60-X84 (Intentional self-harm), or U50-Y98 (External causes of morbidity and mortality), or even an injury code.^[34,45,51,54] In addition, the grouping of F00-F99 as mental health disorders has significant clinical limitations, given that presentations with a code of F00-F09 and F50-F59 are managed primarily by non-psychiatric medical teams.

Changes in the scope of data collection may have confounded the trend analysis in MH_{dx} presentations. Before 2013-14, the NNAPEDCD included only public hospitals classified as peer group A and B, leaving the majority of small hospitals, especially those in rural areas, out of scope.^[72] Since 2013-14, all public hospitals with a designated ED have been included in the NNAPEDCD,^[73] leading to a marked change in hospitals included for NSW.^[222] However, the significant upturn in rates of MH_{dx} presentations in NSW occurred from 2011-12,^[222] and thus prior to the change in data collection, thus the impact of this change in scope at the jurisdictional level is believed to be minimal. Even so, many rural and remote hospitals without a designated ED continue to be excluded, and thus not all emergency occasions of service are captured within the NNAPEDCD dataset.^[92] In the US, the rate of ED presentation with a MH_{dx} was higher in rural hospitals than urban hospitals.^[204] If this situation also exists in Australia, as potentially identified for WA,^[222] the exclusion of rural hospitals (particularly those without designated EDs) may lead to an underestimation of demand for MH care nationally. Further research on mental health emergency presentations across Australia by rurality is indicated.

Finally, given the aggregated nature and lack of cross-tabulations reported by the AIHW, multi-factorial analyses could not be undertaken.

6.7. Conclusion

Between 2004-05 and 2016-17, there were increased presentations in most MH diagnostic groups (F00-F99) across Australia, but particularly presentations for psychoactive substance use, including alcohol use (F10-F19). By 2014-15, psychoactive substance use had the highest rate of presentations per 10,000 population, followed by neurotic, stress-related and somatoform disorders (F40-F49). Further, with most diagnostic groups experiencing increased levels of presentations per 10,000

population in most jurisdictions with time, national and jurisdictional-level policies may be needed to strengthen the capability of community mental health and primary care professionals to recognise, diagnose, and treat earlier in the course of the illness, and to detect deterioration earlier to reduce the need for crisis care in EDs. Key, however, will be prevention of substance-use related presentations through education, policy reform and policing initiatives. As these types of initiatives cannot have immediate effect, and will potentially have significant lead-in times, EDs need to be provided with additional support now, to help them cope with the increased burden of presentations with a MH_{dx}.

Chapter 7. High acuity emergency department presentations and admitted presentations in Australia, and by jurisdiction, 2004-05 to 2016-17: all presentations and presentations with a mental health diagnosis

7.1. Preface

This chapter presents Study 5 of this thesis, an examination of the trends in the rates of high acuity emergency department (ED) presentations with a mental health diagnosis (MH_{dx}), and those admitted, for Australia and each jurisdiction, between 2004-05 and 2016-17. A manuscript of this study is prepared to be resubmitted to *Emergency Medicine Australasia*.

7.2. Introduction

Overcrowding in emergency departments (EDs), and burden associated with increasing numbers of more severe and complex cases and increasing length of stays in ED have been concerns raised internationally and in Australia.^[21,22] These concerns pertain to both all ED presentations and the subset related to mental health (MH),^[22,61,62] with prolonged length of stay for patients with a MH diagnosis (MH_{dx}) a priority for the Australasian College of Emergency Medicine.^[61,62] Further, evidence from NSW^[54] and QLD^[63] supports increasing levels of high acuity MH_{dx} presentations, placing additional demands on EDs; treatment, care and support for individuals with a MH_{dx} being inherently complex. Monitoring the trend of high acuity MH_{dx} presentations and MH_{dx} presentations admitted, is thus very important for informing health care resourcing in the short term, and development of initiatives to

reduce the burden in the medium to longer terms. Although the Australian Institute of Health and Welfare (AIHW) has reported on triage categories and admission rates for all ED presentations and those with a MH_{dx} since 2004,^[45,94] no trends have been assessed.

This fourth study using published data from the AIHW,^[209,222,241] aims to assess and compare trends of high acuity and admitted presentations, for all ED and MH_{dx} presentations between 2004-05 to 2016-17, for Australia and each jurisdiction.

7.3. Methods

7.3.1. Data sources

ED presentation data with any principal diagnosis and the subset with a MH principal diagnosis (*International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian Modification*, codes F00-F99) by triage category and episode end status were extracted from two AIHW series: *Australian Hospital Statistics* (AHS)^[46,83-94] and *Mental Health Services in Australia* (MHSA)^[34-45] respectively. Data were extracted for Australia and its jurisdictions for 2004-05 to 2016-17, except when unavailable, e.g. 2013-14 for MH_{dx} presentations (see companion papers^[209,222,241]) and 2004-05 to 2005-06 for all high acuity presentations. Data are inclusive of all age-groups.

“High acuity” presentations were defined as Australian Triage Scale (ATS) categories 1 (“Resuscitation”) and 2 (“Emergency”).^[94] “Admissions” encompassed presentations with an end status of “admitted to the same hospital” and “referred/transferred to another hospital for admission”.^[94]

Data on estimated resident populations were extracted from the *Australian Demographic Statistics* series.^[194,218]

Total change (x-fold difference between 2004-05 and 2016-17) in the absolute number of presentations and the rate of presentations per 10,000 population for high acuity and admitted ED and MH_{dx} presentations were assessed. Also assessed were the proportion of all presentations and MH_{dx} presentations that were high acuity and the proportion admitted, and the total change in these proportions.

Data were entered into Microsoft Excel 2016, then, exported to Stata 14.

7.3.2. Statistical analysis

Simple linear regression models were used to assess the national and jurisdictional trends of the rate of high acuity and admitted ED and MH_{dx} presentations, and multivariable generalised linear regression to compare these rates across jurisdictions and with the national average. Breakpoints were tested for jurisdictions using statistical goodness-of-fit tests. Likelihood ratios were used to optimise the breakpoints and compare the models with breakpoint to the model with a simple trend. Given that the jurisdictions had significantly different numbers of ED presentations, rates of presentations were weighted by the contribution (%) of each jurisdiction to the total number of Australian ED presentations in each year. Statistical significance was identified with p-value ≤ 0.05 .

7.4. Results

7.4.1. High acuity ED and MH_{dx} presentations

Between 2004-05 and 2016-17, high acuity ED presentations increased from 393,996 to 1,027,426 presentations (2.6-fold) (Table 7.1, Figure 7.1), equating to an increase from 193.2 to 417.7 presentations per 10,000 population (2.2-fold). A significant average annual increase of 18.9 presentations per 10,000 population was assessed across the study period ($p < 0.001$) (Table 7.2). However, there was also

evidence of a break, with the trend greater for 2009-10 to 2016-17 than 2004-05 to 2008-09 (average annual increases of 22.5 and 13.1 presentations/10,000 population) ($p < 0.001$) (Table 7.2). The proportion of high acuity presentations within all ED presentations increased from 9.1% to 13.5% (1.5-fold) over the study period (Table 7.1, Figure 7.2).

Across jurisdictions, significant trends in the rate of high acuity ED presentations were found in all jurisdictions, with the average annual increase ranging from 10.9 to 51.5 presentations per 10,000 population, in TAS and NT respectively, with breakpoints found in all jurisdictions (Table 7.2). Allowing for a breakpoint, the greatest average annual increase was observed for the NT for the period 2011-12 to 2016-17, the smallest (non-significant) increase for the ACT over the same period (78.8 and 1.8 presentations/10,000 population, respectively). Compared to the national average, high acuity ED presentation rates were significantly higher in the NT, SA, WA, and QLD (only after 2009-10), no different in NSW, ACT, and QLD (before 2009-10), and lower in VIC and TAS (Table 7.3).

The proportion of all ED presentations that were high acuity increased in all jurisdictions. The proportion was highest in SA in each year, reaching 15.9% in 2016-17, and lowest in NT between 2006-07 (6.4%) and 2011-12 (7.9%), and TAS between 2012-13 (8.7%) and 2016-17 (10.9%) (Table 7.1, Figure 7.2).

Table 7.1: Number, percentage, and rate per 10,000 population of high acuity†, and admitted presentations‡, (all ED presentations and those with a MH diagnosis) in Australia and jurisdictions, from 2004-05 to 2016-17, except 2013-14 (all states and territories) and 2014-15 and 2015-16 (ACT)§

Year	High acuity presentations†			MH presentations			Admitted presentations‡			MH presentations		
	All ED presentations						All ED presentations					
	No.	%	Rate /10,000	No.	%	Rate /10,000	No.	%	Rate /10,000	No.	%	Rate /10,000
Australia												
2004-05	393,996	9.1	193.2	15,543	11.2	7.6	1,308,852	28.9	641.8	44,678	32.2	21.9
2005-06	427,039	9.0	206.3	17,266	11.6	8.3	1,417,341	28.8	684.8	51,062	34.1	24.7
2006-07	475,373	9.2	225.6	20,553	11.5	9.8	1,492,821	28.2	708.4	59,792	33.5	28.4
2007-08	508,811	9.4	236.7	20,237	12.4	9.4	1,531,553	27.7	712.4	61,319	37.7	28.5
2008-09	542,680	9.7	247.2	20,706	12.0	9.4	1,602,636	27.9	730.1	61,447	35.7	28.0
2009-10	582,083	10.0	260.7	20,891	12.1	9.4	1,683,334	28.3	753.9	59,977	34.8	26.9
2010-11	624,043	10.3	279.3	21,347	12.1	9.6	1,792,895	29.0	802.5	66,062	37.5	29.6
2011-12	690,386	10.8	303.6	23,343	12.4	10.3	1,925,561	29.4	846.7	71,467	37.9	31.4
2012-13	759,062	11.6	327.9	26,755	12.5	11.6	1,913,127	28.5	826.6	74,412	34.8	32.1
2013-14§	832,532	11.9	354.2	30,142	12.3	12.8	2,126,153	29.5	904.6	81,715	33.9	34.8
2014-15	892,478	12.1	374.2	33,398	13.1	14.0	2,285,703	31.0	958.3	91,232	35.6	38.3
2015-16	952,624	12.8	393.5	37,405	13.7	15.4	2,333,197	31.3	963.7	98,172	35.9	40.5
2016-17	1,027,426	13.5	417.7	39,983	14.4	16.3	2,522,884	32.5	1,025.6	107,006	38.6	43.5
Period mean	669,887	10.7	293.9	25,198	12.4	11.1	1,841,235	29.3	812.3	71,411	35.6	31.4
x-fold	2.6	1.5	2.2	2.6	1.3	2.1	1.9	1.1	1.6	2.4	1.2	2.0
AAGR(%)	8.3	3.4	6.6	8.4	2.2	6.7	5.7	1.0	4.0	7.7	1.7	6.0
CAGR(%)	8.3	3.4	6.6	8.2	2.1	6.5	5.6	1.0	4.0	7.5	1.5	5.9
NSW												
2004-05	..	..	..	5,050	10.5	7.5	479,662	31.5	709.9	21,963	45.5	32.5
2005-06	..	..	..	5,666	10.6	8.3	527,777	30.6	774.3	25,125	47.1	36.9
2006-07	161,204	8.8	233.5	7,182	9.2	10.4	545,390	29.1	789.9	26,047	33.5	37.7
2007-08¶	167,903	8.8	239.4	5,344	9.5	7.6	529,383	27.0	754.7	24,041	42.9	34.3
2008-09	171,389	8.8	240.5	5,312	9.6	7.5	549,823	27.4	771.4	22,512	40.8	31.6
2009-10	178,934	9.0	247.4	5,489	10.3	7.6	566,518	27.8	783.3	21,201	39.8	29.3
2010-11	185,207	9.1	256.6	5,042	10.0	7.0	598,650	28.9	829.3	19,362	38.5	26.8
2011-12	219,735	10.1	300.7	5,525	10.8	7.6	646,682	28.9	884.9	19,124	37.2	26.2
2012-13	251,357	11.4	339.3	7,435	11.4	10.0	675,135	29.6	911.2	23,734	36.5	32.0
2013-14§	290,483	11.6	386.4	..	..	..	744,163	28.1	989.9	..	..	..
2014-15	311,707	11.6	408.7	10,314	11.7	13.5	769,603	28.7	1,009.0	31,572	35.7	41.4
2015-16	330,759	12.1	427.4	11,492	11.7	14.8	732,531	26.8	946.5	28,706	29.3	37.1
2016-17	349,221	13.0	444.2	11,900	12.6	15.1	774,772	27.8	985.6	29,001	30.8	36.9
Period mean	237,991	10.4	320.4	7,146	10.7	9.7	626,161	28.6	856.9	24,366	38.1	33.6
x-fold	2.2	1.5	1.9	2.4	1.2	2.0	1.6	0.9	1.4	1.3	0.7	1.1
AAGR(%)	8.2	4.1	6.8	6.7	1.9	5.4	4.2	-1.0	2.9	0.4	-2.6	-0.8
CAGR(%)	8.0	4.0	6.6	7.4	1.6	6.1	4.1	-1.0	2.8	2.3	-3.2	1.1

Year	High acuity presentations†			Admitted presentations‡			MH _{tk} presentations			MH _{tk} presentations		
	All ED presentations			All ED presentations			MH _{tk} presentations			MH _{tk} presentations		
	No	%	Rate /10,000	No	%	Rate /10,000	No	%	Rate /10,000	No	%	Rate /10,000
VIC												
2004-05	..	..	..	2,878	10.0	5.7	373,624	32.3	740.1	7,259	25.2	14.4
2005-06	..	..	..	3,553	11.3	6.9	396,629	31.8	773.7	8,656	27.6	16.9
2006-07	106,356	8.4	203.7	4,073	12.1	7.8	423,459	32.4	811.0	9,656	28.6	18.5
2007-08	115,549	8.8	216.9	4,318	12.5	8.1	442,894	32.8	831.4	10,583	30.6	19.9
2008-09	122,482	9.3	224.9	4,298	12.6	7.9	448,005	33.0	822.5	10,450	30.6	19.2
2009-10	130,331	9.4	235.0	4,327	12.2	7.8	465,345	32.5	839.1	10,856	30.6	19.6
2010-11	140,583	9.7	253.9	4,611	12.3	8.3	488,540	32.9	882.2	17,066	45.5	30.8
2011-12	142,016	9.6	251.2	5,043	12.0	8.9	545,805	36.2	965.4	19,246	45.6	34.0
2012-13	154,227	10.2	267.0	5,422	12.8	9.4	452,761	29.6	783.9	14,504	34.1	25.1
2013-14§	167,183	10.8	283.3	..	..	..	499,876	31.8	847.0	..	..	..
2014-15	174,401	10.8	289.1	6,986	14.3	11.6	544,896	33.8	903.2	18,348	37.7	30.4
2015-16	188,132	11.2	304.5	7,956	15.0	12.9	596,525	35.5	965.4	21,298	40.0	34.5
2016-17	203,497	11.8	321.8	8,662	16.0	13.7	646,766	37.4	1,022.8	23,042	42.6	36.4
Period mean	149,523	100	259.2	5,177	12.7	9.1	486,548	33.2	860.6	14,247	34.9	25.0
x-fold	1.9	1.4	1.6	3.0	1.6	2.4	1.7	1.2	1.4	3.2	1.7	2.5
AAGR(%)	6.7	3.5	4.7	9.1	3.7	7.1	5.0	1.5	3.0	11.3	5.6	9.4
CAGR(%)	6.7	3.4	4.7	9.6	4.0	7.6	4.7	1.2	2.7	10.1	4.5	8.1
QLD												
2004-05	..	..	..	2,378	11.1	6.0	188,364	23.0	471.5	5,908	27.6	14.8
2005-06	..	..	..	3,119	12.8	7.6	194,269	23.0	474.9	8,057	33.1	19.7
2006-07	80,598	9.3	192.1	4,037	14.1	9.6	203,334	22.9	484.6	9,689	33.9	23.1
2007-08	93,541	10.0	217.1	5,524	15.8	12.8	226,573	23.9	525.9	12,226	34.9	28.4
2008-09	110,011	10.3	248.6	5,731	13.6	13.0	257,556	23.6	582.1	12,724	30.1	28.8
2009-10	122,666	11.1	271.8	5,479	13.0	12.1	285,820	25.2	633.2	12,119	28.8	26.8
2010-11	137,492	11.8	307.1	5,632	12.9	12.6	304,727	25.5	680.7	12,258	28.1	27.4
2011-12	149,733	12.4	327.7	6,205	13.2	13.6	304,759	24.6	666.9	12,694	27.1	27.8
2012-13	159,547	12.6	342.8	6,413	12.8	13.8	337,662	26.3	725.4	14,149	28.2	30.4
2013-14§	174,592	13.2	369.6	..	..	..	425,238	31.5	900.1	..	..	..
2014-15	191,352	13.9	400.0	7,727	12.9	16.2	467,908	33.9	978.0	17,663	29.4	36.9
2015-16	213,965	14.9	441.3	8,158	14.3	16.8	506,269	35.2	1,044.1	20,264	35.6	41.8
2016-17	228,764	15.9	464.2	8,639	15.4	17.5	540,159	37.1	1,096.0	24,496	43.6	49.7
Period mean	151,115	123	325.6	5,754	13.5	12.6	326,357	27.4	712.6	13,521	31.7	29.6
x-fold	2.8	1.7	2.4	3.6	1.4	2.9	2.9	1.6	2.3	4.2	1.6	3.4
AAGR(%)	11.0	5.5	9.3	12.5	3.6	10.4	9.3	4.2	7.5	13.4	4.9	11.3
CAGR(%)	11.0	5.5	9.2	11.3	2.7	9.4	9.2	4.1	7.3	12.6	3.9	10.6

Year	High acuity presentations†			Admitted presentations‡		
	All ED presentations			All ED presentations		
	No.	%	Rate /10,000	No.	%	Rate /10,000
WA						
2004-05	..	..	..	1,287	12.7	6.4
2005-06	..	..	..	1,346	11.9	6.5
2006-07	56,491	10.9	267.4	1,753	13.0	8.3
2007-08	59,945	10.8	275.4	1,920	14.3	8.8
2008-09	63,777	11.4	284.2	2,011	13.7	9.0
2009-10	70,903	12.0	309.1	2,077	13.7	9.1
2010-11	77,137	12.0	327.8	2,589	14.1	11.0
2011-12	86,472	12.1	356.3	2,733	13.8	11.3
2012-13	92,850	12.5	372.5	2,891	13.5	11.6
2013-14§	93,710	12.8	371.4	..	..	..
2014-15	102,895	12.8	404.4	3,555	13.6	14.0
2015-16	110,304	13.3	431.1	4,184	14.0	16.4
2016-17	115,911	14.0	449.2	4,253	13.5	16.5
Period mean	84,581	12.2	349.9	2,550	13.5	10.7
x-fold	2.1	1.3	1.7	3.3	1.1	2.6
AAGR(%)	7.5	2.5	5.4	10.8	0.7	8.3
CAGR(%)	7.5	2.5	5.3	10.5	0.5	8.2
SA						
2004-05	..	..	..	2,352	15.2	15.1
2005-06	..	..	..	2,033	15.6	13.0
2006-07	46,195	13.3	291.3	2,322	16.4	14.6
2007-08	45,298	12.6	282.4	1,990	14.3	12.4
2008-09	46,190	13.1	284.3	2,123	14.1	13.1
2009-10	47,317	12.8	287.7	2,167	14.0	13.2
2010-11	51,760	13.7	315.7	2,171	13.7	13.2
2011-12	56,651	13.4	341.9	2,242	14.2	13.5
2012-13	62,381	13.8	373.2	2,554	15.1	15.3
2013-14§	65,194	14.2	386.3	..	..	..
2014-15	68,820	14.7	404.4	3,327	15.8	19.5
2015-16	74,565	15.5	435.3	3,886	16.9	22.7
2016-17	77,564	15.9	450.0	4,049	17.2	23.5
Period mean	58,358	13.9	350.2	2,601	15.2	15.8
x-fold	1.7	1.2	1.5	1.7	1.1	1.6
AAGR(%)	5.4	1.9	4.5	3.3	0.9	2.5
CAGR(%)	5.3	1.4	4.5	4.6	1.0	3.7

Year	High acuity presentations†			Admitted presentations‡			MH _{tk} presentations			MH _{tk} presentations		
	All ED presentations			All ED presentations			MH _{tk} presentations			MH _{tk} presentations		
	No.	%	Rate /10,000	No.	%	Rate /10,000	No.	%	Rate /10,000	No.	%	Rate /10,000
TAS												
2004-05	..	..	..	596	13.1	12.3	26,915	26.3	553.4	2,420	53.3	49.8
2005-06	..	..	..	564	12.5	11.5	29,629	25.8	604.7	2,325	51.5	47.5
2006-07	10,009	8.7	202.9	600	12.8	12.2	30,095	25.2	610.2	2,386	50.7	48.4
2007-08	10,164	8.7	204.1	559	12.9	11.2	31,378	25.1	630.2	2,203	50.9	44.2
2008-09	9,555	7.6	189.9	442	9.7	8.8	32,321	24.8	642.2	2,148	47.2	42.7
2009-10	11,525	8.2	227.0	525	11.4	10.3	30,247	21.4	595.8	1,961	42.6	38.6
2010-11	10,839	7.9	211.9	568	12.1	11.1	30,394	21.1	594.2	1,886	40.3	36.9
2011-12	11,201	8.2	218.8	457	10.4	8.9	30,315	21.4	592.3	1,762	40.0	34.4
2012-13	12,313	8.7	240.2	513	11.1	10.0	32,178	21.9	627.8	1,862	40.4	36.3
2013-14§	12,922	9.0	251.5	..	..	..	37,460	25.3	729.0	..	..	..
2014-15	13,024	8.7	252.7	473	8.6	9.2	38,777	25.8	752.4	2,227	40.6	43.2
2015-16	15,150	9.9	292.7	483	8.2	9.3	41,988	27.3	811.2	2,630	44.4	50.8
2016-17	16,609	10.9	318.9	628	10.3	12.1	44,669	28.6	857.6	2,652	43.3	50.9
Period mean	12,119	8.8	237.3	534	11.1	10.6	33,567	24.6	661.6	2,205	45.4	43.6
x-fold	1.7	1.2	1.6	1.1	0.8	1.0	1.7	1.1	1.6	1.1	0.8	1.0
AAGR(%)	5.5	2.5	5.0	2.5	1.1	1.9	4.5	0.9	3.9	-0.6	-2.0	-1.2
CAGR(%)	5.2	2.2	4.6	0.4	-2.0	-0.1	4.3	0.7	3.7	0.8	-1.7	0.2
ACT												
2004-05	..	..	..	389	17.3	11.8	20,267	21.6	613.8	604	26.9	18.3
2005-06	..	..	..	399	14.6	11.9	25,432	25.5	761.2	988	36.1	29.6
2006-07	7,201	7.5	211.1	254	9.6	7.4	25,334	26.3	742.8	834	31.7	24.5
2007-08	8,215	8.4	237.2	257	10.2	7.4	25,834	26.2	746.0	828	33.0	23.9
2008-09	9,953	9.8	282.5	336	12.0	9.5	28,260	27.7	802.2	969	34.7	27.5
2009-10	10,388	9.8	289.7	368	11.9	10.3	26,890	25.2	749.9	823	26.5	23.0
2010-11	11,618	10.4	315.7	433	12.6	11.8	28,396	25.3	771.7	1,027	29.9	27.9
2011-12	13,422	11.3	356.4	498	13.7	13.2	32,648	27.6	867.0	1,290	35.5	34.3
2012-13	13,381	11.3	348.8	435	11.6	11.3	32,817	27.6	855.4	1,313	35.0	34.2
2013-14§	12,680	10.1	325.6	..	..	..	35,890	28.5	921.7	..	..	..
2014-15§	12,666	..	319.3	..	..	..	37,171	28.6	937.0	..	..	..
2015-16§	..	..	..	..	..	..	..	..	..	..	..	..
2016-17	15,336	10.8	373.8	567	12.0	13.8	47,978	33.4	1,169.3	1,994	42.0	48.6
Period mean	11,486	9.9	306.0	394	12.6	10.9	30,576	27.0	828.2	1,067	33.1	29.2
x-fold	2.1	1.4	1.8	1.5	0.7	1.2	2.4	1.5	1.9	3.3	1.6	2.7
AAGR(%)	7.7	4.6	5.6	3.5	-3.5	1.5	6.6	3.0	4.6	12.7	4.7	10.6
CAGR(%)	7.9	3.6	5.9	3.2	-3.0	1.3	7.4	3.7	5.5	10.5	3.8	8.5

Year	High acuity presentations†			MH _{dx} presentations			Admitted presentations‡			MH _{dx} presentations		
	All ED presentations						All ED presentations					
	No.	%	Rate /10,000	No.	%	Rate /10,000	No.	%	Rate /10,000	No.	%	Rate /10,000
NT												
2004-05	..	..	..	292	10.8	14.1	25,707	23.0	1,245.7	911	33.7	44.1
2005-06	..	..	..	376	10.8	17.9	28,737	24.0	1,364.4	1,338	38.4	63.5
2006-07	7,319	6.4	340.7	376	10.8	17.5	29,483	24.1	1,372.6	1,338	38.0	62.3
2007-08	8,196	6.9	371.7	325	11.2	14.7	29,632	23.7	1,343.8	1,051	36.4	47.7
2008-09	9,323	7.7	412.1	453	13.4	20.0	31,350	24.3	1,385.9	1,200	35.5	53.0
2009-10	10,019	7.9	436.2	459	14.5	20.0	33,447	25.2	1,456.0	490	15.5	21.3
2010-11	9,407	6.9	406.7	528	14.3	22.8	35,879	25.4	1,551.2	514	13.9	22.2
2011-12	11,156	7.9	472.8	640	13.9	27.1	37,591	26.0	1,593.0	1,974	42.8	83.7
2012-13	13,006	9.2	535.8	886	13.2	36.5	37,977	26.1	1,564.5	2,829	42.0	116.5
2013-14§	15,768	11.1	647.2	..	..	..	39,469	27.2	1,620.0	..	..	..
2014-15	17,613	12.4	719.0	1,120	18.0	45.7	42,506	29.9	1,735.2	2,897	46.6	118.3
2015-16	19,749	13.3	803.7	1,246	19.2	50.7	49,418	33.3	2,011.0	3,406	52.5	138.6
2016-17	20,524	13.6	834.0	1,285	19.6	52.2	53,491	34.7	2,173.5	3,541	54.1	143.9
Period mean	12,916	9.4	543.6	666	14.1	28.3	36,514	26.7	1,570.5	1,791	37.5	76.3
x-fold	2.8	2.1	2.4	4.4	1.8	3.7	2.1	1.5	1.7	3.9	1.6	3.3
AAGR(%)	11.1	8.3	9.6	14.5	3.1	12.6	6.4	3.6	4.9	33.4	16.1	31.1
CAGR(%)	10.9	7.9	9.4	13.1	5.1	11.5	6.3	3.5	4.7	12.0	4.0	10.3

Abbreviations and symbols: ..: Not available / Not provided; %: percentage; Rate/10,000: Number of presentation per 10,000 population; AAGR: Average Annual Growth Rate; ACT: Australian Capital Territory; CAGR: Compound Annual Growth Rate; ED: Emergency Department; MH: Mental Health; MH_{dx}: Mental Health Diagnosis; No.: Number of presentations; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† High acuity presentations were defined as Australasian Triage Scale (ATS) categories 1 (“Resuscitation”) and 2 (“Emergency”)

‡ Admitted presentations were defined as presentations “admitted to the same hospital” and “referred to another hospital for admission”.

