The Patterns, Determinants and Measurement of Rural and Remote Primary Health Care Workforce Turnover and Retention

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Copyright Notices

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List of Abbreviations

ABS	Australian Bureau of Statistics
ACCHS	Aboriginal Controlled Community Health Service
ACRRM	Australian College of Rural and Remote Medicine
AHMAC	Australian Health Ministers' Advisory Council
AHP	Allied Health Professional
AHPRA	Australian Health Practitioner Regulation Agency
AHW	Aboriginal Health Worker
AIHW	Australian Institute of Health and Welfare
AMC	Australian Medical Council
AMWAC	Australian Medical Workforce Advisory Committee
APHCRI	Australian Primary Health Care Research Institute
ARIA	Accessibility/Remoteness Index of Australia
ARRWAG	Australian Rural and Remote Workforce Agencies Group
ASGC-RA	Australian Standard Geographical Classification – Remoteness Areas
BMP	Bonded Medical Place
CI	Confidence Interval
COAG	Council of Australian Governments
DALY	Disability Adjusted Life Year
DEEWR	Department of Education, Employment and Workplace Relations
DOH	Australian Government Department of Health
DOHA	Department of Health and Ageing
DWS	District of Workforce Shortage
FACRRM	Fellowship of the Australian College of Rural and Remote Medicine
FGAMS	Foreign Graduates of Australian Medical Schools
FRACGP	Fellow of the Royal Australian College of General Practitioners
FTE	Full Time Equivalent
FWE	Full-time Workload Equivalent
GP	General Practitioner
GPARIA	General Practitioner Accessibility and Remoteness Index of Australia
GPET	General Practice Education and Training
GPRIP	General Practice Rural Incentives Program
GPRRIPS	General Practice Registrars Rural Incentive Payment Scheme
HECS	Higher Education Contribution Scheme
HPSA	Health Professional Shortage Area

HR	Hazard Ratio
HWA	Health Workforce Australia
IMG	International Medical Graduate
IRS	International Recruitment Strategy
ISCO	International Standard Classification of Occupations
MABEL	Medicine in Australia: Balancing Employment and Life
MBS	Medicare Benefits Schedule
MOMPS	Medicare Plus for Other medical Practitioners
MRBS	Medical Rural Bonded Scholarship
NAHRLS	Nursing and Allied Health Rural Locum Scheme
NHSC	National Health Service Corps
NRAS	National Registration Accreditation Scheme
NRRHIP	National Rural and Remote Health Infrastructure Program
NTDH&F	Northern Territory Department of Health and Families
NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
PHC	Primary Health Care
PPR	Provider to Population Ratio
PSAP	Physician Shortage Area Program
RACGP	Royal Australian College of General Practitioners
RAMUS	Rural Australia Medical Undergraduate Scholarship
RDASP	Rural Doctors' Association Settlement Package
RCS	Rural Clinical Schools
RHSET	Rural Health Support Education and Training program
RHWA	Rural Health Workforce Australia
RRGPP	Rural and Remote General Practice Program
RRMA	Rural, Remote and Metropolitan Area classification
RUSC	Rural Undergraduate Support and Co-ordination program
RWA	Rural Workforce Agency
UDRH	University Department of Rural Health
UK	United Kingdom
UN	United Nations
USA	United States of America
VMO	Visiting Medical Officer
WHO	World Health Organization

Preface

Health workforce supply and distribution are amongst the most important issues affecting the ease with which rural and remote populations can access primary health care services. It is crucial that policymakers grappling with these issues have accurate and timely information so that workforce planning and policy-making is fully informed. Considerable research has investigated overall health worker supply and the geographical distribution of health workers. However, little work