§ Data was not available by acuity level in all states and territories, 2004-05 to 2005-06. Data on all ED presentations were not available for the ACT for 2015-16 and admitted ED presentations for 2014-15. Data on MH_{dx} presentations were not available for all states and territories for 2013-14, and also 2014-15 and 2015-16 for the ACT.

¶ In 2007-08, MH_{dx} presentations were under-reported in NSW due to the implementation of a new ED information system. WA data was sourced from a new ED Data Collection.

Source: Australian Hospital Statistics,^[46,83-94] Mental Health Services in Australia.^[34-45]

Table 7.2: Generalised linear regression models† examining the trend of high acuity†† and admitted‡ ED presentations per 10,000 population (all ED presentations and those with a MH diagnosis) in Australia, and by jurisdiction, 2004-05 to 2016-17

Univariable regression models examining the trend of high acuity† presentations								
All ED presentations					ED presentations with a MH diagnosis			
Jurisdictions	β_1 ¶ (No breakpoint)	Breakpoint§ (Year _x)	β_1 ¶ (2004-05 to Year _x)	β_2 ¶ (Year _x to 2016-17)	β_1 ¶ (No breakpoint)	Breakpoint§ (Year _x)	β_1 ¶ (2004-05 to Year _x)	β_2 ¶ (Year _x to 2016-17)
Australia	18.9***	2009-10	13.1***	22.5***	0.7***	2011-12	0.3**	1.3***
NSW	24.3***	2009-10	2.8	30.9***	0.6**	2010-11	-0.3	1.5***
VIC	11.3***	2014-15	10.5***	15.8***	0.6***	2012-13	0.4***	1.1***
QLD	26.8***	2013-14	25.4***	31.0***	0.8***	2007-08	1.9***	0.6***
WA	18.8***	2008-09	10.4*	20.0***	0.9***	2012-13	0.7***	1.3***
SA	18.4***	2009-10	1.9	23.5***	0.8**	2011-12	-0.2	2.2***
TAS	10.9***	2014-15	7.4**	34.8***	-0.2	2015-16	-0.3**	3.2*
ACT	14.1***	2011-12	25.1***	1.8	0.3	2006-07	-2.2*	0.6**
NT	51.5***	2011-12	24.2**	78.8***	3.4***	2009-10	0.8	5.0***
Univariable regression models examining the trend of admitted‡ presentations								
All ED presentations					ED presentations with a MH diagnosis			
Jurisdictions	β_1 ¶ (No breakpoint)	Breakpoint§ (Year _x)	β_1 ¶ (2004-05 to Year _x)	β_2 ¶ (Year _x to 2016-17)	β_1 ¶ (No breakpoint)	Breakpoint§ (Year _x)	β_1 ¶ (2004-05 to Year _x)	β_2 ¶ (Year _x to 2016-17)
Australia	30.6***	2009-10	20.1***	37.1***	1.5***	2012-13	1.0***	2.9***
NSW	24.6***	-	-	-	0.2	2010-11	-1.5*	1.9**
VIC	17.1**	-	-	-	1.7***	2011-12	2.1**	1.3
QLD	55.0***	2011-12	34.4***	88.0***	2.1***	2015-16	1.7***	7.0**
WA	36.4***	-	-	-	1.7***	-	-	-
SA	33.1***	-	-	-	2.2***	2012-13	0.7	5.8***
TAS	20.3***	2011-12	1.3	50.7***	-0.0	2011-12	-2.4***	3.5***
ACT	33.5***	-	-	-	1.9**	2009-10	0.5	3.3**
NT	63.6***	2014-15	37.9***	184.1***	8.6**	2009-10	-4.7	16.9***

Abbreviations and symbols _cons: constant component of the model; ACT: Australian Capital Territory; ED: Emergency Department; MH: Mental Health; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA:

South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Univariable regression models examine the trend of presentations per 10,000 population in Australia, stratified by jurisdiction; Multi-variable regression models examine the trend of presentations per 10,000 population, with a term for jurisdiction to enable a comparison between jurisdictions and Australian national average;

†† High acuity presentations in the purpose of this study comprise ED presentations triaged into categories 1 (“Resuscitation”) and 2 (“Emergency”)

‡ Admission includes the presentations “admitted to the same hospital” and the presentations “referred to another hospital for admission”;

§ Breakpoint is the year when the trend of high acuity presentations per 10,000 population has the most statistically significant structure break. Likelihood ratio tests were used to optimise the breakpoint and compare the model with breakpoint to the model with a simple trend;

¶ Beta-coefficients provide the magnitudes of the difference in high acuity presentations per 10,000 population over years.

Table 7.3: Multivariable regression models† examining the trend of high acuity†† and admitted‡ ED presentations per 10,000 population (all ED presentations and those with a MH diagnosis) in Australia, with a comparison between jurisdictions and Australian national average, 2004-05 to 2016-17

Parameters	High acuity‡ presentations				Admitted§ presentations			
	All ED presentations		MH _{dx} presentations		All ED presentations		MH _{dx} presentations	
	No breakpoint	Breakpoint§ Year _x =2009-10	No breakpoint	Breakpoint§ Year _x =2011-12	No breakpoint	Breakpoint§ Year _x =2009-10	No breakpoint	Breakpoint§ Year _x =2012-13
Year								
Across entire period ($\beta_0^{\text{†}}$)	19.6***		0.7***		30.8***		1.5***	
2004-05 to Year _x ($\beta_1^{\text{†}}$)		12.3***		0.3***		19.9***		0.9***
Year _x to 2016-17 ($\beta_2^{\text{†}}$)		23.2***		1.3***		37.6***		3.0***
Jurisdictions	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$	$\beta_3^{\text{†}}$
NSW	7.6	10.5	-1.1	-1.2**	44.7**	44.5**	2.5	2.4
VIC	-53.2***	-50.1***	-1.8***	-1.8***	51.2*	51.1*	-6.1***	-6.2***
QLD	12.8	16.0*	1.8***	1.7**	-97.4**	-97.1**	-1.4	-1.5
WA	36.4***	39.4***	-0.1	-0.1	-84.7***	-84.4***	-1.5	-1.5
SA	37.1***	40.1***	4.9***	4.9***	-15.3	-15.6	11.5***	11.4***
TAS	-74.9***	-71.6***	-0.2	-0.2	-149.8***	-149.4***	12.7***	12.7***
ACT	0.4	4.3	0.7	0.8	29.5	30.0	-0.4	-0.4
NT	223.5***	226.9***	16.7***	16.6***	750.3***	750.3***	43.3***	43.2***
_cons	156.5***	184.4***	6.3***	7.8***	596.6***	634.9***	20.9***	23.4***

Abbreviations and symbols: _cons: constant component of the model; ACT: Australian Capital Territory; ED: Emergency Department; MH: Mental Health; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia;

† Multi-variable regression models examine the trend of presentations per 10,000 population, with a term for jurisdiction to enable a comparison between jurisdictions and Australian national average;

†† High acuity presentations were defined as Australasian Triage Scale (ATS) categories 1 (“Resuscitation”) and 2 (“Emergency”)

‡ Admitted presentations were defined as presentations “admitted to the same hospital” and “referred to another hospital for admission”;

§ Breakpoint is the year when the trend of high acuity presentations per 10,000 population has the most statistically significant structure break. Likelihood ratio tests were used to optimise the breakpoint and compare the model with breakpoint to the model with a simple trend;

¶ Beta-coefficients provide the magnitudes of the difference in high acuity presentations per 10,000 population over year

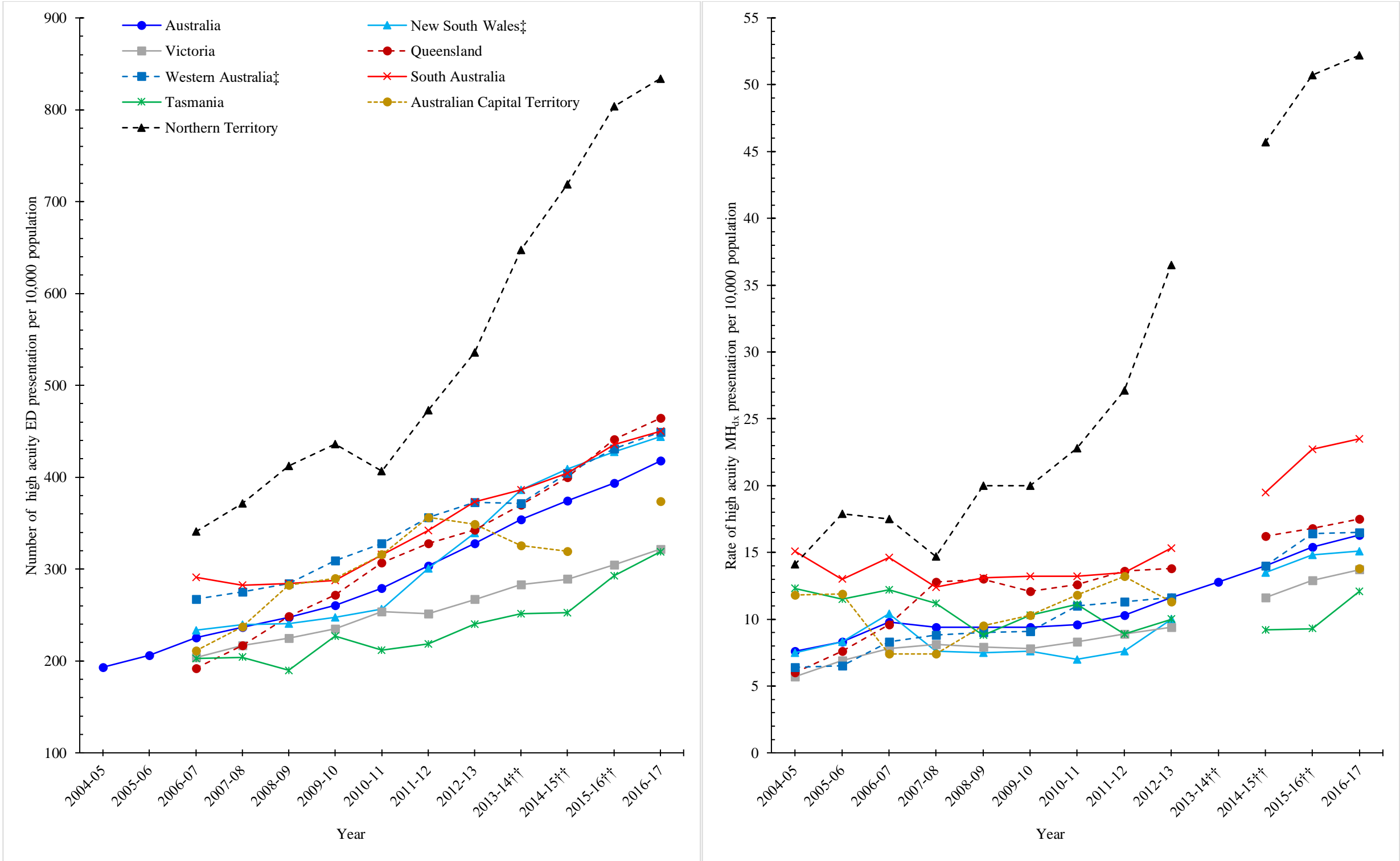


Figure 7.1: Number of high acuity† ED presentations and those with a MH diagnosis per 10,000 population in Australia, by jurisdiction, 2004-05 to 2016-17††

Abbreviations and symbols: ED: Emergency Department; MH: Mental Health; MH_{dx}: Mental Health Diagnosis

† High acuity presentations were defined as Australasian Triage Scale (ATS) categories 1 (“Resuscitation”) or 2 (“Emergency”)

†† Data was not available by acuity level in all states and territories, 2004-05 to 2005-06. Data on all ED presentations were not available for the ACT for 2015-16. Data on MH_{dx} presentations were not available for all states and territories for 2013-14, and also 2014-15 to 2015-16 for the ACT.

‡ In 2007-08, MH_{dx} presentations were under-reported in NSW due to the implementation of a new ED information system. WA data were sourced from a new ED Data Collection.

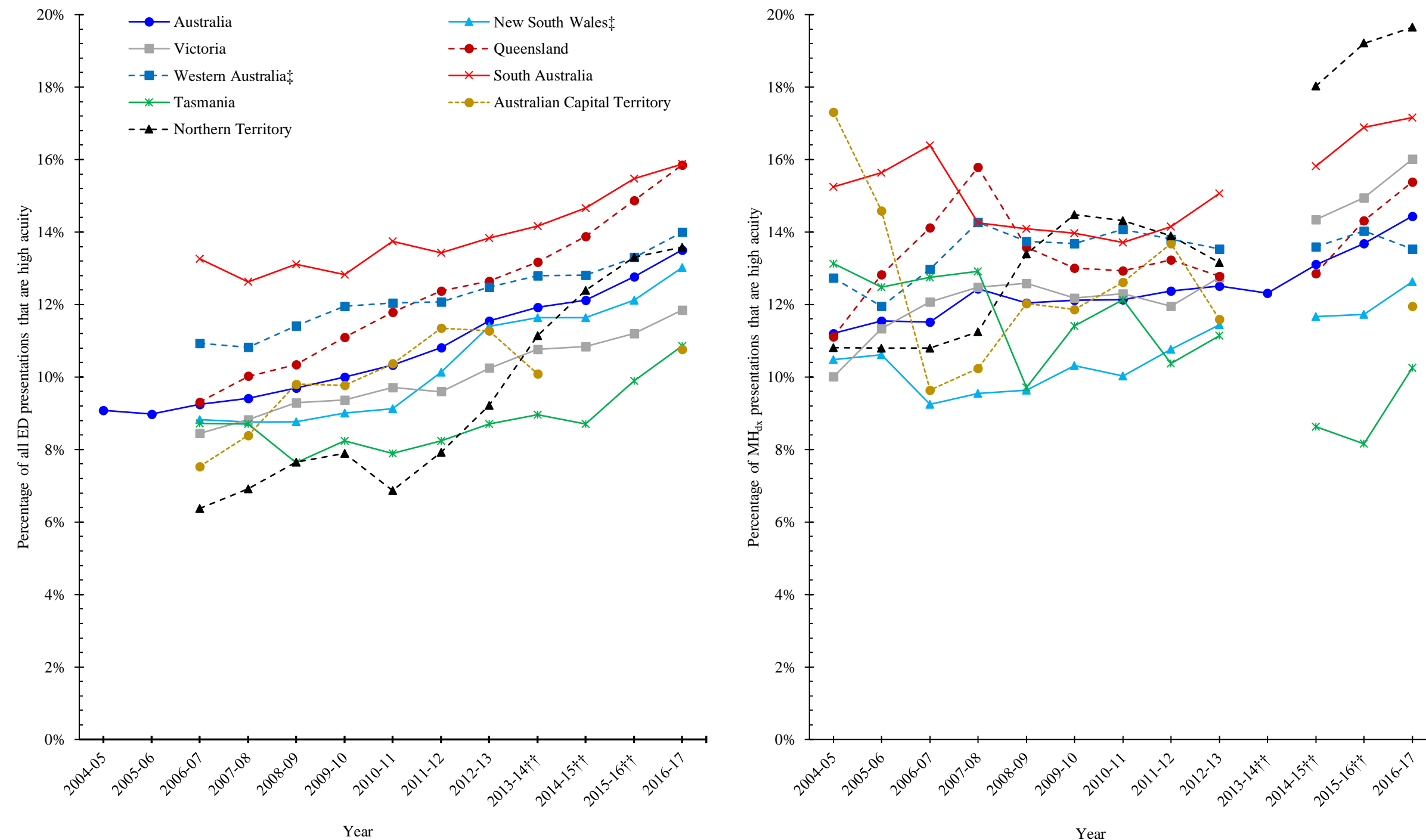


Figure 7.2: Percentage of all ED presentations and those with a MH diagnosis that are high acuity†, Australia, by jurisdiction, 2004-05 to 2016-17††

Abbreviations and symbols: ED: Emergency Department; MH: Mental Health; MH_{dx}: Mental Health Diagnosis

† High acuity presentations were defined as Australasian Triage Scale (ATS) categories 1 (“Resuscitation”) and 2 (“Emergency”)

†† Data was not available by acuity level in all states and territories, 2004-05 to 2005-06. Data on all ED presentations were not available for the ACT for 2015-16. Data on MH_{dx} presentations were not available for all states and territories for 2013-14, and also 2014-15 to 2015-16 for the ACT.

‡ In 2007-08, MH_{dx} presentations were under-reported in NSW due to the implementation of a new ED information system. WA data was sourced from a new ED Data Collection.

For MH_{dx} presentations, high acuity presentations increased from 15,543 to 39,983 across the study period nationally (2.6-fold) (Table 7.1, Figure 7.1), equating to an increase from 7.6 to 16.3 presentations per 10,000 population (2.1-fold). There was a statistically significant average annual increase of 0.7 high acuity MH_{dx} presentations per 10,000 population across the entire period (Table 7.2), with the increase higher for 2011-12 to 2016-17 (1.3 presentations/10,000 population) than 2004-05 to 2011-12 (0.3 presentations/10,000 population). Nationally, the proportion of MH_{dx} presentations that were high acuity increased from 11.2% (2004-05) to 14.4% (2016-17) (1.3-fold), while the proportions of high acuity ED presentations that were for a MH_{dx}, were largely consistent, at 4.0% in 2004-05 and 3.9% in 2016-17 (Table 7.1).

An increase in the rate of high acuity MH_{dx} presentations was found in most jurisdictions across the study period, except ACT and TAS, which only experienced increases after 2006-07 and 2015-16, respectively (Figure 7.1, Table 7.2). The annual increase was highest in the NT (3.4 presentations/10,000 population), particularly after 2009-10 (5.0 presentations/10,000 population). The lowest annual increase was a decrease in TAS before 2012-13 (0.3 presentations/10,000 population). Compared with the national average, significantly higher rates of high acuity MH_{dx} presentations were found for the NT, SA, and QLD, and lower for VIC and NSW (only after 2011-12), but not different elsewhere (Table 7.3).

The proportion of high acuity presentations for MH_{dx} presentations fluctuated in most jurisdictions, except VIC, NT, and NSW, where they increased (particularly after 2007-08 for NSW) (Table 7.1, Figure 7.2).

7.4.2. Admitted ED and MH_{dx} presentations

Over the study period, the admission rate for ED presentations increased nationally from 641.8 to 1,025.6 admitted presentations per 10,000 population (1.6-fold) (Figure 7.3, Table 7.1), with an average annual increase of 30.6 admitted presentations per 10,000 population ($p < 0.001$) (Table 7.2). A greater increase was found for the period 2009-10 to 2016-17 than 2004-05 to 2009-10 (37.1 and 20.1 admitted presentations/10,000 population, respectively) ($p < 0.001$).

Significant trends in admission rates for all ED presentations were found in all jurisdictions, and three jurisdictions had a breakpoint (2011-12 for QLD and TAS, and 2014-15 for NT) (Table 7.2). The highest annual increase in admission rate for all ED presentations was in the NT (184.1 admitted presentation/10,000 population; 2014-15 to 2016-17) and lowest in TAS (2004-05 to 2011-12) without a significant increase. Compared with the national average, the admission rate for all ED presentations was significantly higher in the NT, VIC and NSW, and lower in TAS, QLD, and WA ($p < 0.05$), but not different elsewhere (ACT, SA) (Table 7.3).

The proportion of all ED presentations that were admitted increased in most jurisdictions, except NSW, where it decreased, and TAS, where it fluctuated. The proportion was highest in VIC in each year, reaching 37.4% in 2016-17, and lowest in ACT (2004-05), QLD (2005-06 to 2008-09), and TAS (2009-10 to 2016-17) (Table 7.1, Figure 7.4).

For MH_{dx} presentations, the admission rate for Australia increased from 21.9 to 43.5 admitted presentations per 10,000 population over the study period (2.0-fold) (Figure 7.3, Table 7.1), with an average annual increase of 1.5 admitted presentations per 10,000 population ($p < 0.001$) (Table 7.2). The average annual increase in MH_{dx} presentation admission rates was significantly higher for 2012-13 to 2016-17 than

2004-05 to 2012-13 (2.9 and 1.0 admitted presentations/10,000 population, respectively) ($p < 0.001$). Nationally, the proportion of MH_{dx} presentations admitted increased 1.2-fold (32.2%, 2004-05; 38.6%, 2016-17), and the proportion of all presentations admitted that were for a MH_{dx} increased from 3.4% to 4.2% (Table 7.1, Figure 7.4).

Most jurisdictions experienced an increase in MH_{dx} presentation admission rates over the study period, except for NSW and TAS (Figure 7.3), which experienced increases from 2010-11 ($p < 0.01$) and 2011-12 ($p < 0.001$), respectively (Table 7.2). The highest significant annual increase in MH_{dx} presentation admission rates was in the NT (8.6 admitted presentations/10,000 population), and the lowest in VIC and WA (1.7 admitted presentations/10,000 population). In the NT, the annual increase in MH_{dx} presentation admission rates was highest after 2009-10 (16.9 admitted presentations/10,000 population), as compared with no increase between 2004-05 and 2009-10 (Table 7.2). In the other jurisdictions, significant increases were found for QLD and SA across the study period, and particularly from 2015-16 and 2012-13 respectively. Increases were also observed for VIC (2004-05 to 2011-12) and the ACT (2009-10 to 2016-17). Compared with the national average, MH_{dx} presentation admission rates were significantly higher in NT, TAS, and SA, and lower in VIC ($p < 0.001$), but not different otherwise (Table 7.3).

The proportion of MH_{dx} presentations admitted fluctuated in all jurisdictions. The proportion was highest in TAS (2004-05 to 2009-10), VIC (2010-11 to 2011-12), and the NT (2012-13 to 2016-17). The lowest proportion was found in VIC (2004-05 to 2007-08), QLD (2008-09, 2011-12 to 2012-13), and the NT (2009-10 to 2010-11) (Table 7.1, Figure 7.4).

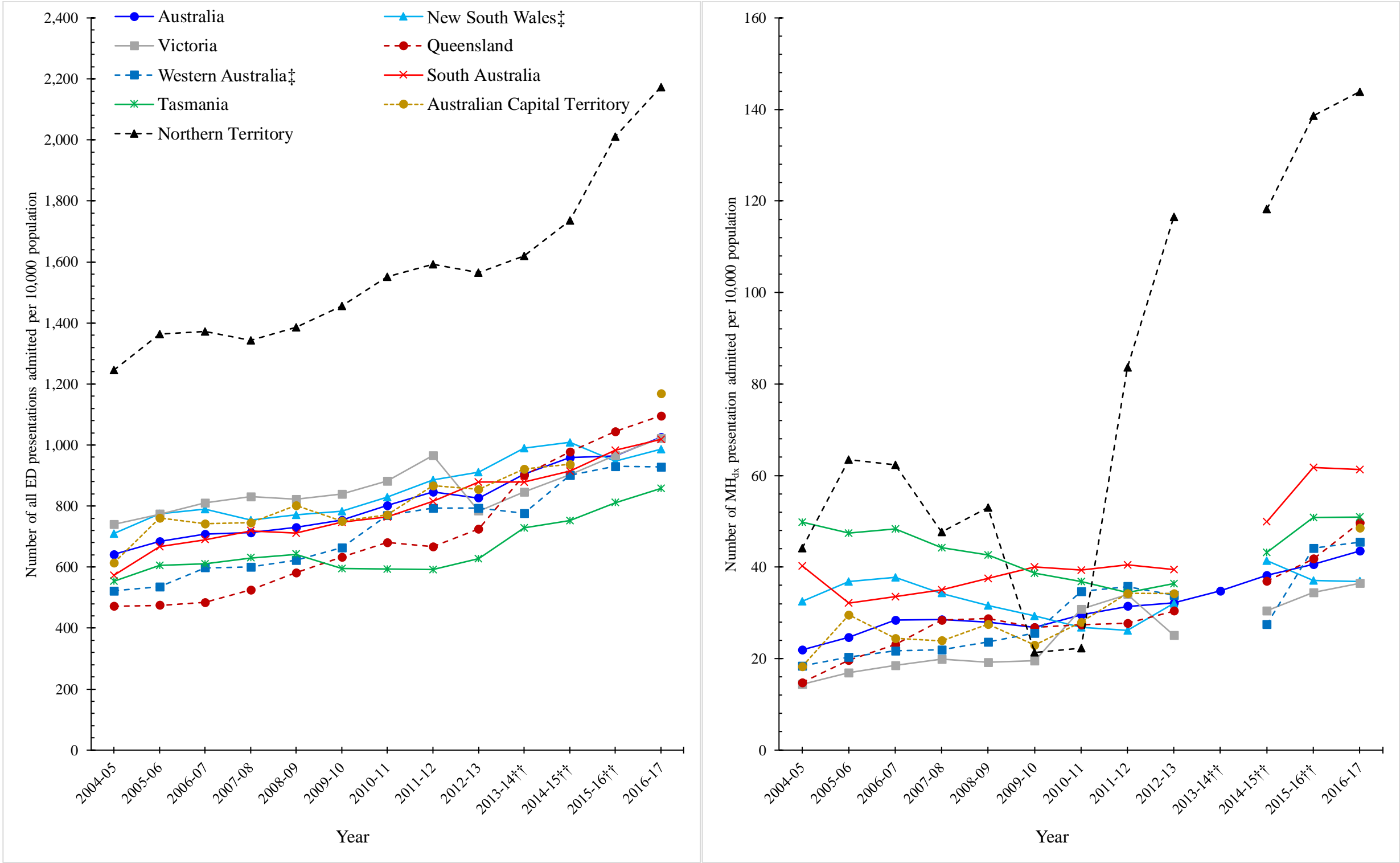


Figure 7.3: Admission rates of ED presentations and those with a MH diagnosis† per 10,000 population in Australia, by jurisdiction, 2004-05 to 2016-17††

Abbreviations and symbols: ED: Emergency Department; MH: Mental Health; MH_{dx}: Mental Health Diagnosis

† Admitted presentations were defined as presentations “admitted to the same hospital” and “referred to another hospital for admission”.

†† Data on all ED presentations were not available for the ACT for 2015-16 and admitted ED presentation for 2014-15. Data on MH_{dx} presentations were not available for all states and territories for 2013-14, and also 2014-15 to 2015-16 for the ACT.

‡ In 2007-08, MH_{dx} presentations were under-reported in NSW due to the implementation of a new ED information system. WA data was sourced from a new ED Data Collection.

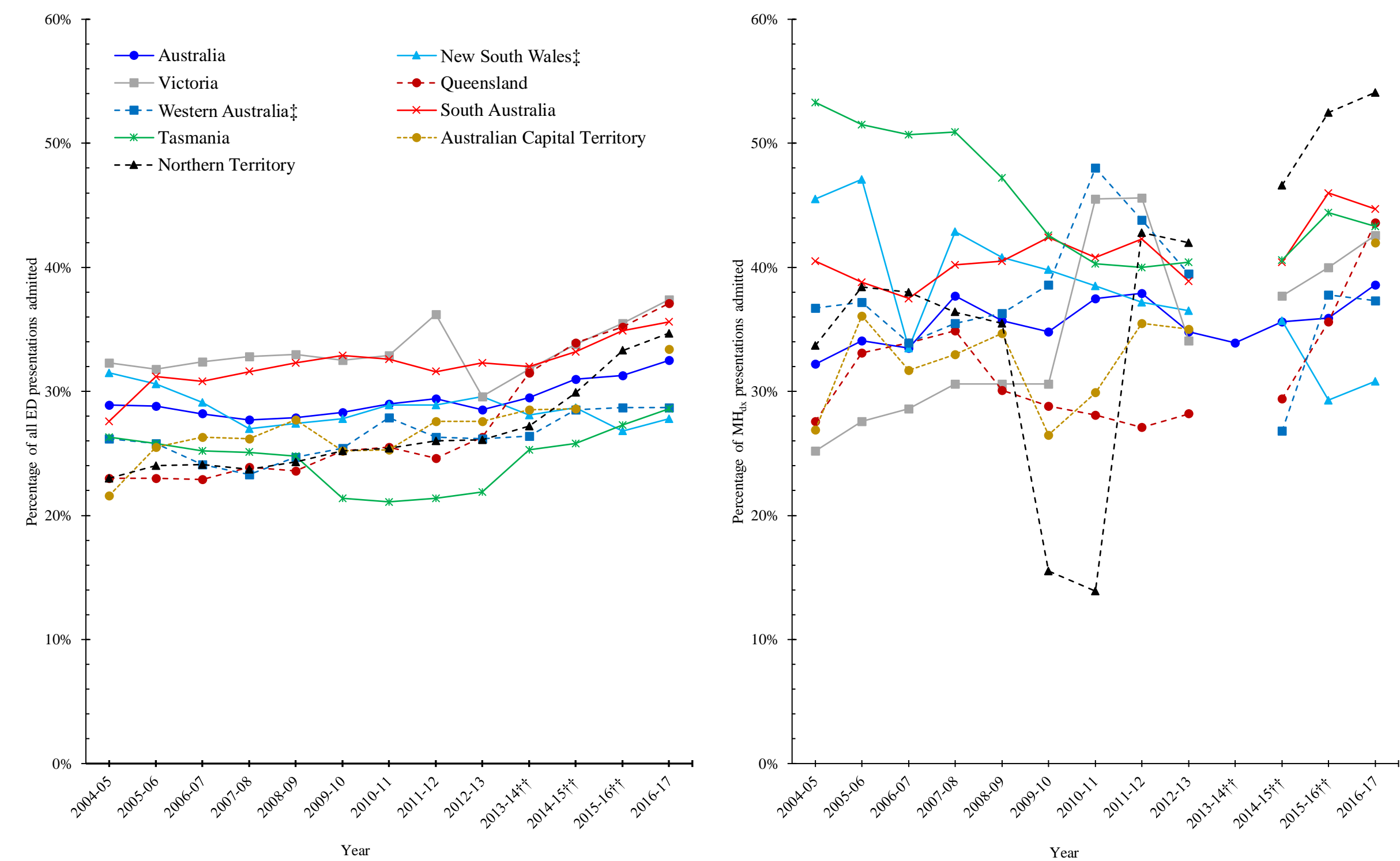


Figure 7.4: Percentage of all ED presentations and those with a MH diagnosis that are admitted†, Australia, by jurisdiction, 2004-05 to 2016-17††

Abbreviations and symbols: ED: Emergency Department; MH: Mental Health; MH_{dx}: Mental Health Diagnosis

† Admitted ED presentations were defined as presentations “admitted to the same hospital” and “referred/transferred to another hospital for admission”.

†† Data on all ED presentations were not available for the ACT for 2015-16 and admitted ED presentations for 2014-15. Data on MH_{dx} presentations were not available for all states and territories for 2013-14, and also 2014-15 to 2015-16 for the ACT.

‡ In 2007-08, MH_{dx} presentations were under-reported in NSW due to the implementation of a new ED information system. WA data was sourced from a new ED Data Collection.

7.5. Discussion

This study is the first examination of long-term trends in high acuity and admitted presentations for all ED presentations and those with a MH diagnosis for Australia and its jurisdictions, and furthers work presented in Chapters 4 to 6. Between 2004-05 and 2016-17, the rate of high acuity presentations for all ED and MH_{dx} presentations in Australia more than doubled, with significant upward trends since 2009-10 for all ED presentations and 2011-12 for MH_{dx} presentations. Meanwhile, the admission rate increased 1.6-fold for all ED presentations and doubled for MH_{dx} presentations, with significant upward trends since 2009-10 and 2012-13, respectively. By 2016-17, admitted presentations comprised nearly a third of all ED presentations, and almost forty percent of MH_{dx} presentations. In turn, MH_{dx} presentations as a proportion of all presentations admitted increased from 3.4% to 4.2% over the study period. Across jurisdictions, there were increasing rates of high acuity presentations for all ED and MH_{dx} presentations, although rates varied between and within jurisdictions. For all ED presentations, the largest increase in high acuity presentation rates was found in the NT (2011-12 to 2016-17), followed by TAS (2015-16 to 2016-17), and lowest in the ACT (2011-12 to 2016-17). For MH_{dx} presentations, the largest increase in high acuity presentation rates was also found in the NT, but between 2009-10 to 2016-17, while the lowest was in TAS before 2015-16.

The increases in the population rates of high acuity ED presentations (2.2-fold) and MH_{dx} presentations (2.1-fold) were much higher than the increases in all ED presentations (1.4-fold) and MH_{dx} presentations (1.7-fold) identified in our companion study (i.e. inclusive of all triage categories).^[222] Thus, there was a greater increase in MH_{dx} presentations than all ED presentations, but similar rates of increase in high acuity presentations, indicating greater relative growth across ATS categories 3-5 for

MH_{dx} presentations. Together with the greater relative increase in admissions for MH_{dx} presentations, these results suggest inadequate capacity to manage patients with a MH_{dx} in the community. Further, as presentations with a MH_{dx} do not include self-harm or overdoses, it is hypothesised that the increase in high acuity presentations for MH_{dx} is most likely due to drug-induced psychosis, consistent with the 2.2-fold increase in the rate of presentations for Mental and behavioural disorders due to psychoactive substance use (F10-F19).^[209]

In Australia, the breakpoint in the trend of high acuity MH_{dx} presentations (2011-12) occurred after the breakpoint in the trend of MH_{dx} presentations as a proportion of all ED presentations (2010-11).^[222] Thus, the identified increase in load of MH_{dx} presentations within EDs is being compounded by an increase in the load of very acute MH_{dx} presentations. Of interest, these breakpoints coincide with the February 2011 agreement to introduce the National Emergency Access Target (NEAT).^[202] The NEAT aimed to improve the quality of care in EDs by reducing the ED length of stay, which, on face value, was perceived to have been achieved.^[203] However, there has been evidence of unintended consequences, including re-presentations to ED^[203,242] and suggestions of increased admissions to achieve the 4-hour target.^[203] Whatever the reason behind the increased rates of admission identified for all ED and MH_{dx} presentations, public sector specialised mental health hospital bed numbers within Australia have experienced slight reductions.^[45,46,91] Increased demand, relative to static supply of beds, has been arguably underpinning concerns about access block for all ED presentations^[45,61,203,243] and MH presentations.^[62]

Between 2004-05 and 2016-17, the rate of high acuity MH_{dx} presentations increased in all jurisdictions, with breakpoints observed in each. Only in the NT, did the breakpoint match that for all MH_{dx} presentations as a proportion of all ED

presentations (2009-10).^[222] In VIC, WA, and TAS, the breakpoints for high acuity MH_{dx} presentations occurred after the breakpoints for all MH_{dx} presentations as a proportion of all ED presentations (2010-11, 2012-13; 2009-10, 2012-13; and 2011-12, 2015-16, respectively).^[222] These results suggest that the increase in acuity of MH_{dx} presentations will have contributed to increased burden as well as load of MH_{dx} presentations in EDs in these particular jurisdictions. In TAS, the breakpoint in high acuity MH_{dx} presentations (2015-16) occurred after a major reduction in the number of public sector specialised MH hospital beds (127, 2013-14; 97, 2014-15),^[45,244] and three years after an identified increase in load of MH_{dx} presentations.^[222] These findings highlight a potential role for the reduction in bed numbers in increasing levels of high acuity presentations; if people were not adequately treated in the first instance, they will potentially deteriorate and re-present in a more severe/crisis condition.

In VIC, the proportion of high acuity MH_{dx} presentations increased from 10.0% (2004-05) to 12.8% (2012-13), lower than findings from a Victorian multicentre study for adults (10.6%, 2004; 18.8%, 2013). While the studies had largely overlapping inclusion criteria the Victorian study included suicide and self-harm,^[151] which may give rise to greater rates of higher acuity presentations. In spite of the assessed increase, which may underpin concerns that have led to Victoria's Royal Commission into Mental Health Services, Victoria has the lowest rate of presentations with MH_{dx}.^[222]

7.6. Limitations

The primary limitations of the current paper comprise concerns regarding the impacts of coding, data collection and reporting practices, as identified in previous chapters. Limited reported cross-tabulations by the AIHW means that admissions by acuity level or stratification of results by age could not be reported.

7.7. Conclusion

Between 2004-05 and 2016-17, increasing rates of high acuity presentations and admitted presentations for all ED and MH_{dx} presentations in Australia and all jurisdictions evidence increasing demands on EDs for resource-intensive care. These findings support and expand upon the current concerns being raised by the Australasian College of Emergency Medicine. Monitoring trends can assist with planning and resourcing, particularly through identifying unexpected and differential increases in demand.

Chapter 8. General Discussion and Conclusion

8.1. Preface

This chapter summarises the overall findings of the thesis, and key findings from individual studies presented in Chapter 3 to Chapter 7, and then provides a general discussion of the combined findings. Following a summary of the limitations, future directions are also outlined.

8.2. Summary of the thesis

This thesis has provided a critical and detailed assessment of the international, national and regional evidence on trends in presentations to emergency departments for people with MH_{dx}. The thesis has employed a rigorous approach to analysis of a spectrum of metrics with the analysis building from simple (x-fold increase, average and compounding annual growth rates) to complex (regression models, with the assessment of breakpoints) across a series of studies. The assessment was conducted at national level and jurisdictional level, and for subgroup of patient characteristics (age group, sex) and ED presentations outcomes (triage category, admission status, diagnostic group). This thesis identified significant increases in the absolute number, population rate and proportion of mental health-related emergency department (MHeD) presentations in Australia between 2004-05 and 2016-17 as hypothesised. Further, this thesis established variations in the number, rate, proportion, and trend of MH_{dx} presentations across jurisdictions, age groups, and sexes, and differing patterns of trends in presentations across jurisdictions for MH-related diagnostic groups, triage categories and episode-end-status. This comprehensive set of findings on the use of

emergency departments by people with MH_{dx} in Australia will provide foundational knowledge inform MH-policy development and future research.

8.3. Summary of key findings of individual studies

The thesis comprised five studies. First, was a systematic review of the international literature on MH-related ED (MHR_{ED}) presentations. Second, was a series of four studies examining ED utilisation for patients with a MH_{dx} in Australian public hospitals over the 13-years to 2016-17 based on data from the Australian national ED dataset, the NNAPEDCD, published by the AIHW.

The systematic review of English peer-reviewed literature published between 1985 and 2015 included 81 studies from 17 countries, predominately from the US (43 studies), Australia (15 studies), and Canada (8 studies), with most studies published after 2003. Since 2003, the growth of publications was 59.3% per annum with the doubling time as short as 1.5 years. National data was only published for the US and comprised two-fifths of its studies, the remainder predominantly reporting individual hospitals' data. Regional data was only reported by the US, Canada, Australia and Denmark. There were variations in MH-related coding systems, disease classifications, inclusion and exclusion criteria between studies. All age-groups was the focus of most studies, followed by children. Overall, national studies from the US showed upward trends in the proportion of MHR_{ED} presentations since 1992, across varying definitions of MHR_{ED} presentations. The proportion of MHR_{ED} presentations appeared to be higher for urban EDs, and lower for rural EDs than the national average. Australian studies reported data for individual hospitals and by region only, and covered all age-groups. Upward trends were found, particularly in NSW (1999-2006) and SA (1993-2002).

Analysis of secondary data from the NNAPEDCD, found increases in absolute number, population rates of all ED and MH_{dx} presentations, as well as, in the proportion of MH_{dx} presentations to public hospital EDs between 2004-05 and 2016-17. As hypothesised in this thesis, the proportion of MH_{dx} presentations increased from 3.3% to 3.7% nationally. Jurisdictionally, the absolute number and population rate of ED_{dx} and MH_{dx} presentations increased over the study period, with SA having the highest proportion of MH_{dx} presentations of any jurisdiction in all years except 2011-12 and 2014-15. The NT had double the population rate of MH_{dx} presentations compared with the national average and was higher than in all other jurisdictions in any given year.

Across the study period, the absolute numbers and population rates of all ED and MH_{dx} presentations for males were greater than for females in each year. However, females experienced greater increases (x-fold, average and compounding annual growth rates) than males in the absolute number, percentage, and population rate of all ED presentations. In contrast for MH_{dx} presentations, males experienced greater increases except for average annual growth rates.

The absolute number and population rate of all ED presentations increased between 2004-05 and 2016-17, except for youth, and were greatest for children (0-14 years) and older persons (≥ 65 years) in each year. Youth (15-24 years) had the highest population rate of MH_{dx} presentations, followed by younger adults (25-34 years) and persons aged 35-44 years. The greatest increase in population rate of all ED presentations was for older persons, and children for MH_{dx} presentations.

Across MH diagnostic groups, the predominant MH diagnosis was F40-F49, followed by F10-F19, F30-F39, and F20-F29, with increases in number of presentations in each MH diagnostic group over the study period, except for F70-F79

and F80-F89. Nationally, the greatest absolute increase was for F10-F19, while the greatest relative increase was for F99. Jurisdictions gave rise to different patterns of MH_{dx} presentations. The greatest increase in population rate of MH_{dx} presentations for F00-F09 was for the ACT and QLD, F10-F19 for the NT, F20-F29 for WA, F30-F39 for the ACT, F40-F49 for QLD, F50-F59 for SA, F60-F69 and F99 for NSW.

Across the study period, there were increases in absolute number, population rate, and proportion of high acuity ED presentations and MH_{dx} presentations nationally, with significant upward trends in population rates of high acuity ED presentations found in all jurisdictions, including a marked increase in the NT for the period 2011-12 to 2016-17. However, the national proportion of all high acuity ED presentations that were for a MH_{dx} was largely consistent over the study period. Increases in the population rate of high acuity MH_{dx} presentations were found in most jurisdictions across the entire study period, except ACT and TAS, which only experienced an increase after 2006-07 and 2015-16, respectively.

Across the study period, the population rate and proportion of admissions for all ED presentations and MH_{dx} presentations increased nationally, and in most jurisdictions, except in NSW and TAS. There was a decrease in proportion of ED presentations that were admitted in NSW, and a fluctuation in TAS. Meanwhile, the admission rate for MH_{dx} presentations and proportion of MH_{dx} presentations increased from 2010-11 and 2011-12 in NSW and TAS, respectively.

There were significant breakpoints in the trends of the proportion of MH_{dx} presentations; and population rates of high acuity presentations and admitted presentations for both all and MH_{dx} presentations, by jurisdiction. In most instances there was no correlation between breakpoints for high acuity and admitted presentations for both all ED presentations and MH_{dx} presentations as summarised in

Table 8.1. Only in the NT, did the breakpoint for high acuity MH_{dx} presentations match that for the proportion of all presentations with a MH_{dx} (2009-10). This breakpoint was also found for admitted MH_{dx} presentations in the NT.

Most often, the breakpoint in the trend of high acuity MH_{dx} presentations occurred after the breakpoint for the proportion of all presentations with a MH_{dx}. This was the case nationally (2011-12, Chapter 7; 2010-11, Chapter 4 respectively), and for VIC, WA, and TAS (2012-13, 2010-11; 2012-13, 2009-10; and 2015-16, 2011-12, respectively).

For admitted MH_{dx} presentations, the breakpoint occurred after the breakpoint in the trend for the proportion of all presentations with a MH_{dx} nationally (2012-13, 2010-11 respectively) and for VIC, QLD, and the ACT (2011-12, 2010-11; 2015-16, 2008-09; and 2009-10, 2007-08, respectively). For TAS and SA, the breakpoint for admitted presentations matched that for the proportion of presentations with a MH_{dx} (2011-12, 2012-13, respectively), as was the case for the NT (2009-10).

Table 8.1: Breakpoints in the trends in proportion of MH_{dx} presentations, population rate of high acuity presentations, and admitted presentations, by jurisdiction

Jurisdictions	Breakpoint				
	Trend in the proportion of MH _{dx} presentations	Trend in population rate of high acuity ED presentations	Trend in population rate of high acuity MH _{dx} presentations	Trend in population rate of admitted ED presentations	Trend in population rate of admitted MH _{dx} presentations
Australia	2010-11	2009-10	2011-12	2009-10	2012-13
NSW	2011-12	2009-10	2010-11	-	2010-11
VIC	2010-11	2014-15	2012-13	-	2011-12
QLD	2008-09	2013-14	2007-08	2011-12	2015-16
WA	2009-10	2008-09	2012-13	-	-
SA	2012-13	2009-10	2011-12	-	2012-13
TAS	2011-12	2014-15	2015-16	2011-12	2011-12
ACT	2007-08	2011-12	2006-07	-	2009-10
NT	2009-10	2011-12	2009-10	2014-15	2009-10

8.4. General discussion

To inform MH-policy development and future research in Australia and elsewhere, this thesis has examined available evidence on trends in presentations to emergency departments for people with MH_{dx} and established a comprehensive set of findings for Australia and its jurisdictions. Monitoring health system performance is essential to assist health policymaking, as reflected in recent strategies focusing on suicide prevention and providing appropriate and sufficient mental health care. For example, the Australian Government's focus on suicide and self-harming and suicide prevention arose after the release of the ABS's *Causes of Death in 2008*, published in 2010.^[245] The first known stand-alone development was a 4-year “*Mental health: Taking Action to Tackle Suicide*” package announced in July 2010.^[246] Strategies from this package were then incorporated into the activities of the *COAG National Action Plan for Mental Health 2006–11* and the *Fourth National Mental Health Plan: an agenda for collaborative government action in mental health 2009–2014* (the Fourth National Mental Health Plan). Further, the importance of national monitoring and the variation of legislation relating to the reporting of deaths across jurisdictions were acknowledged,^[246] and the Standing Committee of Attorneys-General was called to pursue national coronial legislation. In September 2020, the National Suicide and Self-harm Monitoring System commenced.^[247]

The importance of information relating to MH-related ED presentations is reflected in work and advocacy being pursued by the Australasian College for Emergency Medicine (ACEM). In 2018, during this thesis, ACEM published a series of reports on long waiting times and access block within EDs.^[61,62] Data sources employed included (1) the AIHW's reports on ED presentations for 2014-15, 2015-16, 2016-17; (2) the ACEM Annual Site Census 2016; and Prevalence of Mental

Health Access Block (POMAB) Snapshot Survey. In these reports, the ACEM concluded that MH_{dx} presentations had longer waiting times, lower rates of presentations being seen on time, longer stays in ED, higher rates of persons leaving prior to their treatment than presentations with other emergency medical conditions. Subsequently, the ACEM published the “Position Statement – ED overcrowding”, in which they recommended that better access to community-based MH and alcohol and other drug services is needed to reduce hospital inpatient bed demand.^[248] The Productivity Commission has also commented on ED overcrowding based on trends in MH_{dx} presentations to public hospital EDs and recommended alternative care for people with MH conditions presenting to hospital EDs.^[249] The findings obtained through this thesis are thus timely, and complement other work in the field.

The first study in this thesis, found an increase in number of studies on the proportion of MH-related presentations within EDs published in peer-reviewed journals, internationally, especially after 2003 and particularly in the US, Australia and Canada. This increase in publications, primarily from individual hospitals, may reflect an increase in clinical concern regarding MHR_{ED} presentations in Australia and elsewhere. The fact that national data was only available for the US may, in part, be explained by the earlier development of a national ED data collection system, i.e. the NHAMCS-ED from 1992. In Australia, the national ED data collection, the NNAPEDCD, was established in 2003-04, and the studies reported in Chapter 4 to Chapter 7, provide the first known academic analysis of these data.

Within the systematic review, increases in the proportion of MHR_{ED} presentations were found at national level in the US between 1992 and 2010. Recent national studies from the US have highlighted further increases in the proportion of MHR_{ED} presentations for all age groups,^[250,251] children/youth,^[252,253] non-elderly

adults,^[254] and adults.^[255,256] All of these recent national studies used national data sources, including the NHAMCS-ED,^[250,253,256] Pediatric Health Information System,^[252] National Emergency Department Sample,^[251,254] and National Veteran Health Administrative database.^[255] The distribution of studies across age groups and data sources is consistent with the findings in Chapter 3. Within the recent studies for all age groups and children/youth using the NHAMCS-ED, the proportion of MHEd presentations increased from 2.1% to 3.4% for paediatric patients (<15 years), and from 6.9% to 9.9% for youth and adults (≥ 15 years) between 2009 to 2015,^[250] and from 2.0% to 2.5%, 9.0% to 13.2%, and 9.4% to 12.5% for people aged 6-11 years, 12-17 years, and 18-24 years, respectively between 2011-2015.^[253] These studies thus complement and extend on findings presented in Chapter 3, in which the percentage of MHEd presentations were found to have increased from 2.0% (1995) to 2.7% (2001) for children under 19-years,^[115] and from 4.4% (2001) to 7.2% (2011) for youth (6-20 years-old)^[133] and 6.5% (2002) to 7.0% (2008) for all age groups.^[126]

Extending on the Australian findings from the systematic review, Study 2 then found a significant annual increase in the proportion of all ED presentations that had a MH_{dx} nationally between 2004-05 and 2016-17 as hypothesised, especially after 2010-11. At the jurisdictional level, Study 2 found a variation in the proportion of MH_{dx} presentations across Australian jurisdictions, with significant increases found for VIC, QLD, WA, ACT and the NT. The jurisdictional findings in Study 2 were consistent with the reported proportions of presentations for SA (for 2004-2011),^[59] NSW (for 2004-2006),^[31] and VIC (for 2008-09)^[152] identified in the systematic review, Chapter 3. In more recent studies, the proportion of MH_{dx} presentations in NSW for all ages group was approximately 3.0% between 2010 and 2014 (data sourced from NSW Emergency Department Data Collection system)^[204,257] and 3.4% in 2016-17 (based

on two major hospitals only).^[258] These findings are similar to those presented for NSW in Chapter 4, even though the more recent studies included suicide and self-harm-related presentations rather than ICD-10-AM F-codes only. Given that the broadly defined MHRd presentation in the recent NSW studies included suicide and self-harm, proportions of MHRd presentations found in those studies were expected to be higher than the findings in Chapter 4 (2.7%, in 2010-11; 3.5% in 2016-17). This consistency potentially reflects the difficulty in identifying suicide and intentional self-harm-related ED presentations as concerned by the AIHW.^[247] In WA, an increase in the proportion of MH_{dx} presentations from 3.7% in 2002-03 to 4.1% in 2016-17 was assessed using jurisdictional data.^[60] This finding is consistent with the results reported in Chapter 4 (3.6%, 2004-05; 4.1%, 2016-17). Consistencies between findings reported in the thesis and published studies using jurisdictional data that have been similarly coded support the utilisation of the AIHW data as a comprehensive data source. For the jurisdictions using the other coding system, the consistency between findings in the jurisdictional studies with the inclusion of suicide and self-harm-related ED presentations and Chapter 4 without these presentations also support for the comprehensiveness and representativeness of AIHW data.

The assessed increases in the proportion of MH_{dx} presentations found in this thesis and more recent published studies highlight increasing demands on general hospital EDs for MH_{dx} presentations across Australia. Increases in MH_{dx} presentations, even when not statistically significant, are considered clinically significant due to heightened clinical consideration,^[196,197] and increased resource consumption.^[197] The statistically significant differences identified between jurisdictions indicate jurisdictional specific issues. However, significant or upwards trends of MH_{dx}

presentations across all jurisdictions indicates generic issues necessitating concern and policy development at a national level.

In Study 1, the identified pattern of publications seemed to coincide with changes in MH systems and/or service provision including increases in the proportion of MHRD presentations (broadly defined). In the US, the increase in the proportion of MH related ED presentations between 1992 and 2010 coincided with the completion of deinstitutionalisation in 1992^[12] and on-going reduction in psychiatric bed numbers until the early 2000s.^[180] Psychiatric bed numbers were reported to have more than halved between 1992 and 2008.^[190] In Europe, the interest in MHRD presentations coincided with major MH-policy reforms (Mental Health Declaration for Europe and the Mental Health Action Plan for Europe, 2005),^[179] which focused on deinstitutionalisation. However, very few publications from European countries were captured within the systematic review, limiting the ability to generalise findings. In Australia, the increase in the proportion of MHRD presentations in a study of a single, but major, SA hospital, between 1992 and 2002,^[33] also coincided with large reductions in psychiatric bed numbers following the commencement of deinstitutionalisation in this state (started in 1991).^[191] The increase in MH-related presentations in NSW, Australia, between 1999 and 2006,^[31,191] also followed deinstitutionalisation.^[9] However, the lowest number of public psychiatric bed numbers per 100,000 population in NSW between 1992-93 and 2016-17 was in 2000-01 (see Figure 1.1).^[23]

From Study 2, the highest proportion of MH_{dx} presentations predominantly occurred in SA and increased after 2012-13, coinciding with a 10% cut in funding to acute hospitals in 2011 and substantial closure of acute hospital psychiatric beds.^[22] However, public psychiatric beds increased from 2013-14 (Figure 1.1) while the

population rate of MH_{dx} presentations increased throughout the study. Similarly, increasing rates of MH_{dx} presentations and psychiatric bed numbers were observed for the NT after 2011-12, and for QLD and the ACT from 2014-15. In contrast, potentially negative relationship between rates for NSW, VIC, WA across the entire study period, and TAS after 2013-14. An apparent negative relationship was also reflected at the national level. Given inconsistencies in findings between jurisdictions, the overall relationship between psychiatric bed numbers and MH_{dx} presentations appears complex, and no definitive relationship between trends in rates of psychiatric bed numbers and MH_{dx} presentations is evident. However, this finding may be impacted by the level of bed numbers, which are all below the OECD average. It is hypothesised that if bed numbers are below a minimum threshold level, increasing bed numbers will not immediately reduce the demand for ED care, particularly if bed numbers remain below the threshold. Jurisdiction-specific assessment of the relationship between bed numbers, MH_{dx} presentations and other service provision factors is identified as an area for future research.

In 2011, an increase in the proportion of MH_{dx} presentations was identified in most jurisdictions, coinciding with the implementation of the National Emergency Access Target (NEAT) as part of the National Health Reform Agreement.^[202] NEAT has elsewhere been suggested to be associated with increased re-presentations.^[203] Given that NEAT was implemented as a key performance indicator for Australian hospitals, potential adverse impacts indicate a need for review.

Throughout studies in this thesis, but first highlighted through the systematic review, is variation in definitions of MHEd presentations. This variation was, in part, due to differences in coding systems, but also due to the specific diagnoses included within studies. Regarding the definition of MH_{dx} ED presentations employed in

Chapter 4 to 7, the definition employed is that specified and used by the AIHW. The AIHW is an independent statutory agency of the Commonwealth government tasked with producing authoritative and accessible information and statistics to inform and support better policy and service delivery decisions.^[259]

The AIHW employed a narrow definition of a MH-presentation based on F-codes only, thus excluding presentations due to self-harm. The AIHW definition of MH_{dx} also aligns to the definition employed in the Global Burden of Diseases studies.^[3] While the exclusion of suicide and self-harm is highlighted as a limitation in the thesis, if trends are evident for other mental health diagnoses, these are important for policy development.

However, presentations for injuries due to self-harming behaviour have often been considered as MHR_{ED} presentations, particularly in the US,^[50,54,63,108,113,115,125,126,129,136,152,156,157,260-265] but also in Australian studies both in the systematic review^[31-33,145,146,148,149] and since the review was undertaken.^[54,63,151,152] To better identify the impact of MH on ED presentations, the AIHW should consider expanding the breadth of MH diagnoses they report. However, more comprehensive assessment is not straightforward. In September 2020, the National Suicide and Self-harm Monitoring System commenced.^[247] This system does not cover ED presentations due to the difficulty in identifying intentional self-harm and suicide-related presentations.

Further, there is an issue of how many diagnosis codes are considered when MHR_{ED} presentations are assessed. In Australia, only one principal diagnosis has historically been recorded for ED presentations, preventing the ability to monitor multiple reasons for presentations including comorbidities and dual diagnoses. The total burden of mental illness will, therefore, be underestimated. However, two

additional diagnoses could be collected from 2013-14,^[73] and 99 from 2015-16.^[74] As the collection of additional diagnoses is not mandatory, only through the consistent assignment of multiple codes will these data prove useful. It is likely that only if the importance of this information is acknowledged by ED clinicians, and a commitment made to its collection will this occur. Further improvement and training in clinical coding practices in EDs is therefore necessary.

In addition, the Systematized Nomenclature Of Medicine – Clinical Term (SNOMED-CT), first introduced in NSW in 2008,^[210] has been recently identified as experiencing redundancy and duplication.^[211] Study 4 identified potential problems with SNOMED-CT regarding the coding of F99 in NSW compared with other jurisdictions. Thus, the usefulness of SNOMED-CT in assessing MH conditions in EDs is uncertain. The difference in clinical coding systems across jurisdictions may also limit inter-jurisdictional comparisons.

For age-specific issues, the systematic review identified a shift of focus toward MHrED presentations by children in the US and Canada. Since the systematic review, specific interest in MHrED presentations by children has also arisen in Australia.^[51] This interest is consistent with findings from Study 3 that children had the greatest increase in the population rate of MH_{dx} presentations, followed by youth and younger adults. These findings were also supported by a study from NSW.^[54] In the US and Canada, there was a concern that lack of staff with paediatric psychiatry training in emergency services had led to the increase in MH-related presentations by children, potentially due to re-presentations.^[11,155,186] In Australia, the second Australian Child and Adolescent Survey of Mental Health and Wellbeing^[219] found an increase in the prevalence of depression and anxiety in children and youth. There has also been concern regarding inadequate provision of community-based care for these age

groups.^[57,58] Further, community-based care provision for children is different than for adults, so that transitional age groups, i.e. youth and younger adult, may not be receiving enough support for their MH conditions.^[57,58] Given the increasing demand for paediatric mental health services in the emergency setting, ensuring EDs have access to age-appropriate MH professionals is crucial. Age-specific professionals are needed because different MH management and treatment strategies are required.^[55,56] Mobile community teams with age-appropriate skills across the life-span may be one option to provide early intervention with the aim of preventing multiple initial and subsequent ED presentations.

Regarding ED presentations by Indigenous status, these data were excluded as there was an acknowledged variation in the quality of data across jurisdictions, preventing jurisdictional comparisons.^[46] Without reliable data on Indigenous status, the ability to identify differences in health service utilisation and thus, differential care needs is not possible. This issue has real significance for the NT, which has the highest proportion of Indigenous residents, 30.0%, in 2016-17, and for which the proportion of ED presentations for Indigenous Australians were 46.5%^[94] indicating higher relative demand/needs among Indigenous Australians. Therefore, efforts should be made to improve the quality of Indigenous data, and to a consistent level across jurisdictions to enable further assessment of MH_{dx} presentations to support policy development and implementation.

Regarding diagnosis-specific issues, this thesis highlights presentations for mental and behavioural disorders due to psychoactive substance use (F10-F19). As postulated in Study 4, the increase of ED presentations for F10-F19, particularly between 2010-11 and 2015-16, is potentially due to the increase in problematic use of methamphetamine (including “crystal/ice”), as well as cocaine and inhalants, and the

misuse of pharmaceuticals, especially pain-killers/analgesics and opioids.^[223,224] In addition, risky alcohol consumption has also been identified as a concern in some jurisdictional studies, including the NT^[223] and WA,^[60] but not NSW^[228] or QLD.^[229] Importantly, psychoactive substance use-related presentations are associated with acute behavioural disturbance, and thus have resourcing and safety implications.^[227] Given the increase in ED presentations for F10-F19 at the same time as an increase in the problematic use of psychoactive substances, strengthening national and jurisdiction-specific plans and strategies targeting substance use appears essential.

A greater increase in MH_{dx} presentations than all ED presentations (identified in Study 2), alongside similar rates of increase in high acuity presentations (identified in Study 5), indicates greater relative growth across ATS categories 3-5 for MH_{dx} presentations. Together with the greater relative increase in admissions for MH_{dx} presentations, these findings suggest that MH community services have inadequate capacity to manage patients with a MH_{dx}. Increased demand, relative to static supply of beds, has been arguably underpinning concerns about access block for all ED presentations^[45,61,203,243] and MH presentations.^[62] Further, increasing rates of MH_{dx} presentations and MH_{dx} presentations admitted underscores increasing (but underestimated) demand for MH treatment in Australian public hospitals both in EDs and inpatient care. Within the context of Australia's current MH-system, policies may be needed to strengthen the ability of community mental health services to detect deterioration earlier thus preventing ED presentations. The roles of primary care providers, general practitioners, and community service organisations may need to be strengthened to offer a more stepwise approach.

The systematic review (presented in Chapter 3) found a greater proportion of MHrED presentations (based on a consistent definition) for rural hospitals than the

national average in the US supported by findings from regional studies. Differences in MH-related presentation rates between rural and urban areas in the US may be because of differences in insurance coverage. For example, people covered by public insurance were more likely to be young, living in rural area, and using EDs for their MH needs,^[129] particularly for depression,^[187] than individuals covered by private insurance^[132,138] or noninsurance.^[138] However, in Australia, Study 2 showed no significant change in the trend of proportions of MH_{dx} presentations in 2013-14, when the national data collection was expanded from major and large hospital to include all public hospitals with a designated ED. However, as many rural and remote hospitals are without a designated ED, many emergency occasions of service are not captured within the NNAPEDCD dataset.^[92] The extent of care for MH in rural and remote areas requires further investigation.

In the US, when national data included Federal, Military, and Veterans Administration hospitals,^[48] the reported percentage of MHR_{ED} presentations across all age-groups was the highest across studies. This finding indicates higher comparative burden of MHR_{ED} presentations in Federal, Military, and Veterans Administration hospitals. In Australia, it is also important to conduct further research to determine whether any particular type(s) of hospital are also facing higher demands for MH_{dx} presentations, and/or in particular sub-populations.

8.5. Limitations

The systematic review (Study 1, Chapter 3) had several limitations. Firstly, unclear description of outcomes assessed within papers, potentially led to omission of relevant data^[142] and studies^[174]. Secondly, provision of averages across multiple-year timeframes, as well as, single-year-only data reported in some studies limited the ability to examine trends over time. Given that the systematic review focused on

MHrED presentations to general hospitals, studies that reported data for Psychiatric Emergency Services only were excluded, so countries with a stand-alone Psychiatric Emergency Services system were effectively ineligible. Further, significant differences in MH-system funding, organisation, and provision across countries makes direct comparisons problematic.^[25,188,189]

The series of studies that analysed secondary data reported by the AIHW have certain limitations in common due to the nature, scope of data and data collection process and AIHW reporting practices. Firstly, the analysed data were sourced from reported analyses of a national database comprised of data supplied by the state/territory authorities. These data are limited by the absence of a national agreement and standards on data collection within EDs, and restricted to variables reported. Secondly, there were two major changes in scope of the data in 2012-13 and 2013-14, raising concerns about the comparability of the data over time. The first change in data collection practices in 2012-13 was the retention of patients who were admitted and remained within the ED environment (e.g. in an observation unit, short-stay unit, ED ward or awaiting a bed in an admitted patient ward of the hospital) until they physically departed the ED.^[72,75] The second major change was the expansion of the NNAPEDCD in 2013-14 from peer group A and B hospitals to all hospitals with an ED. However, the identified limitations had minimal impact on the findings and their interpretation as per Study 2 (Chapter 4). Additionally, MH_{dx} presentations were not specifically assessed for Indigenous Australians due to concerns of the AIHW about data quality.

The different coding practices and systems in EDs also limited the ability to comprehensively capture MH-related presentations, with potential impacts for inter-jurisdictional comparisons between jurisdictions that use ICD versus those that do not.

The fact that a single diagnostic code has been historically recorded, limits the ability to understand presentations for dual diagnosis, and may partly explain the increase in unspecified mental disorders (F99) identified in Study 4 (Chapter 6). Further, the narrow definition of MHeED presentations (ICD-10-AM F-codes only) employed by the AIHW leads to an underestimation of MHeED presentations due to the exclusion of self-harm, suicide, and physical health-related ED presentations with MH-related comorbidities.^[34,45,51,54]

Finally, given the aggregated and limited tabulations and cross-tabulated data provided by the AIHW, there was no data on re-presentations, and no ability to undertake multi-factorial analysis, and/or assess interactional impacts. More complex analyses using the primary data supplied to the AIHW was considered beyond the scope of the current work program, given the need for multi-jurisdictional ethics and national data linkages, which were in the process of being established when this work commenced. The necessity for more in-depth analysis is reflected in different age-groups having different MH-related problems^[51,187,219] using health services differently^[129,132,138,187] and given that different MH diagnoses are associated with different triage groups.^[209]

8.6. Future directions

Based on key findings (Section 8.3), the following areas are identified for future consideration across service provision, health informatics and research contexts.

8.6.1. Mental health care system and service provision

- Strengthening the roles and capabilities of primary care providers, general practitioners, and community service organisations to offer a more stepwise approach to MH care. The objective, to detect deterioration

earlier and improve management thus preventing further increase in MH_{dx} ED presentations, particularly low acuity presentations.

- Explore whether mobile community mental health teams with age-appropriate skills across the life-span could minimise presentations and re-presentations, given increasing presentation rates across all-groups, particularly for children and youth.
- Ensuring EDs have access to age-appropriate MH professionals, especially for children and youth given the importance of these skill-sets has been identified internationally.
- Review the National Emergency Access Target (NEAT) to ensure it is appropriate, specific and applicable for ED presentations with a MH_{dx}, given the coincidence between the introduction of the NEAT and the increase in re-presentations to ED for a MH_{dx}.
- Strengthen national plans and strategies to control the use of psychoactive drugs; develop more effective jurisdiction-specific plans and strategies to control drugs and alcohol consumption; and enhance support in the community given the greatest absolute increase MH_{dx} presentations in Australia was for psychoactive substance use, with increases observed in every jurisdiction.

8.6.2. Reporting

- Review the sensitivity and specificity of SNOMED-CT for MH presentations given the increase in presentations with an unspecified MH condition (F99) in NSW to ascertain if this increase is a coding system or jurisdictional level artefact; and

- Improve the quality, reliability of the Indigenous data, and the consistency of these data across jurisdictions.

Given concerns that not all mental health related presentations are captured through F00-F99, when reporting data for MH-related presentations in hospital EDs, the AIHW should consider:

- Expanding the breadth of MH diagnoses and definition of MH-related ED presentations to include the presentations for suicide and self-harm, noting current issues with capturing MH-related co-morbidities for the other ED presentations;
- Provide data with cross-tabulations to enable greater consideration of sociodemographic factors on MH-related presentations in hospital EDs; and
- Assess mental health-related emergency occasions of service.

8.6.3. Research

Further research should:

- Employ unit record of multi-jurisdictional data to minimise the limitations of the secondary data used in research, including producing more informative cross-tabulations.
- Assess the MH_{dx} presentations for Indigenous Australians;
- Assess the practicability and usefulness of additional diagnoses in assessing ED presentations by MH patients;
- Through data-linkage
 - Assess re-presentations rates
 - Assess the sensitivity and specificity of ED diagnostic coding for intentional self-harm and suicide-related ED presentations, especially

those with underlying MH conditions with reference to admitted patient data.

- Assess the multiple factors affecting the trend of MH_{dx} presentations
- Always provide single-year data for multiple-year timeframes to enable the determinations of trends and meta-analysis; and
- Identify more fully the reasons behind the apparent increases in MHR_{ED} presentations, including the role of the resourcing of community mental health services, and changes in acute psychiatric inpatient bed numbers;

8.7. Conclusion

This thesis incorporates a systematic review of academic literature on the proportion of MHR_{ED} presentations between 1985 and 2015, and a series of studies examining the trends of MH_{dx} presentations to Australian public hospital EDs between 2004-05 and 2016-17 using the publicly available secondary data from AIHW reports. Within the peer-reviewed literature, MH_{dx} presentations as a proportion of all ED presentations were found to increase in the US at the national level, and Australia at individual hospital and regional levels. In Australia, the proportion of MH_{dx} presentations, defined as ICD-10 F-codes, has increased in all Australian jurisdictions between 2004-05 to 2016-17, but particularly since 2010-11. Across MH diagnostic groups, there were increases in the population rates of MH_{dx} presentations for most, but particularly psychoactive substance use-related disorders. Increasing rates of MH_{dx} presentations and MHR_{ED} presentations admitted underscores increasing (but underestimated) demand for MH treatment in Australian public hospitals both in EDs and inpatient care. Healthcare planning strategies for urgent and emergency care cannot afford to overlook the growing impact of youth and younger adults on MH_{dx} presentations. To reduce the need for MH crisis care in Australian EDs, strategies are

required to reduce psychoactive substance use in the community, and policies may be needed to strengthen the capability of community MH services and primary care professionals to recognise, diagnose, and treat earlier in the course of illness. To comprehensively assess the burden of MHeD presentations, a national data-linking protocol is recommended. Within such an analysis, the definition of MH-related presentations could and should be expanded to include conditions which will be assigned a physical health- and/or injury-related code commonly associated with a MH condition. The use of an expanded definition is also recommended for the AIHW. The recording of multiple codes is also recommended to enable better monitoring of trends. In the interim, cross-tabulations across patient characteristics and outcomes of presentations would provide better insight into the roles of multiple factors affecting ED use for MH conditions.

References

1. World Health Organization (WHO), *Mental health and development: Targeting people with mental health conditions as a vulnerable group*. 2010, Geneva, Switzerland: WHO.
2. Vos, T., A.D. Flaxman, M. Naghavi, R. Lozano, C. Michaud, M. Ezzati, K. Shibuya, J.A. Salomon, S. Abdalla, V. Aboyans, J. Abraham, I. Ackerman, R. Aggarwal, S.Y. Ahn, M.K. Ali, M. Alvarado, H.R. Anderson, L.M. Anderson, K.G. Andrews, C. Atkinson, L.M. Baddour, A.N. Bahalim, S. Barker-Collo, L.H. Barrero, D.H. Bartels, M.G. Basanez, A. Baxter, M.L. Bell, E.J. Benjamin, D. Bennett, E. Bernabe, K. Bhalla, B. Bhandari, B. Bikbov, A. Bin Abdulhak, G. Birbeck, J.A. Black, H. Blencowe, J.D. Blore, F. Blyth, I. Bolliger, A. Bonaventure, S. Boufous, R. Bourne, M. Boussinesq, T. Braithwaite, C. Brayne, L. Bridgett, S. Brooker, P. Brooks, T.S. Brugha, C. Bryan-Hancock, C. Bucello, R. Buchbinder, G. Buckle, C.M. Budke, M. Burch, P. Burney, R. Burstein, B. Calabria, B. Campbell, C.E. Canter, H. Carabin, J. Carapetis, L. Carmona, C. Cella, F. Charlson, H. Chen, A.T. Cheng, D. Chou, S.S. Chugh, L.E. Coffeng, S.D. Colan, S. Colquhoun, K.E. Colson, J. Condon, M.D. Connor, L.T. Cooper, M. Corriere, M. Cortinovis, K.C. de Vaccaro, W. Couser, B.C. Cowie, M.H. Criqui, M. Cross, K.C. Dabhadkar, M. Dahiya, N. Dahodwala, J. Damsere-Derry, G. Danaei, A. Davis, D. De Leo, L. Degenhardt, R. Dellavalle, A. Delossantos, J. Denenberg, S. Derrett, D.C. Des Jarlais, S.D. Dharmaratne, M. Dherani, C. Diaz-Torne, H. Dolk, E.R. Dorsey, T. Driscoll, H. Duber, B. Ebel, K. Edmond, A. Elbaz, S.E. Ali, H. Erskine, P.J. Erwin, P. Espindola, S.E. Ewoigbokhan, F. Farzadfar, V. Feigin, D.T. Felson,

- A. Ferrari, C.P. Ferri, E.M. Fevre, M.M. Finucane, S. Flaxman, L. Flood, K. Foreman, M.H. Forouzanfar, F.G. Fowkes, R. Franklin, M. Fransen, M.K. Freeman, B.J. Gabbe, S.E. Gabriel, E. Gakidou, H.A. Ganatra, B. Garcia, F. Gaspari, R.F. Gillum, G. Gmel, R. Gosselin, R. Grainger, J. Groeger, F. Guillemin, D. Gunnell, R. Gupta, J. Haagsma, H. Hagan, Y.A. Halasa, W. Hall, D. Haring, J.M. Haro, J.E. Harrison, R. Havmoeller, R.J. Hay, H. Higashi, C. Hill, B. Hoen, H. Hoffman, P.J. Hotez, D. Hoy, J.J. Huang, S.E. Ibeanusi, K.H. Jacobsen, S.L. James, D. Jarvis, R. Jasrasaria, S. Jayaraman, N. Johns, J.B. Jonas, G. Karthikeyan, N. Kassebaum, N. Kawakami, A. Keren, J.P. Khoo, C.H. King, L.M. Knowlton, O. Kobusingye, A. Koranteng, R. Krishnamurthi, R. Laloo, L.L. Laslett, T. Lathlean, J.L. Leasher, Y.Y. Lee, J. Leigh, S.S. Lim, E. Limb, J.K. Lin, M. Lipnick, S.E. Lipshultz, W. Liu, M. Loane, S.L. Ohno, R. Lyons, J. Ma, J. Mabweijano, M.F. MacIntyre, R. Malekzadeh, L. Mallinger, S. Manivannan, W. Marcenes, L. March, D.J. Margolis, G.B. Marks, R. Marks, A. Matsumori, R. Matzopoulos, B.M. Mayosi, J.H. McAnulty, M.M. McDermott, N. McGill, J. McGrath, M.E. Medina-Mora, M. Meltzer, G.A. Mensah, T.R. Merriman, A.C. Meyer, V. Miglioli, M. Miller, T.R. Miller, P.B. Mitchell, A.O. Mocumbi, T.E. Moffitt, A.A. Mokdad, L. Monasta, M. Montico, M. Moradi-Lakeh, A. Moran, L. Morawska, R. Mori, M.E. Murdoch, M.K. Mwaniki, K. Naidoo, M.N. Nair, L. Naldi, K.M. Narayan, P.K. Nelson, R.G. Nelson, M.C. Nevitt, C.R. Newton, S. Nolte, P. Norman, R. Norman, M. O'Donnell, S. O'Hanlon, C. Olives, S.B. Omer, K. Ortblad, R. Osborne, D. Ozgediz, A. Page, B. Pahari, J.D. Pandian, A.P. Rivero, S.B. Patten, N. Pearce, R.P. Padilla, F. Perez-Ruiz, N. Perico, K. Pesudovs, D. Phillips, M.R. Phillips, K. Pierce, S. Pion, G.V. Polanczyk, S.

- Polinder, C.A. Pope, 3rd, S. Popova, E. Porrini, F. Pourmalek, M. Prince, R.L. Pullan, K.D. Ramaiah, D. Ranganathan, H. Razavi, M. Regan, J.T. Rehm, D.B. Rein, G. Remuzzi, K. Richardson, F.P. Rivara, T. Roberts, C. Robinson, F.R. De Leon, L. Ronfani, R. Room, L.C. Rosenfeld, L. Rushton, R.L. Sacco, S. Saha, U. Sampson, L. Sanchez-Riera, E. Sanman, D.C. Schwebel, J.G. Scott, M. Segui-Gomez, S. Shahraz, D.S. Shepard, H. Shin, R. Shivakoti, D. Singh, G.M. Singh, J.A. Singh, J. Singleton, D.A. Sleet, K. Sliwa, E. Smith, J.L. Smith, N.J. Stapelberg, A. Steer, T. Steiner, W.A. Stolk, L.J. Stovner, C. Sudfeld, S. Syed, G. Tamburlini, M. Tavakkoli, H.R. Taylor, J.A. Taylor, W.J. Taylor, B. Thomas, W.M. Thomson, G.D. Thurston, I.M. Tleyjeh, M. Tonelli, J.A. Towbin, T. Truelsen, M.K. Tsilimbaris, C. Ubeda, E.A. Undurraga, M.J. van der Werf, J. van Os, M.S. Vavilala, N. Venketasubramanian, M. Wang, W. Wang, K. Watt, D.J. Weatherall, M.A. Weinstock, R. Weintraub, M.G. Weisskopf, M.M. Weissman, R.A. White, H. Whiteford, S.T. Wiersma, J.D. Wilkinson, H.C. Williams, S.R. Williams, E. Witt, F. Wolfe, A.D. Woolf, S. Wulf, P.H. Yeh, A.K. Zaidi, Z.J. Zheng, D. Zonies, A.D. Lopez, C.J. Murray, M.A. AlMazroa and Z.A. Memish, Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, 2012. **380**(9859): p. 2163-2196.
3. Vos, T., R.M. Barber, B. Bell, A. Bertozzi-Villa, S. Biryukov, I. Bolliger, F. Charlson, A. Davis, L. Degenhardt, D. Dicker, L. Duan, H. Erskine, V.L. Feigin, A.J. Ferrari, C. Fitzmaurice, T. Fleming, N. Graetz, C. Guinovart, J. Haagsma, G.M. Hansen, S.W. Hanson, K.R. Heuton, H. Higashi, N. Kassebaum, H. Kyu, E. Laurie, X. Liang, K. Lofgren, R. Lozano, M.F. MacIntyre, M. Moradi-Lakeh, M. Naghavi, G. Nguyen, S. Odell, K. Ortblad,

- D.A. Roberts, G.A. Roth, L. Sandar, P.T. Serina, J.D. Stanaway, C. Steiner, B. Thomas, S.E. Vollset, H. Whiteford, T.M. Wolock, P. Ye, M. Zhou, M.A. Ávila, G.M. Aasvang, C. Abbafati, A.A. Ozgoren, F. Abd-Allah, M.I.A. Aziz, S.F. Abera, V. Aboyans, J.P. Abraham, B. Abraham, I. Abubakar, L.J. Abu-Raddad, N.M.E. Abu-Rmeileh, T.C. Aburto, T. Achoki, I.N. Ackerman, A. Adelekan, Z. Ademi, A.K. Adou, J.C. Adsuar, J. Arnlov, E.E. Agardh, M.J. Al Khabouri, S.S. Alam, D. Alasfoor, M.I. Albittar, M.A. Alegretti, A.V. Aleman, Z.A. Alemu, R. Alfonso-Cristancho, S. Alhabib, R. Ali, F. Alla, P. Allebeck, P.J. Allen, M.A. AlMazroa, U. Alsharif, E. Alvarez, N. Alvis-Guzman, O. Ameli, H. Amini, W. Ammar, B.O. Anderson, H.R. Anderson, C.A.T. Antonio, P. Anwari, H. Apfel, V.S.A. Arsenijevic, A. Artaman, R.J. Asghar, R. Assadi, L.S. Atkins, C. Atkinson, A. Badawi, M.C. Bahit, T. Bakfalouni, K. Balakrishnan, S. Balalla, A. Banerjee, S.L. Barker-Collo, S. Barquera, L. Barregard, L.H. Barrero, S. Basu, A. Basu, A. Baxter, J. Beardsley, N. Bedi, E. Beghi, T. Bekele, M.L. Bell, C. Benjet, D.A. Bennett, I.M. Bensenor, H. Benzian, E. Bernabe, T.J. Beyene, N. Bhala, A. Bhalla, Z. Bhutta, K. Bienhoff, B. Bikbov, A.B. Abdulhak, J.D. Blore, F.M. Blyth, M.A. Bohensky, B.B. Basara, G. Borges, N.M. Bornstein, D. Bose, S. Boufous, R.R. Bourne, L.N. Boyers, M. Brainin, M. Brauer, C.E.G. Brayne, A. Brazinova, N.J.K. Breitborde, H. Brenner, A.D.M. Briggs, P.M. Brooks, J. Brown, T.S. Brugha, R. Buchbinder, G.C. Buckle, G. Bukhman, A.G. Bulloch, M. Burch, R. Burnett, R. Cardenas, N.L. Cabral, I.R.C. Nonato, J.C. Campuzano, J.R. Carapetis, D.O. Carpenter, V. Caso, C.A. Castaneda-Orjuela, F. Catala-Lopez, V.K. Chadha, J.-C. Chang, H. Chen, W. Chen, P.P. Chiang, O. Chimed-Ochir, R. Chowdhury, H. Christensen, C.A. Christophi, S.S. Chugh, M. Cirillo, M.

- Coggeshall, A. Cohen, V. Colistro, S.M. Colquhoun, A.G. Contreras, L.T. Cooper, C. Cooper, K. Cooperrider, J. Coresh, M. Cortinovis, M.H. Criqui, J.A. Crump, L. Cuevas-Nasu, R. Dandona, L. Dandona, E. Dansereau, H.G. Dantes, P.I. Dargan, G. Davey, D.V. Davitoiu, A. Dayama, V. De la Cruz-Gongora, S.F. de la Vega, D. De Leo, B. del Pozo-Cruz, R.P. Dellavalle, K. Deribe, S. Derrett, D.C. Des Jarlais, M. Dessalegn, G.A. deVeber, S.D. Dharmaratne, C. Diaz-Torne, E.L. Ding, K. Dokova, E.R. Dorsey, T.R. Driscoll, H. Duber, A.M. Durrani, K.M. Edmond, R.G. Ellenbogen, M. Endres, S.P. Ermakov, B. Eshrati, A. Esteghamati, K. Estep, S. Fahimi, F. Farzadfar, D.F.J. Fay, D.T. Felson, S.-M. Fereshtehnejad, J.G. Fernandes, C.P. Ferri, A. Flaxman, N. Foigt, K.J. Foreman, F.G.R. Fowkes, R.C. Franklin, T. Furst, N.D. Futran, B.J. Gabbe, F.G. Gankpe, F.A. Garcia-Guerra, J.M. Geleijnse, B.D. Gessner, K.B. Gibney, R.F. Gillum, I.A. Ginawi, M. Giroud, G. Giussani, S. Goenka, K. Goginashvili, P. Gona, T.G. de Cosio, R.A. Gosselin, C.C. Gotay, A. Goto, H.N. Gouda, R.I. Guerrant, H.C. Gughani, D. Gunnell, R. Gupta, R. Gupta, R.A. Gutierrez, N. Hafezi-Nejad, H. Hagan, Y. Halasa, R.R. Hamadeh, H. Hamavid, M. Hammami, G.J. Hankey, Y. Hao, H.L. Harb, J.M. Haro, R. Havmoeller, R.J. Hay, S. Hay, M.T. Hedayati, I.B.H. Pi, P. Heydarpour, M. Hijar, H.W. Hoek, H.J. Hoffman, J.C. Hornberger, H.D. Hosgood, M. Hossain, P.J. Hotez, D.G. Hoy, M. Hsairi, H. Hu, G. Hu, J.J. Huang, C. Huang, L. Huiart, A. Hussein, M. Iannarone, K.M. Iburg, K. Innos, M. Inoue, K.H. Jacobsen, S.K. Jassal, P. Jeemon, P.N. Jensen, V. Jha, G. Jiang, Y. Jiang, J.B. Jonas, J. Joseph, K. Juel, H. Kan, A. Karch, C. Karimkhani, G. Karthikeyan, R. Katz, A. Kaul, N. Kawakami, D.S. Kazi, A.H. Kemp, A.P. Kengne, Y.S. Khader, S.E.A.H. Khalifa, E.A. Khan, G. Khan, Y.-H. Khang, I. Khonelidze, C.

- Kieling, D. Kim, S. Kim, R.W. Kimokoti, Y. Kinfu, J.M. Kinge, B.M. Kissela, M. Kivipelto, L. Knibbs, A.K. Knudsen, Y. Kokubo, S. Kosen, A. Kramer, M. Kravchenko, R.V. Krishnamurthi, S. Krishnaswami, B.K. Defo, B.K. Bicer, E.J. Kuipers, V.S. Kulkarni, K. Kumar, G.A. Kumar, G.F. Kwan, T. Lai, R. Lalloo, H. Lam, Q. Lan, V.C. Lansingh, H. Larson, A. Larsson, A.E.B. Lawrynnowicz, J.L. Leasher, J.-T. Lee, J. Leigh, R. Leung, M. Levi, B. Li, Y. Li, Y. Li, J. liang, S. Lim, H.-H. Lin, M. Lind, M.P. Lindsay, S.E. Lipshultz, S. Liu, B.K. Lloyd, S.L. Ohno, G. Logroscino, K.J. Looker, A.D. Lopez, N. Lopez-Olmedo, J. Lortet-Tieulent, P.A. Lotufo, N. Low, R.M. Lucas, R. Lunevicius, R.A. Lyons, J. Ma, S. Ma, M.T. Mackay, M. Majdan, R. Malekzadeh, C.C. Mapoma, W. Marcenes, L.M. March, C. Margono, G.B. Marks, M.B. Marzan, J.R. Masci, A.J. Mason-Jones, R.G. Matzopoulos, B.M. Mayosi, T.T. Mazorodze, N.W. McGill, J.J. McGrath, M. McKee, A. McLain, B.J. McMahon, P.A. Meaney, M.M. Mehndiratta, F. Mejia-Rodriguez, W. Mekonnen, Y.A. Melaku, M. Meltzer, Z.A. Memish, G. Mensah, A. Meretoja, F.A. Mhimbira, R. Micha, T.R. Miller, E.J. Mills, P.B. Mitchell, C.N. Mock, T.E. Moffitt, N.M. Ibrahim, K.A. Mohammad, A.H. Mokdad, G.L. Mola, L. Monasta, M. Montico, T.J. Montine, A.R. Moore, A.E. Moran, L. Morawska, R. Mori, J. Moschandreas, W.N. Moturi, M. Moyer, D. Mozaffarian, U.O. Mueller, M. Mukaigawara, M.E. Murdoch, J. Murray, K.S. Murthy, P. Naghavi, Z. Nahas, A. Naheed, K.S. Naidoo, L. Naldi, D. Nand, V. Nangia, K.M.V. Narayan, D. Nash, C. Nejjari, S.P. Neupane, L.M. Newman, C.R. Newton, M. Ng, F.N. Ngalesoni, N.T. Nhung, M.I. Nisar, S. Nolte, O.F. Norheim, R.E. Norman, B. Norrving, L. Nyakarahuka, I.H. Oh, T. Ohkubo, S.B. Omer, J.N. Opio, A. Ortiz, J.D. Pandian, C.I.A. Panelo, C. Papachristou,

- E.-K. Park, C.D. Parry, A.J.P. Caicedo, S.B. Patten, V.K. Paul, B.I. Pavlin, N. Pearce, L.S. Pedraza, C.A. Pellegrini, D.M. Pereira, F.P. Perez-Ruiz, N. Perico, A. Pervaiz, K. Pesudovs, C.B. Peterson, M. Petzold, M.R. Phillips, D. Phillips, B. Phillips, F.B. Piel, D. Plass, D. Poenaru, G.V. Polanczyk, S. Polinder, C.A. Pope, S. Popova, R.G. Poulton, F. Pourmalek, D. Prabhakaran, N.M. Prasad, D. Qato, D.A. Quistberg, A. Rafay, K. Rahimi, V. Rahimi-Movaghar, S.u. Rahman, M. Raju, I. Rakovac, S.M. Rana, H. Razavi, A. Refaat, J. Rehm, G. Remuzzi, S. Resnikoff, A.L. Ribeiro, P.M. Riccio, L. Richardson, J.H. Richardus, A.M. Riederer, M. Robinson, A. Roca, A. Rodriguez, D. Rojas-Rueda, L. Ronfani, D. Rothenbacher, N. Roy, G.M. Ruhago, N. Sabin, R.L. Sacco, K. Ksoreide, S. Saha, R. Sahathevan, M.A. Sahraian, U. Sampson, J.R. Sanabria, L. Sanchez-Riera, I.S. Santos, M. Satpathy, J.E. Saunders, M. Sawhney, M.I. Saylan, P. Scarborough, B. Schoettker, I.J.C. Schneider, D.C. Schwebel, J.G. Scott, S. Seedat, S.G. Sepanlou, B. Serdar, E.E. Servan-Mori, K. Shackelford, A. Shaheen, S. Shahraz, T.S. Levy, S. Shangguan, J. She, S. Sheikhabaei, D.S. Shepard, P. Shi, K. Shibuya, Y. Shinohara, R. Shiri, K. Shishani, I. Shiue, M.G. Shrimel, I.D. Sigfusdottir, D.H. Silberberg, E.P. Simard, S. Sindi, J.A. Singh, L. Singh, V. Skirbekk, K. Sliwa, M. Soljak, S. Soneji, S.S. Soshnikov, P. Speyer, L.A. Sposato, C.T. Sreeramareddy, H. Stoeckl, V.K. Stathopoulou, N. Steckling, M.B. Stein, D.J. Stein, T.J. Steiner, A. Stewart, E. Stork, L.J. Stovner, K. Stroumpoulis, L. Sturua, B.F. Sunguya, M. Swaroop, B.L. Sykes, K.M. Tabb, K. Takahashi, F. Tan, N. Tandon, D. Tanne, M. Tanner, M. Tavakkoli, H.R. Taylor, B.J. Te Ao, A.M. Temesgen, M.T. Have, E.Y. Tenkorang, A.S. Terkawi, A.M. Theadom, E. Thomas, A.L. Thorne-Lyman, A.G. Thrift, I.M. Tleyjeh, M. Tonelli, F. Topouzis, J.A.

- Towbin, H. Toyoshima, J. Traebert, B.X. Tran, L. Trasande, M. Trillini, T. Truelsen, U. Trujillo, M. Tsilimbaris, E.M. Tuzcu, K.N. Ukwaja, E.A. Undurraga, S.B. Uzun, W.H. van Brakel, S. van de Vijver, R.V. Dingenen, C.H. van Gool, Y.Y. Varakin, T.J. Vasankari, M.S. Vavilala, L.J. Veerman, G. Velasquez-Melendez, N. Venketasubramanian, L. Vijayakumar, S. Villalpando, F.S. Violante, V.V. Vlassov, S. Waller, M.T. Wallin, X. Wan, L. Wang, J. Wang, Y. Wang, T.S. Warouw, S. Weichenthal, E. Weiderpass, R.G. Weintraub, A. Werdecker, K.R.R. Wessells, R. Westerman, J.D. Wilkinson, H.C. Williams, T.N. Williams, S.M. Woldeyohannes, C.D.A. Wolfe, J.Q. Wong, H. Wong, A.D. Woolf, J.L. Wright, B. Wurtz, G. Xu, G. Yang, Y. Yano, M.A. Yenesew, G.K. Yentur, P. Yip, N. Yonemoto, S.-J. Yoon, M. Younis, C. Yu, K.Y. Kim, M.E.S. Zaki, Y. Zhang, Z. Zhao, Y. Zhao, J. Zhu, D. Zonies, J.R. Zunt, J.A. Salomon and C.J.L. Murray, Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*, 2015. **386**(9995): p. 743-800.
4. Kessler, R.C., S. Aguilar-Gaxiola, J. Alonso, S. Chatterji, S. Lee, J. Ormel, T.B. Ustun, and P.S. Wang, The global burden of mental disorders: an update from the WHO World Mental Health (WMH) surveys. *Epidemiologia e Psichiatria Sociale*, 2009. **18**(1): p. 23-33.
5. Australian Bureau of Statistics (ABS), *National Health Survey - First Results - Australia 2017-18*. 2018, Canberra, ACT, Australia: ABS.
6. Demyttenaere, K., R. Bruffaerts, J. Posada-Villa, I. Gasquet, V. Kovess, J.P. Lepine, M.C. Angermeyer, S. Bernert, G. de Girolamo, P. Morosini, G. Polidori, T. Kikkawa, N. Kawakami, Y. Ono, T. Takeshima, H. Uda, E.G.

- Karam, J.A. Fayyad, A.N. Karam, Z.N. Mneimneh, M.E. Medina-Mora, G. Borges, C. Lara, R. de Graaf, J. Ormel, O. Gureje, Y. Shen, Y. Huang, M. Zhang, J. Alonso, J.M. Haro, G. Vilagut, E.J. Bromet, S. Gluzman, C. Webb, R.C. Kessler, K.R. Merikangas, J.C. Anthony, M.R. Von Korff, P.S. Wang, T.S. Brugha, S. Aguilar-Gaxiola, S. Lee, S. Heeringa, B.E. Pennell, A.M. Zaslavsky, T.B. Ustun, S. Chatterji, and W.H.O.W.M.H.S. Consortium, Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. *The Journal of the American Medical Association*, 2004. **291**(21): p. 2581-2590.
7. Department of Health and Ageing, *National Mental Health Report 2013: Tracking progress of mental health reform in Australia, 1993-2011*. 2013, Canberra, ACT, Australia: Commonwealth of Australia.
 8. Bassuk, E.L. and S. Gerson, Deinstitutionalization and mental health services. *Scientific American*, 1978. **238**(2): p. 46-53.
 9. Palmer, G.R. and S.D. Short, Health services for disadvantage groups, in *Health care and public policy - An Australian analysis*. 2000, Australia: MacMillan. p. 252-303.
 10. WHO, *Promoting mental health: concepts, emerging evidence, practice (summary report)*. 2004, Geneva, Switzerland: WHO.
 11. Oyewumi, L.K., O. Odejide, and S.S. Kazarian, Psychiatric emergency services in a Canadian city: I. Prevalence and patterns of use. *Canadian Journal of Psychiatry*, 1992. **37**(2): p. 91-95.
 12. Witkin, M.J., J. Atay, and R.W. Manderscheid, Trends in state and county mental hospitals in the U.S. from 1970 to 1992. *Psychiatric Services*, 1996. **47**(10): p. 1079-1081.

13. Rosen, A., The Australian experience of deinstitutionalization: interaction of Australian culture with the development and reform of its mental health services. *Acta Psychiatrica Scandinavica Supplementum*, 2006(429): p. 81-89.
14. WHO, *Innovation in deinstitutionalization: a WHO expert survey*. 2014, Geneva, Switzerland: WHO.
15. Gerson, S. and E. Bassuk, Psychiatric emergencies: an overview. *American Journal of Psychiatry*, 1980. **137**(1): p. 1-11.
16. Ellison, J.M., D.H. Hughes, and K.A. White, An emergency psychiatry update. *Hospital and Community Psychiatry*, 1989. **40**(3): p. 250-260.
17. Bassuk, E.L., The impact of deinstitutionalization on the general hospital psychiatric emergency ward. *Hospital and Community Psychiatry*, 1980. **31**(9): p. 623-627.
18. Priebe, S., A. Badesconyi, A. Fioritti, L. Hansson, R. Kilian, F. Torres-Gonzales, T. Turner, and D. Wiersma, Reinstitutionalisation in mental health care: comparison of data on service provision from six European countries. *The BMJ*, 2005. **330**(7483): p. 123-126.
19. Lamb, H.R. and L.E. Weinberger, The shift of psychiatric inpatient care from hospitals to jails and prisons. *Journal of the American Academy of Psychiatry and the Law*, 2005. **33**(4): p. 529-534.
20. Alakeson, V., N. Pande, and M. Ludwig, A plan to reduce emergency room 'boarding' of psychiatric patients. *Health Affairs*, 2010. **29**(9): p. 1637-1642.
21. Organisation for Economic Co-operation and Development (OECD). *Australia at the forefront of mental health care innovation but should remain attentive to population needs, says OECD*. 2014. [cited: 2016]; Available from URL:

- <http://www.oecd.org/els/health-systems/MMHC-Country-Press-Note-Australia.pdf>.
22. Allison, S., T. Bastiampillai, D. Siskind, L. Roeger, and R. Goldney, The National Mental Health Commission Report: Evidence based or ideologically driven? *Australian and New Zealand Journal of Psychiatry*, 2015. **49**(11): p. 960-962.
 23. Australian Institute of Health and Welfare (AIHW). *Specialised mental health care facilities*. Mental health services in Australia 2020. [updated: 01/2020]; [cited: 2020]; Available from URL: <https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/report-contents/specialised-mental-health-care-facilities>.
 24. Department of Health, *Fourth National Mental Health Plan - An agenda for collaborative government action in mental health 2009–2014*. 2009, Canberra, ACT, Australia: Commonwealth of Australia.
 25. Australian Government, *The Fifth National Mental Health and Suicide Prevention Plan*. 2017, Canberra, ACT, Australia: Commonwealth of Australia.
 26. Barratt, H., A. Rojas-Garcia, K. Clarke, A. Moore, C. Whittington, S. Stockton, J. Thomas, S. Pilling, and R. Raine, Epidemiology of Mental Health Attendances at Emergency Departments: Systematic Review and Meta-Analysis. *PLoS One*, 2016. **11**(4): p. e0154449.
 27. Goldstein, A.B. and S.M. Horwitz, Child and adolescent psychiatric emergencies in nonsuicide-specific samples: the state of the research literature. *Pediatric Emergency Care*, 2006. **22**(5): p. 379-384.

28. Leon, S.L., P. Cloutier, C. Polihronis, R. Zemek, A.S. Newton, C. Gray, and M. Cappelli, Child and Adolescent Mental Health Repeat Visits to the Emergency Department: A Systematic Review. *Hospital Pediatrics*, 2017. **7**(3): p. 177-186.
29. Newton, A.S., M.P. Hamm, J. Bethell, A.E. Rhodes, C.J. Bryan, L. Tjosvold, S. Ali, E. Logue, and I.G. Manion, Pediatric suicide-related presentations: a systematic review of mental health care in the emergency department. *Annals of Emergency Medicine*, 2010. **56**(6): p. 649-659.
30. Lee, S., The characteristics of police presentations to an emergency department in a community hospital. *Australasian Emergency Nursing Journal*, 2006. **9**(2): p. 65-72.
31. Tankel, A.S., M.J. Di Palma, K.M. Kramer, and R. van der Zwan, Increasing impact of mental health presentations on New South Wales public hospital emergency departments 1999-2006. *Emergency Medicine Australasia*, 2011. **23**(6): p. 689-696.
32. Knott, J.C., A. Pleban, D. Taylor, and D. Castle, Management of mental health patients attending Victorian emergency departments. *Australian and New Zealand Journal of Psychiatry*, 2007. **41**(9): p. 759-767.
33. Kalucy, R., L. Thomas, and D. King, Changing demand for mental health services in the emergency department of a public hospital. *Australian and New Zealand Journal of Psychiatry*, 2005. **39**(1-2): p. 74-80.
34. AIHW, *Mental health services in Australia 2004–05. Mental health series no. 9. AIHW cat. no. HSE 47*. 2007, Canberra, ACT, Australia: AIHW.
35. AIHW, *Mental health services in Australia 2005–06. Mental health series no. 10. AIHW cat. no. HSE 56*. 2008, Canberra, ACT, Australia: AIHW.

-
36. AIHW, *Mental health services in Australia 2006–07. Mental health series no. 11. AIHW cat. no. HSE 74*. 2009, Canberra, ACT, Australia: AIHW.
 37. AIHW, *Mental health services in Australia 2007–08. Mental health series no. 12. AIHW cat. no. HSE 88*. 2010, Canberra, ACT, Australia: AIHW.
 38. AIHW, *Mental health services in Australia 2008-09*. 2010, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
 39. AIHW, *Mental health services in Australia 2009-10*. 2011, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
 40. AIHW, *Mental health services in Australia 2010-11*. 2012, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
 41. AIHW, *Mental health services in Australia 2011-12*. 2012, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
 42. AIHW, *Mental health services in Australia 2012-13*. 2014, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>

43. AIHW, Mental health services in Australia 2014-15. 2015, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
44. AIHW, Mental health services in Australia 2015-16. 2016, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
45. AIHW, Mental health services in Australia 2016-17. 2018, Canberra, ACT, Australia: AIHW. Available from URL:
<https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/archived-reports-and-data>
46. AIHW, *Australian hospital statistics 2004-05. Health services series no. 26. Cat. no. HSE 41*. 2006, Canberra, ACT, Australia: AIHW.
47. Centers for Disease Control and Prevention, Emergency department visits by patients with mental health disorders--North Carolina, 2008-2010. *Morbidity and Mortality Weekly Report*, 2013. **62**(23): p. 469-472.
48. Nalliah, R.P., J.D. Da Silva, and V. Allareddy, The characteristics of hospital emergency department visits made by people with mental health conditions who had dental problems. *Journal of the American Dental Association*, 2013. **144**(6): p. 617-624.
49. Slade, E.P., L.B. Dixon, and S. Semmel, Trends in the duration of emergency department visits, 2001-2006. *Psychiatric Services*, 2010. **61**(9): p. 878-884.

50. Larkin, G.L., C.A. Claassen, J.A. Emond, A.J. Pelletier, and C.A. Camargo, Trends in U.S. emergency department visits for mental health conditions, 1992 to 2001. *Psychiatric Services*, 2005. **56**(6): p. 671-677.
51. Hiscock, H., R.J. Neely, S. Lei, and G. Freed, Paediatric mental and physical health presentations to emergency departments, Victoria, 2008-15. *The Medical Journal of Australia*, 2018. **208**(8): p. 343-348.
52. Scott, D., R. Crossin, R. Ogeil, K. Smith, and D.I. Lubman, Exploring Harms Experienced by Children Aged 7 to 11 Using Ambulance Attendance Data: A 6-Year Comparison with Adolescents Aged 12(-)17. *International Journal of Environmental Research and Public Health*, 2018. **15**(7).
53. Roggenkamp, R., E. Andrew, Z. Nehme, S. Cox, and K. Smith, Descriptive Analysis Of Mental Health-Related Presentations To Emergency Medical Services. *Prehospital Emergency Care*, 2018. **22**(4): p. 399-405.
54. Perera, J., T. Wand, K.J. Bein, D. Chalkley, R. Ivers, K.S. Steinbeck, R. Shields, and M.M. Dinh, Presentations to NSW emergency departments with self-harm, suicidal ideation, or intentional poisoning, 2010-2014. *The Medical Journal of Australia*, 2018. **208**(8): p. 348-353.
55. Newton, A.S., L. Hartling, A. Soleimani, S. Kirkland, M.P. Dyson, and M. Cappelli, A systematic review of management strategies for children's mental health care in the emergency department: update on evidence and recommendations for clinical practice and research. *Emergency Medicine Journal*, 2017. **34**(6): p. 376-384.
56. Bradshaw, L.E., S.E. Goldberg, S.A. Lewis, K. Whittamore, J.R. Gladman, R.G. Jones, and R.H. Harwood, Six-month outcomes following an emergency

- hospital admission for older adults with co-morbid mental health problems indicate complexity of care needs. *Age Ageing*, 2013. **42**(5): p. 582-588.
57. Nguyen, T., M.G. Embrett, N.G. Barr, G.M. Mulvale, D.K. Vania, G.E. Randall, and B. DiRezze, Preventing Youth from Falling Through the Cracks Between Child/Adolescent and Adult Mental Health Services: A Systematic Review of Models of Care. *Community Mental Health Journal*, 2017. **53**(4): p. 375-382.
58. Singh, S.P., Transition of care from child to adult mental health services: the great divide. *Current Opinion in Psychiatry*, 2009. **22**(4): p. 386-390.
59. Bidargaddi, N., T. Bastiampillai, G. Schrader, R. Adams, C. Piantadosi, J. Strobel, G. Tucker, and S. Allison, Changes in monthly unemployment rates may predict changes in the number of psychiatric presentations to emergency services in South Australia. *BMC Emergency Medicine*, 2015. **15**(1).
60. Yap, M., M. Tuson, D. Whyatt, and A. Vickery, Anxiety and alcohol in the working-age population are driving a rise in mental health-related emergency department presentations: 15 year trends in emergency department presentations in Western Australia. *Emergency Medicine Australasia*, 2020. **32**(1): p. 80-87.
61. Australasian College for Emergency Medicine (ACEM), *The Long Wait: An Analysis of Mental Health Presentations to Australian Emergency Departments*. 2018, Melbourne, Victoria, Australia: ACEM.
62. ACEM, *Waiting times in the emergency department for people with acute mental and behavioural conditions*. 2018, Melbourne, Victoria, Australia: ACEM.

-
63. Bost, N., J. Crilly, and K. Wallen, The impact of a flow strategy for patients who presented to an Australian emergency department with a mental health illness. *International Emergency Nursing*, 2015. **23**(4): p. 265-273.
 64. WHO, *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies*. 2010, Geneva, Switzerland: WHO.
 65. Novak, S. and N. Djordjevic, Information system for evaluation of healthcare expenditure and health monitoring. *Physica A: Statistical Mechanics and its Applications*, 2019. **520**: p. 72-80.
 66. Victorian Quality Council, *A guide to using data for health care quality improvement*. 2008, Melbourne, Victoria, Australia: Rural and Regional Health and Aged Care Services Division, Victorian Government Department of Human Services.
 67. AIHW, *National Health Information Agreement: Procedure Manual*. 1994, Canberra, ACT, Australia: AIHW.
 68. AIHW, *National Health Data Dictionary: version 16.2. National Health Data Dictionary series. Cat. no. HWI 131*. 2015, Canberra, ACT, Australia: AIHW.
 69. The Cochrane Collaboration, *Cochrane handbook for systematic reviews of Interventions Version 5.0.1 [updated September 2008]*, ed. J.P.T. Higgins and S. Green. 2008, The Cochrane Collaboration.
 70. Neil, A.L., V.J. Carr, C. Mihalopoulos, A. Mackinnon, T.J. Lewin, and V.A. Morgan, What difference a decade? The costs of psychosis in Australia in 2000 and 2010: comparative results from the first and second Australian national surveys of psychosis. *Australian and New Zealand Journal of Psychiatry*, 2014. **48**(3): p. 237-248.
-

-
71. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS*. Health Sector National Minimum Data Sets 2003. [cited: 2018]; Available from URL:
<https://meteor.aihw.gov.au/content/index.phtml/itemId/273053>.
 72. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2012-13*. Health Sector National Minimum Data Sets 2012. [cited: 2018]; Available from URL:
<http://meteor.aihw.gov.au/content/index.phtml/itemId/474371>.
 73. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2013-14*. Health Sector National Minimum Data Sets 2013. [cited: 2018]; Available from URL:
<http://meteor.aihw.gov.au/content/index.phtml/itemId/509116>.
 74. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2015-16*. Health Sector National Minimum Data Sets 2015. [cited: 2018]; Available from URL:
<http://meteor.aihw.gov.au/content/index.phtml/itemId/588932>.
 75. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2011-12*. Health Sector National Minimum Data Sets 2011. [cited: 2018]; Available from URL:
<https://meteor.aihw.gov.au/content/index.phtml/itemId/426881>.
 76. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS*. Health Sector National Minimum Data Sets 2005. [cited: 2018]; Available from URL:
<https://meteor.aihw.gov.au/content/index.phtml/itemId/319769>.

-
77. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS*. Health Sector National Minimum Data Sets 2006. [cited: 2018]; Available from URL: <https://meteor.aihw.gov.au/content/index.phtml/itemId/322655>.
78. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2007-08*. Health Sector National Minimum Data Sets 2007. [cited: 2018]; Available from URL: <https://meteor.aihw.gov.au/content/index.phtml/itemId/349836>.
79. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2008-10*. Health Sector National Minimum Data Sets 2008. [cited: 2018]; Available from URL: <https://meteor.aihw.gov.au/content/index.phtml/itemId/363530>.
80. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2010-11*. Health Sector National Minimum Data Sets 2010. [cited: 2018]; Available from URL: <https://meteor.aihw.gov.au/content/index.phtml/itemId/374220>.
81. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2014-15*. Health Sector National Minimum Data Sets 2014. [cited: 2018]; Available from URL: <https://meteor.aihw.gov.au/content/index.phtml/itemId/566909>.
82. AIHW. *Metadata Online Registry: Non-admitted patient emergency department care NMDS 2016-17*. Health Sector National Minimum Data Sets 2016. [cited: 2018]; Available from URL: <https://meteor.aihw.gov.au/content/index.phtml/itemId/612346>.
-

-
83. AIHW, *Australian hospital statistics 2013-14: Emergency department care. Health services series no. 58. Cat. no. HSE 153.* 2014, Canberra, ACT, Australia: AIHW.
 84. AIHW, *Australian hospital statistics 2005-06. Health services series no. 30. Cat. no. HSE 50.* 2007, Canberra, ACT, Australia: AIHW.
 85. AIHW, *Australian hospital statistics 2006-07. Health services series no. 31. Cat. no. HSE 55.* 2008, Canberra, ACT, Australia: AIHW.
 86. AIHW, *Australian hospital statistics 2007-08. Health services series no. 33. Cat. no. HSE 71.* 2009, Canberra, ACT, Australia: AIHW.
 87. AIHW, *Australian hospital statistics 2008-09. Health services series no. 34. Cat. no. HSE 84.* 2010, Canberra, ACT, Australia: AIHW.
 88. AIHW, *Australian hospital statistics 2009-10. Health services series no. 38. Cat. no. HSE 107.* 2011, Canberra, ACT, Australia: AIHW.
 89. AIHW, *Australian hospital statistics 2010-11. Health services series no. 43. Cat. no. HSE 117.* 2012, Canberra, ACT, Australia: AIHW.
 90. AIHW, *Australian hospital statistics 2011-12. Health services series no. 50. AIHW cat. no. HSE 134.* 2013, Canberra, ACT, Australia: AIHW.
 91. AIHW, *Australian hospital statistics 2012-13. Health services series no. 54. AIHW cat. no. HSE 145.* 2014, Canberra, ACT, Australia: AIHW.
 92. AIHW, *Emergency department care 2014-15: Australian hospital statistics. Health services series no. 65. Cat. no. HSE 168.* 2015, Canberra, ACT, Australia: AIHW.
 93. AIHW, *Emergency department care 2015-16: Australian hospital statistics. Health services series no. 72. Cat. no. HSE 182.* 2016, Canberra, ACT, Australia: AIHW.
-

-
94. AIHW, *Emergency department care 2016-17: Australian hospital statistics. Health services series no. 80. Cat. no. HSE 194*. 2017, Canberra, ACT, Australia: AIHW.
 95. FitzGerald, G., G.A. Jelinek, D. Scott, and M.F. Gerdtz, Emergency department triage revisited. *Emergency Medicine Journal*, 2010. **27**(2): p. 86-92.
 96. Microsoft Corporation, Microsoft Excel. 2019.
 97. StataCorp, Stata Statistical Software: Release 14. 2015, StataCorp LP: College Station, TX.
 98. Kessler, R.C., K.A. McGonagle, S. Zhao, C.B. Nelson, M. Hughes, S. Eshleman, H.U. Wittchen, and K.S. Kendler, Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Archives of General Psychiatry*, 1994. **51**(1): p. 8-19.
 99. Gureje, O. and B. Oladeji, Mental health: Morbidity and impact, in *Mental and Neurological Public Health: A Global Perspective*, V. Patel, A. Woodward, V.L. Feigin, H.K. Heggenhougen, and S.R. Quah, Editors. 2010, USA: Elsevier. p. 118-126.
 100. Blazer, D.G., R.C. Kessler, K.A. McGonagle, and M.S. Swartz, The prevalence and distribution of major depression in a national community sample: the National Comorbidity Survey. *American Journal of Psychiatry*, 1994. **151**(7): p. 979-986.
 101. Stone, A., D. Rogers, S. Kruckenberg, and A. Lieser, Impact of the mental healthcare delivery system on california emergency departments. *The Western Journal of Emergency Medicine*, 2012. **13**(1): p. 51-56.
-

-
102. Hakenewerth, A.M., J.E. Tintinalli, A.E. Waller, and A. Ising, Emergency Department Visits by Older Adults with Mental Illness in North Carolina. *The Western Journal of Emergency Medicine*, 2015. **16**(7): p. 1142-1145.
 103. Mapelli, E., Erratum: Trends in Pediatric Emergency Department Utilization for Mental Health-Related Visits (J Pediatr (2015) 167 (905-910)). *The Journal of Pediatrics*, 2015. **167**(5): p. 1176.
 104. Mapelli, E., T. Black, and Q. Doan, Trends in Pediatric Emergency Department Utilization for Mental Health-Related Visits. *The Journal of Pediatrics*, 2015. **167**(4): p. 905-910.
 105. Puryear, D.A., R. Lovitt, and D.A. Miller, Characteristics of elderly persons seen in an urban psychiatric emergency room. *Hospital and Community Psychiatry*, 1991. **42**(8): p. 802-807.
 106. Stebbins, L.A. and G.L. Hardman, A survey of psychiatric consultations at a suburban emergency room. *General Hospital Psychiatry*, 1993. **15**(4): p. 234-242.
 107. Christodulu, K.V., R. Lichenstein, M.D. Weist, M.E. Shafer, and M. Simone, Psychiatric emergencies in children. *Pediatric Emergency Care*, 2002. **18**(4): p. 268-270.
 108. Sills, M.R. and S.D. Bland, Summary statistics for pediatric psychiatric visits to US emergency departments, 1993-1999. *Pediatrics*, 2002. **110**(4): p. e40.
 109. Cully, J.A., V.A. Molinari, A.L. Snow, J. Burruss, K.J. Kotrla, and M.E. Kunik, Utilization of emergency center services by older adults with a psychiatric diagnosis. *Aging and Mental Health*, 2005. **9**(2): p. 172-176.

110. Goldstein, A.B., M.A. Silverman, S. Phillips, and R. Lichenstein, Mental health visits in a pediatric emergency department and their relationship to the school calendar. *Pediatric Emergency Care*, 2005. **21**(10): p. 653-657.
111. Dorfman, D.H. and S.D. Mehta, Restraint use for psychiatric patients in the pediatric emergency department. *Pediatric Emergency Care*, 2006. **22**(1): p. 7-12.
112. Kunen, S., C. Prejean, B. Gladney, D. Harper, and C.V. Mandry, Disposition of emergency department patients with psychiatric comorbidity: results from the 2004 National Hospital Ambulatory Medical Care Survey. *Emergency Medicine Journal*, 2006. **23**(4): p. 274-275.
113. Larkin, G.L., C.A. Claassen, A.J. Pelletier, and C.A. Camargo, Jr., National study of ambulance transports to United States emergency departments: importance of mental health problems. *Prehospital and Disaster Medicine*, 2006. **21**(2): p. 82-90.
114. Goldstein, A.B., E. Frosch, S. Davarya, and P.J. Leaf, Factors associated with a six-month return to emergency services among child and adolescent psychiatric patients. *Psychiatric Services*, 2007. **58**(11): p. 1489-1492.
115. Grupp-Phelan, J., J.S. Harman, and K.J. Kelleher, Trends in mental health and chronic condition visits by children presenting for care at U.S. emergency departments. *Public Health Reports*, 2007. **122**(1): p. 55-61.
116. Hartley, D., E.C. Ziller, S.L. Loux, J.A. Gale, D. Lambert, and A.E. Yousefian, Use of critical access hospital emergency rooms by patients with mental health symptoms. *The Journal of Rural Health*, 2007. **23**(2): p. 108-115.

117. Mahajan, P., R. Thomas, D.R. Rosenberg, J.P. Leleszi, E. Leleszi, A. Mathur, E.L. Hairston, and S.R. Knazik, Evaluation of a child guidance model for visits for mental disorders to an inner-city pediatric emergency department. *Pediatric Emergency Care*, 2007. **23**(4): p. 212-217.
118. Grupp-Phelan, J., P. Mahajan, G.L. Foltin, E. Jacobs, M. Tunik, M. Sonnett, S. Miller, and P. Dayan, Referral and resource use patterns for psychiatric-related visits to pediatric emergency departments. *Pediatric Emergency Care*, 2009. **25**(4): p. 217-220.
119. Mahajan, P., E.R. Alpern, J. Grupp-Phelan, J. Chamberlain, L. Dong, R. Holubkov, E. Jacobs, R. Stanley, M. Tunik, M. Sonnett, S. Miller, G.L. Foltin, and N. Pediatric Emergency Care Applied Research, Epidemiology of psychiatric-related visits to emergency departments in a multicenter collaborative research pediatric network. *Pediatric Emergency Care*, 2009. **25**(11): p. 715-720.
120. Soto, E.C., A.M. Frederickson, H. Trivedi, A. Le, M.C. Eugene, M. Shekher, M. Weiskopf, K. Allen-Dicker, R. Dicker, V. Fornari, and C.U. Correll, Frequency and correlates of inappropriate pediatric psychiatric emergency room visits. *Journal of Clinical Psychiatry*, 2009. **70**(8): p. 1164-1177.
121. Ku, B.S., K.C. Scott, S.G. Kertesz, and S.R. Pitts, Factors associated with use of urban emergency departments by the U.S. homeless population. *Public Health Reports*, 2010. **125**(3): p. 398-405.
122. Case, S.D., B.G. Case, M. Olfson, J.G. Linakis, and E.M. Laska, Length of stay of pediatric mental health emergency department visits in the United States. *Journal of the American Academy of Child and Adolescent Psychiatry*, 2011. **50**(11): p. 1110-1119.

-
123. Little, D.R., M.E. Clasen, J.L. Hendricks, and I.A. Walker, Impact of closure of mental health center: emergency department utilization and length of stay among patients with severe mental illness. *Journal of Health Care for the Poor and Underserved*, 2011. **22**(2): p. 469-472.
 124. Waseem, M., R. Prasankumar, K. Pagan, and M. Leber, A retrospective look at length of stay for pediatric psychiatric patients in an urban emergency department. *Pediatric Emergency Care*, 2011. **27**(3): p. 170-173.
 125. Huffman, L.C., N.E. Wang, O. Saynina, F.J. Wren, P.H. Wise, and S.M. Horwitz, Predictors of hospitalization after an emergency department visit for California youths with psychiatric disorders. *Psychiatric Services*, 2012. **63**(9): p. 896-905.
 126. Chakravarthy, B., M. Tenny, C.L. Anderson, S. Rajeev, T. Istambouli, and S. Lotfipour, Analysis of mental health substance abuse-related emergency department visits from 2002 to 2008. *Substance Abuse*, 2013. **34**(3): p. 292-297.
 127. Frank, J.W., C.M. Andrews, T.C. Green, A.M. Samuels, T.T. Trinh, and P.D. Friedmann, Emergency department utilization among recently released prisoners: a retrospective cohort study. *BMC Emergency Medicine*, 2013. **13**: p. 16.
 128. Liu, S.W., J.T. Nagurney, Y. Chang, B.A. Parry, P. Smulowitz, and S.J. Atlas, Frequent ED users: are most visits for mental health, alcohol, and drug-related complaints? *American Journal of Emergency Medicine*, 2013. **31**(10): p. 1512-1515.
 129. Matsu, C.R., D. Goebert, J.J. Chung-Do, B. Carlton, J. Sugimoto-Matsuda, and S. Nishimura, Disparities in psychiatric emergency department visits

- among youth in Hawai'i, 2000-2010. *The Journal of Pediatrics*, 2013. **162**(3): p. 618-623.
130. Minassian, A., G.M. Vilke, and M.P. Wilson, Frequent emergency department visits are more prevalent in psychiatric, alcohol abuse, and dual diagnosis conditions than in chronic viral illnesses such as hepatitis and human immunodeficiency virus. *Journal of Emergency Medicine*, 2013. **45**(4): p. 520-525.
131. Brennan, J.J., T.C. Chan, R.Y. Hsia, M.P. Wilson, and E.M. Castillo, Emergency department utilization among frequent users with psychiatric visits. *Academic Emergency Medicine*, 2014. **21**(9): p. 1015-1022.
132. Pittsenbarger, Z.E. and R. Mannix, Trends in pediatric visits to the emergency department for psychiatric illnesses. *Academic Emergency Medicine*, 2014. **21**(1): p. 25-30.
133. Simon, A.E. and K.C. Schoendorf, Emergency department visits for mental health conditions among US children, 2001-2011. *Clinical Pediatrics*, 2014. **53**(14): p. 1359-1366.
134. Snowden, M., J. Pasic, S. Mitchell, J. Unutzer, and R.C. Veith, Equitable care of psychiatric emergency room patients: it does take a village. *American Journal of Psychiatry*, 2014. **171**(7): p. 720-722.
135. Buhumaid, R., J. Riley, M. Sattarian, B. Bregman, and J. Blanchard, Characteristics of Frequent Users of the Emergency Department with Psychiatric Conditions. *Journal of Health Care for the Poor and Underserved*, 2015. **26**(3): p. 941-950.
136. Choi, N.G., D.M. Dinitto, C.N. Marti, and B.Y. Choi, Associations of Mental Health and Substance Use Disorders with Presenting Problems and Outcomes

- in Older Adults' Emergency Department Visits. *Academic Emergency Medicine*, 2015. **22**(11): p. 1316-1326.
137. Fahimi, J., A. Aurrecoechea, E. Anderson, A. Herring, and H. Alter, Substance abuse and mental health visits among adolescents presenting to US emergency departments. *Pediatric Emergency Care*, 2015. **31**(5): p. 331-338.
138. Hsia, R.Y., J.B. Nath, and L.C. Baker, California emergency department visit rates for medical conditions increased while visit rates for injuries fell, 2005-11. *Health Affairs*, 2015. **34**(4): p. 621-626.
139. Lynch, S., M. Bautista, C. Freer, C. Kalynych, and P. Hendry, Child Mental Health Services in the Emergency Department: Disparities in Access. *Pediatric Emergency Care*, 2015. **31**(7): p. 473-478.
140. Nolan, J.M., C. Fee, B.A. Cooper, S.H. Rankin, and M.A. Blegen, Psychiatric boarding incidence, duration, and associated factors in United States emergency departments. *Journal of Emergency Nursing*, 2015. **41**(1): p. 57-64.
141. Sheridan, D.C., D.M. Spiro, R. Fu, K.P. Johnson, J.S. Sheridan, A.A. Oue, W. Wang, R. Van Nes, and M.L. Hansen, Mental Health Utilization in a Pediatric Emergency Department. *Pediatric Emergency Care*, 2015. **31**(8): p. 555-559.
142. Vohra, R., S.S. Madhavan, and U. Sambamoorthi, National trends and characteristics of psychiatric admissions in US emergency departments: 2006-2011. *Value in Health*, 2015. **18** (3): p. A250.
143. Watts, S., Medications prescribed for emergency department patients who have symptoms or diagnosis of psychological/mental health disorders. *Academic Emergency Medicine*, 2015. **1**: p. S207-S208.

144. Fry, M. and S. Brunero, The characteristics and outcomes of mental health patients presenting to an emergency department over a twelve month period. *Australian Emergency Nursing Journal*, 2004. **7**(2): p. 21-25.
145. Starling, J., K. Bridgland, and D. Rose, Psychiatric emergencies in children and adolescents: an Emergency Department audit. *Australasian Psychiatry*, 2006. **14**(4): p. 403-407.
146. Brunero, S., G. Fairbrother, S. Lee, and M. Davis, Clinical characteristics of people with mental health problems who frequently attend an Australian emergency department. *Australian Health Review*, 2007. **31**(3): p. 462-470.
147. Moore, G., M. Gerdtz, E. Manias, G. Hepworth, and A. Dent, Socio-demographic and clinical characteristics of re-presentation to an Australian inner-city emergency department: implications for service delivery. *BMC Public Health*, 2007. **7**: p. 320.
148. Lee, S., S. Brunero, G. Fairbrother, and D. Cowan, Profiling police presentations of mental health consumers to an emergency department. *International Journal of Mental Health Nursing*, 2008. **17**(5): p. 311-316.
149. Shafiei, T., N. Gaynor, and G. Farrell, The characteristics, management and outcomes of people identified with mental health issues in an emergency department, Melbourne, Australia. *Journal of Psychiatric and Mental Health Nursing*, 2011. **18**(1): p. 9-16.
150. Cutler, D., M. Smith, T. Wand, T. Green, M. Dinh, and R. Gribble, Involuntary admissions under the Mental Health Act 2007 (New South Wales): a comparison of patients detained by ambulance officers, medical practitioners and accredited persons in an emergency department. *Emergency Medicine Australasia*, 2013. **25**(6): p. 544-549.

151. Alarcon Manchego, P., J. Knott, A. Graudins, B. Bartley, and B. Mitra, Management of mental health patients in Victorian emergency departments: A 10 year follow-up study. *Emergency Medicine Australasia*, 2015. **27**(6): p. 529-536.
152. Enticott, J.C., I.H. Cheng, G. Russell, J. Szwarc, G. Braitberg, A. Peek, and G. Meadows, Emergency department mental health presentations by people born in refugee source countries: an epidemiological logistic regression study in a Medicare Local region in Australia. *Australian Journal of Primary Health*, 2015. **21**(3): p. 286-292.
153. Eric Jarvis, G., L.J. Kirmayer, G.K. Jarvis, and R. Whitley, The role of Afro-Canadian status in police or ambulance referral to emergency psychiatric services. *Psychiatric Services*, 2005. **56**(6): p. 705-710.
154. Clarke, D.E., A.M. Brown, L. Hughes, and L. Motluk, Education to improve the triage of mental health patients in general hospital emergency departments. *Accident and Emergency Nursing*, 2006. **14**(4): p. 210-218.
155. Kennedy, A., P. Cloutier, J.E. Glennie, and C. Gray, Establishing best practice in pediatric emergency mental health: a prospective study examining clinical characteristics. *Pediatric Emergency Care*, 2009. **25**(6): p. 380-386.
156. Newton, A.S., S. Ali, D.W. Johnson, C. Haines, R.J. Rosychuk, R.A. Keaschuk, P. Jacobs, and T.P. Klassen, A 4-year review of pediatric mental health emergencies in Alberta. *Canadian Journal of Emergency Medicine*, 2009. **11**(5): p. 447-454.
157. Ali, S., R.J. Rosychuk, K.A. Dong, P.J. McGrath, and A.S. Newton, Temporal trends in pediatric mental health visits: using longitudinal data to

- inform emergency department health care planning. *Pediatric Emergency Care*, 2012. **28**(7): p. 620-625.
158. Cappelli, M., J.E. Glennie, P. Cloutier, A. Kennedy, M. Vloet, A. Newton, R. Zemek, and C. Gray, Physician management of pediatric mental health patients in the emergency department: assessment, charting, and disposition. *Pediatric Emergency Care*, 2012. **28**(9): p. 835-841.
159. Bruffaerts, R., M. Sabbe, and K. Demyttenaere, Attenders of a university hospital psychiatric emergency service in Belgium - general characteristics and gender differences. *Social Psychiatry and Psychiatric Epidemiology*, 2004. **39**(2): p. 146-153.
160. Bruffaerts, R., M. Sabbe, and K. Demyttenaere, Who visits the psychiatric emergency room for the first time? *Social Psychiatry and Psychiatric Epidemiology*, 2006. **41**(7): p. 580-586.
161. Hislop, L., P.T. Grant, and I. Smith, Acute psychiatric problems in an A&E Department. *Health Bulletin*, 1996. **54**(2): p. 158-162.
162. Keene, J. and J. Rodriguez, Are mental health problems associated with use of Accident and Emergency and health-related harm? *European Journal of Public Health*, 2007. **17**(4): p. 387-393.
163. Kropp, S., C. Andreis, B. te Wildt, U. Reulbach, M. Ohlmeier, I. Auffarth, and M. Ziegenbein, Psychiatric patients turnaround times in the emergency department. *Clinical Practice and Epidemiology in Mental Health*, 2005. **1**: p. 27.
164. Nexoe, J., J.P. Wilche, B. Niclasen, A.B. Kjeldsen, C. Faergemann, A. Munck, and J.M. Lauritsen, Violence- and alcohol-related acute healthcare

- visits in Greenland. *Scandinavian Journal of Public Health*, 2013. **41**(2): p. 113-118.
165. Saliou, V., A. Fichelle, M. McLoughlin, I. Thauvin, and M. Lejoyeux, Psychiatric disorders among patients admitted to a French medical emergency service. *General Hospital Psychiatry*, 2005. **27**(4): p. 263-268.
166. Zeppegno, P., C. Gramaglia, L.M. Castello, F. Bert, M.R. Gualano, F. Ressico, I. Coppola, G.C. Avanzi, R. Siliquini, and E. Torre, Suicide attempts and emergency room psychiatric consultation. *BMC Psychiatry*, 2015. **15**: p. 13.
167. Padilha, V.M., C.S. Schettini, A. Santos Junior, and R.C. Azevedo, Profile of patients attended as psychiatric emergencies at a university general hospital. *Sao Paulo Medical Journal*, 2013. **131**(6): p. 398-404.
168. Adityanjee, D. Mohan, and N.N. Wig, Determinants of emergency room visits for psychological problems in a general hospital. *International Journal of Social Psychiatry*, 1988. **34**(1): p. 25-30.
169. Chan, C.M., M.Y. Wong, S.L. Chan, M.Y. Wan, and Y.F. Mo, The efficacy of emergency medicine ward for the management of patients with mental disorders. *Hong Kong Journal of Emergency Medicine*, 2009. **16**(4): p. 217-223.
170. Nishi, D., Y. Matsuoka, E. Kawase, S. Nakajima, and Y. Kim, Mental health service requirements in a Japanese medical centre emergency department. *Emergency Medicine Journal*, 2006. **23**(6): p. 468-469.
171. Chen, C.K., T.Y. Wang, and W.S. Wang, Demographic and clinical characteristics of users of psychiatric emergency services on an off-shore

- island in Taiwan. *International Journal of Psychiatry in Clinical Practice*, 2010. **14**(3): p. 168-173.
172. Kannan, V.C., C.N. Andriamalala, and T.A. Reynolds, The burden of acute disease in Mahajanga, Madagascar - a 21 month study. *PLoS One*, 2015. **10**(3): p. e0119029.
173. Jolfaei, A.G., M.N. Isfahani, and F. Shoyookhi, Characteristics of psychiatric visits to the emergency department of Rasoul-e-Akram Hospital, Tehran, Iran. *Iranian Journal of Psychiatry and Behavioral Sciences*, 2012. **6**(2): p. 42-47.
174. Capp, R. and J. Wiler, National trends in adult emergency department visits with mental health disorders. *Academic Emergency Medicine*, 2015. **1**: p. S186-S187.
175. Centers for Disease Control and Prevention. *Ambulatory Health Care Data*. 2009. [updated: 14/07/2009]; [cited: 2016]; Available from URL: https://www.cdc.gov/nchs/ahcd/nhamcs_participant.htm.
176. The Rural Health Information Hub. *Critical Access Hospitals (CAHs)*. 2015. [updated: 4/8/2015]; [cited: 2016]; Available from URL: <https://www.ruralhealthinfo.org/topics/critical-access-hospitals>.
177. Agency for Healthcare Research and Quality. *Healthcare Cost and Utilization Project (HCUP)*. 2015. [updated: 2016]; [cited: 2016]; Available from URL: <http://www.ahrq.gov/research/data/hcup/index.html>.
178. Larsen, P.O. and M. von Ins, The rate of growth in scientific publication and the decline in coverage provided by Science Citation Index. *Scientometrics*, 2010. **84**(3): p. 575-603.

-
179. Semrau, M., E.A. Barley, A. Law, and G. Thornicroft, Lessons learned in developing community mental health care in Europe. *World Psychiatry*, 2011. **10**(3): p. 217-225.
 180. Hewlett, E. and V. Moran, *Making Mental Health Count*. 2014.
 181. Riumallo-Herl, C., S. Basu, D. Stuckler, E. Courtin, and M. Avendano, Job loss, wealth and depression during the Great Recession in the USA and Europe. *International Journal of Epidemiology*, 2014. **43**(5): p. 1508-1517.
 182. De Vogli, R., M. Marmot, and D. Stuckler, Excess suicides and attempted suicides in Italy attributable to the great recession. *Journal of Epidemiology and Community Health*, 2013. **67**(4): p. 378-379.
 183. Reeves, A., M. McKee, and D. Stuckler, Economic suicides in the Great Recession in Europe and North America. *The British Journal of Psychiatry*, 2014. **205**(3): p. 246-247.
 184. Bor, J., S. Basu, A. Coutts, M. McKee, and D. Stuckler, Alcohol use during the great recession of 2008-2009. *Alcohol Alcohol*, 2013. **48**(3): p. 343-348.
 185. Oyewumi, L.K., O. Odejide, and S.S. Kazarian, Psychiatric emergency services in a Canadian city: II. Clinical characteristics and patients' disposition. *Canadian Journal of Psychiatry*, 1992. **37**(2): p. 96-99.
 186. Currier, G.W. and M. Allen, Organization and function of academic psychiatric emergency services. *General Hospital Psychiatry*, 2003. **25**(2): p. 124-129.
 187. Cronholm, P.F., F.K. Barg, M.E. Pailler, M.B. Wintersteen, G.S. Diamond, and J.A. Fein, Adolescent depression: views of health care providers in a pediatric emergency department. *Pediatric Emergency Care*, 2010. **26**(2): p. 111-117.

-
188. Drake, R.E. and E. Latimer, Lessons learned in developing community mental health care in North America. *World Psychiatry*, 2012. **11**(1): p. 47-51.
 189. McGeorge, P., Lessons learned in developing community mental health care in Australasia and the South Pacific. *World Psychiatry*, 2012. **11**(2): p. 129-132.
 190. Organisation for Economic Co-operation and Development (OECD), Hospital beds (indicator). 2017, OECD.
 191. Department of Health and Ageing - Australian Government, *National Mental Health Report 2013: tracking progress of mental health reform in Australia 1993 – 2011*. 2013, Canberra: Commonwealth of Australia.
 192. Redick, R.W., M.J. Witkin, J.E. Atay, and R.W. Manderscheid, CMHS data highlights on: availability of psychiatric beds, United States: selected years, 1970-1990. *Mental Health Statistical Note*, 1994(213): p. 1-7.
 193. Manderscheid, R.W., M.J. Henderson, M.J. Witkin, and J.E. Atay, The U.S. mental health system of the 1990s. The challenges of managed care. *International Journal of Law and Psychiatry*, 2000. **23**(3-4): p. 245-259.
 194. ABS, *Australian Demographic Statistics: December Quarter 2010. Cat No 3101.0*. Australian Demographic Statistics 2011, Canberra, ACT, Australia: ABS.
 195. ABS, *Australian Demographic Statistics: March Quarter 2017. cat. no. 3101.0*. Australian Demographic Statistics 2017, Canberra, ACT, Australia: ABS.

196. Murphy, J.G., G.S. Fenichel, and S. Jacobson, Psychiatry in the emergency department: factors associated with treatment and disposition. *American Journal of Emergency Medicine*, 1984. **2**(4): p. 309-314.
197. Lyons, A. *Australia's health system still failing people with acute mental health needs: Report*. 2018. [cited: 2019]; Available from URL: <https://www1.racgp.org.au/news/p/professional/australia%E2%80%99s-health-system-still-failing-people-wit>.
198. Gottlieb, M., B. Long, and A. Koyfman, Approach to the Agitated Emergency Department Patient. *Journal of Emergency Medicine*, 2018. **54**(4): p. 447-457.
199. AIHW, *Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2011*. *Australian Burden of Disease Study series no. 3. BOD 4*. 2016, Canberra, ACT, Australia: AIHW.
200. Department of Health and Ageing, *Report on the Audit of Health Workforce in Rural and Regional Australia, April 2008*. 2008, Canberra, ACT, Australia: Commonwealth of Australia.
201. He, J., X.Y. Hou, S. Toloo, J.R. Patrick, and G. Fitz Gerald, Demand for hospital emergency departments: a conceptual understanding. *World Journal of Emergency Medicine*, 2011. **2**(4): p. 253-261.
202. Council of Australian Governments (COAG), *The National Health Reform Agreement- National Partnership Agreement on Improving Public Hospital Services*. 2011, Canberra, ACT, Australia: COAG.
203. Staib, A., C. Sullivan, B. Griffin, A. Bell, and I. Scott, Report on the 4-h rule and National Emergency Access Target (NEAT) in Australia: time to review. *Australian Health Review*, 2016. **40**(3): p. 319-323.

-
204. Dinh, M.M., S. Berendsen Russell, K.J. Bein, D. Chalkley, D. Muscatello, R. Paoloni, and R. Ivers, Understanding drivers of Demand for Emergency Service Trends in Years 2010-2014 in New South Wales: An initial overview of the DESTINY project. *Emergency Medicine Australasia*, 2016. **28**(2): p. 179-186.
205. Lowthian, J.A., A.J. Curtis, D.J. Jolley, J.U. Stoelwinder, J.J. McNeil, and P.A. Cameron, Demand at the emergency department front door: 10-year trends in presentations. *The Medical Journal of Australia*, 2012. **196**: p. 128-132.
206. Tran, Q.N., L.G. Lambeth, K. Sanderson, B. de Graaff, M. Breslin, V. Tran, E.J. Huckerby, and A.L. Neil, Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: A secondary data analysis. *Emergency Medicine Australasia*, 2019. **31**(6): p. 1064-1072.
207. Burkett, E., M.G. Martin-Khan, J. Scott, M. Samanta, and L.C. Gray, Trends and predicted trends in presentations of older people to Australian emergency departments: effects of demand growth, population aging and climate change. *Australian Health Review*, 2017. **41**(3): p. 246-253.
208. Thomas, D.P., I.P. Anderson, and M.A. Kelaher, Accessibility and quality of care received in emergency departments by Aboriginal and Torres Strait Islander people. *Australian Health Review*, 2008. **32**(4): p. 648-654.
209. Tran, Q.N., L.G. Lambeth, K. Sanderson, B. de Graaff, M. Breslin, E.J. Huckerby, V. Tran, and A.L. Neil, Trend of emergency department presentations with a mental health diagnosis in Australia by diagnostic group,

- 2004-05 to 2016-17. *Emergency Medicine Australasia*, 2020. **32**(2): p. 190-201.
210. New South Wales (NSW) Department of Health. *SNOMED CT within the NSW Public Health System*. Information Bulletin 2008. [cited: 2019]; Available from URL: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/IB2008_043.pdf.
211. Dinh, M.M., S. Berendsen Russell, and K.J. Bein, Diagnoses, damned diagnoses and statistics: Dealing with disparate diagnostic coding systems within the New South Wales Emergency Department Data Collection. *Emergency Medicine Australasia*, 2019. **31**(5): p. 830-836.
212. Skinner, H.G., J. Blanchard, and A. Elixhauser, Trends in Emergency Department Visits, 2006–2011. *Statistical Brief*, 2014. **179**.
213. Moore, B.J., C. Stocks, and P.L. Owens, Trends in Emergency Department Visits, 2006–2014. *Statistical Brief*, 2017. **227**.
214. Lowthian, J.A., A.J. Curtis, P.A. Cameron, J.U. Stoelwinder, M.W. Cooke, and J.J. McNeil, Systematic review of trends in emergency department attendances: an Australian perspective. *Emergency Medicine Journal*, 2011. **28**(5): p. 373-377.
215. Culhane, A., B.W. Patterson, J. Birstler, C. Longhurst, and M.K. Kim, Trends in pediatric patients presenting to the emergency department with mental health complaints. *Academic Emergency Medicine*, 2017. **24**: p. S125.
216. Gill, P.J., N. Saunders, S. Gandhi, A. Gonzalez, P. Kurdyak, S. Vigod, and A. Guttman, Emergency Department as a First Contact for Mental Health Problems in Children and Youth. *Journal of the American Academy of Child and Adolescent Psychiatry*, 2017. **56**(6): p. 475-482.e474.

-
217. Sawyer, S.M. and G.C. Patton, Why are so many more adolescents presenting to our emergency departments with mental health problems? *The Medical Journal of Australia*, 2018. **208**(8): p. 339-340.
218. ABS, *Australian Demographic Statistics: December Quarter 2017. Cat No 3101.0*. Australian Demographic Statistics 2018, Canberra, ACT, Australia: ABS.
219. Lawrence, D., S. Johnson, J. Hafekost, K.B.d. Haan, M. Sawyer, J. Ainley, and S.R. Zubrick, *The Mental Health of Children and Adolescents. Report on the second Australian Child and Adolescent Survey of Mental Health and Wellbeing*. 2015, Canberra, ACT, Australia: Department of Health.
220. Mitchell, R.J., M.R. Bambach, D. Muscatello, K. McKenzie, and Z.J. Balogh, Can SNOMED CT as implemented in New South Wales, Australia be used for road trauma injury surveillance in emergency departments? *Health Information Management Journal*, 2013. **42**(2): p. 4-8.
221. Rui, P., K. Kang, and J. Ashman, *National Hospital Ambulatory Medical Care Survey: 2016 emergency department summary tables*. 2016.
222. Tran, Q.N., L.G. Lambeth, K. Sanderson, B. de Graaff, M. Breslin, V. Tran, E.J. Huckerby, and A.L. Neil, Emergency department presentations with a mental health diagnosis in Australia, by jurisdiction and by sex, 2004-05 to 2016-17. *Emergency Medicine Australasia*, 2020. **32**(3): p. 383-392.
223. AIHW, *National Drug Strategy Household Survey 2016 - Supplementary data tables. Drug Statistics series no. 31. Cat. no. PHE 214*. 2017, Canberra, ACT, Australia: AIHW.
-

-
224. Australian Criminal Intelligence Commission (ACIC), *National Wastewater Drug Monitoring Program—Report 6, December 2018*. 2019, Canberra, ACT, Australia: ACIC.
225. Jones, R., C. Woods, and K. Usher, Rates and features of methamphetamine-related presentations to emergency departments: An integrative literature review. *Journal of Clinical Nursing*, 2018. **27**(13-14): p. 2569-2582.
226. Roxburgh, A. and L. Burns, Drug-related hospital stays in Australia, 1993-2012. 2013, Sydney, NSW, Australia: National Drug and Alcohol Research Centre.
227. Oliver, M., A.A. Adonopulos, P.S. Haber, M.M. Dinh, T. Green, T. Wand, A. Vitte, and D. Chalkley, Impact of acutely behavioural disturbed patients in the emergency department: A prospective observational study. *Emergency Medicine Australasia*, 2019. **31**(3): p. 387-392.
228. Gale, M., D.J. Muscatello, M. Dinh, J. Byrnes, A. Shakeshaft, A. Hayen, C.R. MacIntyre, P. Haber, M. Cretikos, and P. Morton, Alcopops, taxation and harm: a segmented time series analysis of emergency department presentations. *BMC Public Health*, 2015. **15**(1): p. 468.
229. Kisely, S. and D. Lawrence, A time series analysis of alcohol-related presentations to emergency departments in Queensland following the increase in alcopops tax. *Journal of Epidemiology and Community Health*, 2016. **70**(2): p. 181-186.
230. NSW Ministry of Health, *Crystalline Methamphetamine: Key Messages*. 2016, Sydney, NSW, Australia: NSW Ministry of Health.
231. Johnston, A.N., M. Spencer, M. Wallis, S.A. Kinner, M. Broadbent, J.T. Young, E. Heffernan, G. Fitzgerald, E. Bosley, G. Keijzers, P. Scuffham, P.
-

- Zhang, M. Martin-Khan, and J. Crilly, Review article: Interventions for people presenting to emergency departments with a mental health problem: A systematic scoping review. *Emergency Medicine Australasia*, 2019. **31**(5): p. 715-729.
232. Jones, R., C. Woods, R. Barker, and K. Usher, Patterns and features of methamphetamine-related presentations to emergency departments in QLD from 2005 to 2017. *International Journal of Mental Health Nursing*, 2019. **28**(4): p. 833-844.
233. Jones, R., K. Usher, and C. Woods, Crystal methamphetamine's impact on frontline emergency services in Victoria, Australia. *Australasian Emergency Care*, 2019. **22**(4): p. 201-205.
234. Spillane, I.M., D. Krieser, S. Dalton, L. Heinrich, and F.E. Babl, Limitations to diagnostic coding accuracy in emergency departments: implications for research and audits of care. *Emergency Medicine Australasia*, 2010. **22**(1): p. 91-92.
235. NSW Ministry of Health, Emergency Department Data Collection, Center for Health Record Linkage, Editor. 2017, Sydney, NSW, Australia: NSW Ministry of Health.
236. Burgess, P.M., J.E. Pirkis, T.N. Slade, A.K. Johnston, G.N. Meadows, and J.M. Gunn, Service use for mental health problems: findings from the 2007 National Survey of Mental Health and Wellbeing. *Australian and New Zealand Journal of Psychiatry*, 2009. **43**(7): p. 615-623.
237. Vasiliadis, H.M. and A. Dezetter, [Publicly funded programs of psychotherapy in Australia and England]. *Sante Mentale Au Quebec*, 2015. **40**(4): p. 101-118.

-
238. Jorm, A.F., S.B. Patten, T.S. Brugha, and R. Mojtabai, Has increased provision of treatment reduced the prevalence of common mental disorders? Review of the evidence from four countries. *World Psychiatry*, 2017. **16**(1): p. 90-99.
239. Stephenson, C.P., E. Karanges, and I.S. McGregor, Trends in the utilisation of psychotropic medications in Australia from 2000 to 2011. *Australian and New Zealand Journal of Psychiatry*, 2013. **47**(1): p. 74-87.
240. Whiteford, H.A., W.J. Buckingham, M.G. Harris, P.M. Burgess, J.E. Pirkis, J.J. Barendregt, and W.D. Hall, Estimating treatment rates for mental disorders in Australia. *Australian Health Review*, 2014. **38**(1): p. 80-85.
241. Tran, Q.N., L.G. Lambeth, K. Sanderson, B. de Graaff, M. Breslin, V. Tran, E.J. Huckerby, and A.L. Neil, Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: A secondary data analysis. *Emergency Medicine Australasia*, 2019.
242. McCaig, L. and N. Ly, National Hospital Ambulatory Medical Care Survey: 2000 Emergency Department Summary. *Advance Data*, 2002. **326**.
243. Lawton, L.D., S. Thomas, and D.G. Morel, Trends in access block 2011 to 2013: the Redcliffe National Emergency Access Target experience. *Emergency Medicine Australasia*, 2015. **27**(1): p. 11-15.
244. Cooper, E. *Shortage of acute beds in Tasmania a 'crisis', mental health expert says*. 2018. Available from URL: <https://www.abc.net.au/news/2018-09-19/mental-health-beds-breakdown-for-tasmania/10267362>.
245. ABS, *Causes of Death: 2008. Cat No 3303.0*. Causes of Death. 2010, Canberra, ACT, Australia: ABS.
-

-
246. Department of Health, *Commonwealth response to The Hidden Toll: Suicide in Australia Report of the Senate Community Affairs Reference Committee*. 2010, Canberra, ACT, Australia: Commonwealth of Australia.
247. AIHW. *Suicide & self-harm monitoring*. 2020. [updated: 06/11/2020]]; Available from URL: <https://www.aihw.gov.au/suicide-self-harm-monitoring>.
248. ACEM, Position Statement ED overcrowding. 2020, ACEM.
249. Productivity Commission, *Mental Health, Report no. 95*. Vol. 2. 2020, Canberra, ACT, Australia: Commonwealth of Australia.
250. Santillanes, G., S. Axeen, C.N. Lam, and M. Menchine, National trends in mental health-related emergency department visits by children and adults, 2009-2015. *American Journal of Emergency Medicine*, 2020. **38**(12): p. 2536-2544.
251. Hooker, E.A., P.J. Mallow, and M.M. Oglesby, Characteristics and Trends of Emergency Department Visits in the United States (2010-2014). *Journal of Emergency Medicine*, 2019. **56**(3): p. 344-351.
252. Cutler, G.J., J. Rodean, B.T. Zima, S.K. Doupnik, A.L. Zagel, K.R. Bergmann, J.A. Hoffmann, and M.I. Neuman, Trends in Pediatric Emergency Department Visits for Mental Health Conditions and Disposition by Presence of a Psychiatric Unit. *Academic Pediatrics*, 2019. **19**(8): p. 948-955.
253. Kalb, L.G., E.K. Stapp, E.D. Ballard, C. Holingue, A. Keefer, and A. Riley, Trends in Psychiatric Emergency Department Visits Among Youth and Young Adults in the US. *Pediatrics*, 2019. **143**(4).
254. Capp, R., R. Hardy, R. Lindrooth, and J. Wiler, National Trends in Emergency Department Visits by Adults With Mental Health Disorders. *Journal of Emergency Medicine*, 2016. **51**(2): p. 131-135 e131.
-

-
255. Ng, S.V. and R.A. Rosenheck, Severe mental illness and emergency department service use nationally in the Veterans Health Administration. *General Hospital Psychiatry*, 2017. **44**: p. 61-66.
256. Zhu, J.M., A. Singhal, and R.Y. Hsia, Emergency Department Length-Of-Stay For Psychiatric Visits Was Significantly Longer Than For Nonpsychiatric Visits, 2002-11. *Health Affairs*, 2016. **35**(9): p. 1698-1706.
257. Dinh, M.M., S. Berendsen Russell, K.J. Bein, D. Chalkley, D. Muscatello, R. Paoloni, and R. Ivers, Trends and characteristics of short-term and frequent representations to emergency departments: A population-based study from New South Wales, Australia. *Emergency Medicine Australasia*, 2016. **28**(3): p. 307-312.
258. Coates, D., M. David, B. Roberts, and D. Duerden, An examination of the profile and journey of patients with mental illness in the emergency department. *International Emergency Nursing*, 2019. **43**: p. 15-22.
259. AIHW. *About us*. [updated: 22/07/2020]; [cited: 2020]; Available from URL: <https://www.aihw.gov.au/about-us>.
260. Pandya, A., G.L. Larkin, R. Randles, A.L. Beautrais, and R.P. Smith, Epidemiological trends in psychosis-related Emergency Department visits in the United States, 1992-2001. *Schizophrenia Research*, 2009. **110**(1-3): p. 28-32.
261. Larkin, G.L., R.P. Smith, and A.L. Beautrais, Trends in US emergency department visits for suicide attempts, 1992-2001. *Crisis*, 2008. **29**(2): p. 73-80.
-

-
262. Smith, R.P., G.L. Larkin, and S.M. Southwick, Trends in U.S. emergency department visits for anxiety-related mental health conditions, 1992-2001. *Journal of Clinical Psychiatry*, 2008. **69**(2): p. 286-294.
263. Hazlett, S.B., M.L. McCarthy, M.S. Londner, and C.U. Onyike, Epidemiology of adult psychiatric visits to US emergency departments. *Academic Emergency Medicine*, 2004. **11**(2): p. 193-195.
264. Newton, A.S., R.J. Rosychuk, K. Dong, J. Curran, M. Slomp, and P.J. McGrath, Emergency health care use and follow-up among sociodemographic groups of children who visit emergency departments for mental health crises. *Canadian Medical Association Journal*, 2012. **184**(12): p. E665-674.
265. Newton, A.S., S. Ali, D.W. Johnson, C. Haines, R.J. Rosychuk, R.A. Keaschuk, P. Jacobs, M. Cappelli, and T.P. Klassen, Who comes back? Characteristics and predictors of return to emergency department services for pediatric mental health care. *Academic Emergency Medicine*, 2010. **17**(2): p. 177-186.

Appendices

Appendix 1: Metadata items in the NNAPEDCD

METOR identifier	Metadata item	Started Ended	Code (format) and values	Obligations	Max occurs	Definition
	Patient's characteristics					
270100	Patient—compensable status	2004-05 2016-17	N (1 = “Compensable”; 2 = “Non-compensable”; 9 = “Not stated/not known”)	Mandatory	1	Whether or not a patient is a compensable patient
429894	Address—Australian postcode, Australian postcode code (Postcode datafile)	2013-14 2016-17	NNNN	Mandatory	1	The Australian numeric descriptor for a postal delivery area for an address.
270070	Person—area of usual residence, geographical location code (ASGC 2004)	2004-05 2005-06	NNNNN	Mandatory	1	Geographical location of usual residence of the person
329147	Person—area of usual residence, geographical location code (ASGC 2005)	2006-07 2006-07	NNNNN	Mandatory	1	Geographical location of usual residence of the person
341800	Person—area of usual residence, geographical location code (ASGC 2006)	2007-08 2007-08	NNNNN	Mandatory	1	Geographical location of usual residence of the person
362291	Person—area of usual residence, geographical location code (ASGC 2007)	2008-09 2009-10	NNNNN	Mandatory	1	Geographical location of usual residence of the person
386783	Person—area of usual residence, geographical location code (ASGC 2009)	2010-11 2010-11	NNNNN	Mandatory	1	Geographical location of usual residence of the person
426285	Person—area of usual residence, geographical location code (ASGC 2010)	2011-12 2011-12	NNNNN	Mandatory	1	Geographical location of usual residence of the person
455536	Person—area of usual residence, geographical location code (ASGC 2011)	2012-13 2012-13	NNNNN	Mandatory	1	Geographical location of usual residence of the person
469909	Person—area of usual residence, statistical area level 2 (SA2) code (ASGS 2011)	2012-13 2016-17	N(9)	Mandatory	1	The geographical region in which a person or group of people usually reside
270277	Person—country of birth, code (SACC 1998)	2004-05 2009-10	NNNN	Conditional	1	The country in which the person was born
370943	Person—country of birth, code (SACC 2008)	2010-11 2011-12	NNNN	Conditional	1	The country in which the person was born

459973	Person—country of birth, code (SACC 2011)	2012-13 2016-17	NNNN	Mandatory	1	The country in which the person was born
287007	Person—date of birth	2004-05 2016-17	DDMMYYYY	Mandatory	1	The date of birth of the person
291036	Person—Indigenous status	2004-05 2015-16	N (1 = “Aboriginal but not Torres Strait Islander origin”; 2 = “Torres Strait Islander but not Aboriginal origin”; 3 = “Both Aboriginal and Torres Strait Islander origin”; 4 = “Neither Aboriginal nor Torres Strait Islander origin”; 9 = “Not stated/inadequately described”)	Mandatory	1	Whether a person identifies as being of Aboriginal or Torres Strait Islander origin. This is in accord with the first two of three components of the Commonwealth definition
602543	Person—Indigenous status	2016-17 2016-17	N (1 = “Aboriginal but not Torres Strait Islander origin”; 2 = “Torres Strait Islander but not Aboriginal origin”; 3 = “Both Aboriginal and Torres Strait Islander origin”; 4 = “Neither Aboriginal nor Torres Strait Islander origin”; 9 = “Not stated/inadequately described”)	Mandatory	1	Whether a person identifies as being of Aboriginal or Torres Strait Islander origin. This is in accord with the first two of three components of the Commonwealth definition
290046	Person—person identifier	2004-05 2016-17	XXXXXX[X(14)]	Mandatory	1	Person identifier unique within an establishment or agency
287316	Person—sex	2004-05 2016-17	N (1 = “Male”; 2 = “Female”; 3 = “Intersex or indeterminate”; 9 = “Not stated/inadequately described”)	Mandatory	1	The biological distinction between male and female
555463	Record—identifier	2014-15	X[X(79)]	Mandatory	1	A record identifier that is unique to the reporting body
270092	Episode of care—funding eligibility indicator (Department of Veterans' Affairs)	2004-05 2016-17	N (1 = “Yes”; 2 = “No”)	Mandatory (Conditional since 2010-11)	1	Whether an eligible person's charges for this hospital admission are met by the Department of Veterans' Affairs (DVA)
269973	Establishment—organisation identifier (Australian)	2004-05 2016-17	NNX[X]NNNNN	Mandatory	1	The identifier for the establishment in which episode or event occurred. Each separately administered health care establishment to have a unique identifier at the national level.
	ED presentations data					
	<i>Presentation date and time</i>					
270393	Health service event—presentation date	2004-05 2005-06	DDMMYYYY	Mandatory	1	The date on which the patient/client presents for the delivery of a service.
270080	Health service event—presentation time	2004-05 2005-06	hhmm	Mandatory	1	The time at which the patient presents for the delivery of a service.
313801	Non-admitted patient ED service episode—service commencement date	2005-06 2009-10	DDMMYYYY	Mandatory	1	The date on which a non-admitted patient ED service event commences.
390398	Non-admitted patient ED service episode—service commencement date	2010-11 2011-12	DDMMYYYY	Mandatory	1	The date on which a non-admitted patient ED service event commences

313806	Non-admitted patient ED service episode—service commencement time	2005-06 2009-10	hhmm	Mandatory	1	The time at which a non-admitted patient ED service event commences.
390401	Non-admitted patient ED service episode—service commencement time	2010-11 2011-12	hhmm	Mandatory	1	The time at which a non-admitted patient ED service event commences
471886	ED stay – presentation date	2012-13 2016-17	DDMMYYYY	Mandatory	1	The date on which the patient/client presents for the delivery of an emergency department service
471889	ED stay – presentation time	2012-13 2016-17	hhmm	Mandatory	1	The time at which the patient presents for the delivery of an emergency department service
474116	Non-admitted patient ED service episode—clinical care commencement date	2012-13 2015-16	DDMMYYYY	Conditional	1	The date on which ED non-admitted clinical care commences
621842	Non-admitted patient ED service episode—clinical care commencement date	2016-17 2016-17	DDMMYYYY	Conditional	1	The date on which ED non-admitted clinical care commences
474118	Non-admitted patient ED service episode—clinical care commencement time	2012-13 2015-16	hhmm	Conditional	1	The time at which emergency department non-admitted clinical care commences
621847	Non-admitted patient ED service episode—clinical care commencement time	2016-17 2016-17	hhmm	Conditional	1	The time at which emergency department non-admitted clinical care commences
	<i>Episode end date and time</i>					
474138	Non-admitted patient ED service episode—episode end date	2012-13 2015-16	DDMMYYYY	Mandatory	1	The date on which the non-admitted patient emergency department service episode ends
621850	Non-admitted patient ED service episode—episode end date	2016-17 2016-17	DDMMYYYY	Mandatory	1	The date on which the non-admitted patient emergency department service episode ends
322621	Non-admitted patient ED service episode—episode end time	2006-07 2010-11	hhmm	Mandatory	1	The time at which the non-admitted patient ED service episode ends.
471904	Non-admitted patient ED service episode—episode end time	2011-12 2011-12	hhmm	Mandatory	1	The time at which the non-admitted patient ED service episode ends.

474169	Non-admitted patient ED service episode—episode end time	2012-13 2015-16	hhmm	Mandatory	1	The time at which the non-admitted patient ED service episode ends.
621853	Non-admitted patient ED service episode—episode end time	2016-17 2016-17	hhmm	Mandatory	1	The time at which the non-admitted patient ED service episode ends.
270404	Non-admitted patient ED service episode—service episode length, total minutes	2004-05 2010-11	NNNNN	Mandatory	1	The amount of time, measured in minutes, between when a patient presents at an ED for an ED service episode, and when the non-admitted component of the ED service episode has concluded.
472820	Non-admitted patient ED service episode—service episode length, total minutes	2011-12 2011-12	NNNNN	Mandatory	1	The amount of time, measured in minutes, between when a patient presents at an ED, and when the non-admitted ED service episode has concluded.
474181	Non-admitted patient ED service episode—service episode length, total minutes	2012-13 2016-17	NNNNN	Mandatory	1	The amount of time, measured in minutes, between when a patient presents at an ED, and when the non-admitted ED service episode has concluded.
322597	ED stay—physical departure date	2005-06 2011-12	DDMMYYYY	Mandatory	1	The date on which a patient departs an ED after a stay.
474436	ED stay—physical departure date	2012-13 2015-16	DDMMYYYY	Mandatory	1	The date on which a patient departs an ED after a stay.
621816	ED stay—physical departure date	2016-17 2016-17	DDMMYYYY	Mandatory	1	The date on which a patient departs an ED after a stay.
322610	ED stay—physical departure time	2005-06 2011-12	hhmm	Mandatory	1	The time at which a patient departs an ED after a stay.
474438	ED stay—physical departure time	2012-13 2015-16	hhmm	Mandatory	1	The time at which a patient departs an ED after a stay.
621829	ED stay—physical departure time	2016-17 2016-17	hhmm	Mandatory	1	The time at which a patient departs an ED after a stay.
	Diagnosis					
497496	ED stay—diagnosis classification type	2013-14 2014-15	N.N (1.0 = “SNOMED-CT-AU (EDRS)”; 2.0 = “ICD-9-CM, 2nd edition”; 3.6 = “ICD-10-AM, 6th edition”; 3.7 = “ICD-10-AM, 7th edition”; 3.8 = “ICD-10-AM, 8th edition”; 3.9 = “ICD-10-AM, 9th edition”; 9.0 = “No diagnosis classification provided”)	Conditional	1	The type of classification used for recording emergency department diagnosis
590662	ED stay—diagnosis classification type	2015-16 2016-17	N.N	Conditional	1	The type of classification used for recording emergency department diagnosis

			(1.0 = “SNOMED-CT-AU (EDRS)”; 2.0 = “ICD-9-CM, 2nd edition”; 3.6 = “ICD-10-AM, 6th edition”; 3.7 = “ICD-10-AM, 7th edition”; 3.8 = “ICD-10-AM, 8th edition”; 9.0 = “No diagnosis classification provided”)			
497490	ED stay—principal diagnosis	2013-14 2014-15	X[X(8)]	Conditional	1	The diagnosis established at the conclusion of the patient's attendance in an ED to be mainly responsible for occasioning the attendance following consideration of clinical assessment
590664	ED stay—principal diagnosis	2015-16 2016-17	X[X(8)]	Conditional	1	The diagnosis established at the conclusion of the patient's attendance in an ED to be mainly responsible for occasioning the attendance following consideration of clinical assessment
497490	ED stay—additional diagnosis	2013-14 2014-15	X[X(8)]	Conditional	2	The condition or complaint coexisting with the ED principal diagnosis during a patient's attendance to the ED, as represented by a code
590658	ED stay—additional diagnosis	2015-16 2016-17	X[X(8)]	Conditional	99	The condition or complaint coexisting with the ED principal diagnosis during a patient's attendance to the ED, as represented by a code
	<i>Urgency related group (URG)</i>					
449585	ED stay—URG major diagnostic block	2013-14 2013-14	N[AA] (1A = “Poisoning, comatose”; 1B = “Poisoning, conscious”; 1C = “Drug reaction”; 1D = “Alcohol/drug abuse and alcohol/drug induced mental disorders”; 2A = “Injury, multiple sites”; 2B = “Injury, single site, major”; 2Ba = “Injury, single site, minor”; 3A = “Circulatory system illness”; 3B = “Respiratory system illness”; 3C = “Digestive system illness”; 3D = “Urological illness”; 3E = “Neurological illness”; 3F = “Illness of the eyes”; 3G = “Illness of the ear, nose and throat”; 3H = “Musculoskeletal/connective tissue illness”; 3I = “Illness of skin, subcutaneous tissue, breast”; 3J = “Blood/immune system illness”; 3K = “Obstetric illness”; 3L = “Gynaecological illness”; 3M = “Male reproductive system illness”; 3N = “System infection/parasites”; 3O = “Illness of other and unknown systems”; 3P = “Newborn/neonate”; 3Q = “Hepatobiliary system illness”; 4 = “Psychiatric illness”; 5 = “Social problem”; 6 = “Other presentation”)	Mandatory	1	The urgency related group (URG) major diagnostic block category into which the patient's ED diagnosis is grouped
547612	ED stay—URG major diagnostic block	2014-15 2016-17	N[AA] (1A = “Poisoning”; 1C = “Drug reaction”; 1D = “Alcohol/drug abuse and alcohol/drug induced mental disorders”; 2A = “Injury, multiple sites”; 2B = “Injury, single site, major”; 2Ba = “Injury, single site, minor”; 3A = “Circulatory system illness”; 3B = “Respiratory system illness”; 3C = “Digestive system illness”; 3D = “Urological illness”; 3E = “Neurological illness”; 3F = “Illness of the eyes”; 3G = “Illness of the ear, nose and throat”; 3H = “Musculoskeletal/connective tissue illness”; 3I = “Illness of skin, subcutaneous tissue, breast”; 3J = “Blood/immune system illness”; 3K = “Obstetric illness”; 3L = “Gynaecological illness”; 3M = “Male reproductive system illness”; 3N = “System infection/parasites”; 3O = “Illness of	Mandatory	1	The urgency related group (URG) major diagnostic block category into which the patient's ED diagnosis is grouped

			other and unknown systems”; 3P = “Newborn/neonate”; 3Q = “Hepatobiliary system illness”; 3R = “Endocrine, nutritional and metabolic system illness”; 3S = “Allergy”; 4 = “Psychiatric illness”; 5 = “Social problem”; 6 = “Other presentation”; 9 = “Not stated/inadequately described”)			
498030	ED stay—URG (v1.3)	2013-14 2016-17	[X]N[N]	Mandatory	1	A patient classification scheme which provides a means of relating the number and types of patients treated in an ED
	Episode-end status <i>Departure status</i>					
270001	Non-admitted patient ED service episode—patient departure status	2004-05 2005-06	N (1 = “Admitted to this hospital (including to units or beds within the ED”); 2 = “Non-admitted patient ED service episode completed - departed without being admitted or referred to another hospital”; 3 = “Referred to another hospital for admission”; 4 = “Did not wait to be attended by a health care professional”; 5 = “Left at own risk after being attended by a health care professional but before the non-admitted patient ED service episode was completed”; 6 = “Died in ED as a non-admitted patient”; 7 = “Dead on arrival, not treated in ED”)	Mandatory	1	The status of the patient at the end of the non-admitted patient ED service episode
322641	Non-admitted patient ED service episode—episode end status	2006-07 2010-11	N (1 = “Admitted to this hospital (including to units or beds within the ED”); 2 = “Non-admitted patient ED service episode completed - departed without being admitted or referred to another hospital”; 3 = “Non-admitted patient ED service episode completed - referred to another hospital for admission”; 4 = “Did not wait to be attended by a health care professional”; 5 = “Left at own risk after being attended by a health care professional but before the non-admitted patient ED service episode was completed”; 6 = “Died in ED as a non-admitted patient”; 7 = “Dead on arrival, not treated in ED”)	Mandatory	1	The status of the patient at the end of the non-admitted patient ED service episode
471901	Non-admitted patient ED service episode—episode end status	2011-12 2011-12	N (1 = “Admitted to this hospital”; 2 = “Non-admitted patient ED service episode completed - departed without being admitted or referred to another hospital”; 3 = “Non-admitted patient ED service episode completed - referred to another hospital for admission”; 4 = “Did not wait to be attended by a health care professional”; 5 = “Left at own risk after being attended by a health care professional but before the non-admitted patient ED service episode was completed”; 6 = “Died in ED as a non-admitted patient”; 7 = “Dead on arrival, ED clinician certified the death of patient”)	Mandatory	1	The status of the patient at the end of the non-admitted patient ED service episode
474159	Non-admitted patient ED service episode—episode end status	2012-13 2015-16	N (1 = “Admitted to this hospital (either short stay unit, hospital-in-the-home or non-ED hospital ward”); 2 = “Non-admitted patient ED service episode completed - departed without being admitted or referred to another hospital”; 3 = “Non-admitted patient ED service episode completed - referred to another hospital for admission”; 4 = “Did not wait to be attended by a health care professional”; 5 = “Left at own risk after being attended by a health care professional but before the non-admitted patient ED service episode was completed”; 6 =	Mandatory	1	The status of the patient at the end of the non-admitted patient ED service episode

			“Died in ED as a non-admitted patient”; 7 = “Dead on arrival, ED clinician certified the death of patient”)			
616654	Non-admitted patient ED service episode—episode end status	2016-17 2016-17	N (1 = “Admitted to this hospital (either short stay unit, hospital-in-the-home or non-ED hospital ward)”; 2 = “Non-admitted patient ED service episode completed - departed without being admitted or referred to another hospital”; 3 = “Non-admitted patient ED service episode completed - referred to another hospital for admission”; 4 = “Did not wait to be attended by a health care professional”; 5 = “Left at own risk after being attended by a health care professional but before the non-admitted patient ED service episode was completed”; 6 = “Died in ED as a non-admitted patient”; 7 = “Dead on arrival, ED clinician certified the death of patient”; 8 = “Registered, advised of another health care service, and left the ED without being attended by a health care professional)	Mandatory	1	The status of the patient at the end of the non-admitted patient ED service episode
	<i>Transport mode (arrival)</i>					
270000	Non-admitted patient ED service episode—transport mode (arrival)	2004-05 2005-06	N (1 = “Ambulance, air ambulance or helicopter rescue service”; 2 = “Police/correctional services vehicle”; 8 = “Other”; 9 = “Not stated/unknown”)	Mandatory	1	The mode of transport by which the person arrives at the ED
471921	ED stay—transport mode (arrival)	2012-13 2016-17	N (1 = “Ambulance, air ambulance or helicopter rescue service”; 2 = “Police/correctional services vehicle”; 8 = “Other”; 9 = “Not stated/unknown”)	Mandatory	1	The mode of transport by which the person arrives at the ED
	<i>Triage date and time</i>					
313815	Non-admitted patient ED service episode—triage date	2005-06 2011-12	DDMMYYYY	Mandatory	1	The date on which the patient is triaged.
474189	Non-admitted patient ED service episode—triage date	2012-13 2016-17	DDMMYYYY	Conditional	1	The date on which the patient is triaged.
313817	Non-admitted patient ED service episode—triage time	2005-06 2011-12	hhmm	Mandatory	1	The time at which the patient is triaged
474193	Non-admitted patient ED service episode—triage time	2012-13 2016-17	hhmm	Conditional	1	The time at which the patient is triaged
	<i>Triage category</i>					
270078	Non-admitted patient ED service episode—triage category	2004-05 2005-06	N (1 = “Resuscitation: immediate, within seconds”; 2 = “Emergency: within 10 minutes”; 3 = “Urgent: within 30 minutes”; 4 = “Semi-urgent: within 60 minutes”; 5 = “Non-urgent: within 120 minutes”)	Mandatory	1	The urgency of the patient's need for medical and nursing care
390392	Non-admitted patient ED service episode—triage category	2010-11 2010-11	N (1 = “Resuscitation: immediate, within seconds”; 2 = “Emergency: within 10 minutes”; 3 = “Urgent: within 30 minutes”; 4 = “Semi-urgent: within 60 minutes”; 5 = “Non-urgent: within 120 minutes”)	Mandatory	1	The urgency of the patient's need for medical and nursing care as assessed at triage

471926	Non-admitted patient ED service episode—triage category	2011-12 2011-12	N (1 = “Resuscitation: immediate, within seconds”; 2 = “Emergency: within 10 minutes”; 3 = “Urgent: within 30 minutes”; 4 = “Semi-urgent: within 60 minutes”; 5 = “Non-urgent: within 120 minutes”)	Mandatory	1	The urgency of the patient's need for medical and nursing care as assessed at triage
474185	Non-admitted patient ED service episode—triage category	2012-13 2016-17	N (1 = “Resuscitation: immediate, within seconds”; 2 = “Emergency: within 10 minutes”; 3 = “Urgent: within 30 minutes”; 4 = “Semi-urgent: within 60 minutes”; 5 = “Non-urgent: within 120 minutes”)	Conditional	1	The urgency of the patient's need for medical and nursing care as assessed at triage
	<i>Type of visit to ED</i>					
270362	Non-admitted patient ED service episode—type of visit to ED	2004-05 2005-06	N (1 = Emergency presentation: attendance for an actual or suspected condition which is sufficiently serious to require acute unscheduled care”; 2 = Return visit, planned: presentation is planned and is a result of a previous ED presentation or return visit”; 3 = “Pre-arranged admission: a patient who presents at the ED for either clerical, nursing or medical processes to be undertaken, and admission has been pre-arranged by the referring medical officer and a bed allocated”; 4 = “Patient in transit: the ED is responsible for care and treatment of a patient awaiting transport to another facility”; 5 = “Dead on arrival: a patient who is dead on arrival at the ED”)	Mandatory	1	The reason the patient presents to an ED
474195	ED stay—type of visit to ED	2012-13 2013-14	N (1 = Emergency presentation: attendance for an actual or suspected condition which is sufficiently serious to require acute unscheduled care”; 2 = Return visit, planned: presentation is planned and is a result of a previous ED presentation or return visit”; 3 = “Pre-arranged admission: a patient who presents at the ED for either clerical, nursing or medical processes to be undertaken, and admission has been pre-arranged by the referring medical officer and a bed allocated”; 4 = “Patient in transit: the ED is responsible for care and treatment of a patient awaiting transport to another facility”; 5 = “Dead on arrival: a patient who is dead on arrival at the ED”)	Mandatory	1	The reason the patient presents to an ED
495958	ED stay—type of visit to ED	2014-15 2016-17	N (1 = Emergency presentation”; 2 = Return visit, planned”; 3 = “Pre-arranged admission”; 4 = “Patient in transit”; 5 = “Dead on arrival”)	Mandatory	1	The reason the patient presents to an ED
	<i>Waiting time</i>					
270007	Non-admitted patient ED service episode—waiting time (to service delivery), total minutes	2004-05 2004-05	NNNNN	Mandatory	1	The time elapsed in minutes for each patient from presentation in the ED to a service occurrence of a specific event related to service delivery

390412	Non-admitted patient ED service episode—waiting time (to service delivery), total minutes	2010-11 2011-12	NNNNN	Mandatory	1	The time elapsed in minutes for each patient from presentation in the ED to the commencement of the ED service event
471932	ED stay—waiting time (to commencement of clinical care), total minutes	2012-13 2015-16	NNNNN	Conditional	1	The time elapsed in minutes for each patient from presentation in the ED to the commencement of the ED non-admitted clinical care
621840	ED stay—waiting time (to commencement of clinical care), total minutes	2016-17 2016-17	NNNNN	Conditional	1	The time elapsed in minutes for each patient from presentation in the ED to the commencement of the ED non-admitted clinical care

Abbreviation: ED: Emergency Department; METeOR: Metadata Online Repository; ASGC: Australian Standard Geographical Classification; ASGS: Australian Statistical Geography Standard; SACC: Standard Australian Classification of Countries; DVA: Department of Veterans' Affairs; URG: Urgency Related Group; SNOMED-CT-AU (EDRS): Systematized Nomenclature of Medicine - Clinical Terms - Australian version (Emergency Department Reference Set); ICD: International Statistical Classification of Diseases and Related Health Problems

Source: *Metadata Online Registry: Non-admitted patient emergency department care NMDS2004-05 to 2015-16*^[71-82]

Appendix 2: Public hospital peer group classification

Peer group	Sub-group	Definition
Principal referral and specialist women's & children's hospitals	<i>Principal referral</i>	Major city hospitals with >20,000 acute casemix-adjusted separations and Regional hospitals with >16,000 acute casemix-adjusted separations per annum.
	<i>Specialist women's and children's</i>	Specialised acute women's and children's hospitals with >10,000 acute casemix-adjusted separations per annum.
Large hospitals	<i>Major city</i>	Major city acute hospitals treating >10,000 acute casemix-adjusted separations per annum.
	<i>Regional and remote</i>	Regional acute hospitals treating >8,000 acute casemix-adjusted separations per annum, and remote hospitals with >5,000 casemix-adjusted separations.
Medium hospitals	<i>Group 1</i>	Medium acute hospitals in Regional and Major city areas treating between 5,000 and 10,000 acute casemix-adjusted separations per annum.
	<i>Group 2</i>	Medium acute hospitals in Regional and Major city areas treating between 2,000 and 5,000 acute casemix-adjusted separations per annum, and acute hospitals treating <2,000 casemix-adjusted separations per annum but with >2,000 separations per annum.
Small acute hospitals	<i>Regional</i>	Small Regional acute hospitals (mainly small country town hospitals), acute hospitals treating <2,000 separations/year, and with <40% non-acute and outlier patient days of total patient-days.
	<i>Remote</i>	Small remote hospitals (<5,000 acute casemix-adjusted separations but not 'Multipurpose services' and not 'Small non-acute'). Most are <2,000 separations.
Sub-acute and nonacute hospitals	<i>Small non-acute</i> <i>Multi-purpose services</i> <i>Hospices; Rehabilitation; Mother-craft</i>	Small non-acute hospitals, treating <2,000 separations per annum, and with more than 40% non-acute and outlier patient days of total patient days.

	<i>Other non-acute</i>	For example, geriatric treatment centres combining rehabilitation and palliative care with a small number of acute patients
Un-peered and other hospitals		Prison medical services, dental hospitals, special circumstance hospitals, Major city hospitals with <2,000 acute casemix-adjusted separations, hospitals with <200 separations, etc.
Psychiatric hospitals		

Sources: Australian Hospital Statistics,^[46,83-94]

The following 3 published articles have been removed for copyright or proprietary reasons.

Tran, Q. N., Lambeth, L. G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V., Huckerby, E. J., Neil, A. L., 2020. Emergency department presentations with a mental health diagnosis in Australia, by jurisdiction and by sex, 2004–05 to 2016–17, *Emergency medicine Australasia*, 2020, 32(3), 383-392.

Chapter 5 appears to be the equivalent of the pre-peer reviewed version of the following article: Tran, Q. N., Lambeth, L. G., Sanderson, K., de Graaff, B., Breslin, M., Tran, V., Huckerby, E. J., Neil, A. L., 2019. Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: a secondary data analysis, *Emergency medicine Australasia*, 31(6), 1064-1072.

Tran, Q. N., Lambeth, L. G., Sanderson, K., de Graaff, B., Breslin, M., Huckerby, E. J., Tran, V., Neil, A. L., 2020. Trend of emergency department presentations with a mental health diagnosis in Australia by diagnostic group, 2004–05 to 2016–17, *Emergency medicine Australasia*, 32(2), 190-201.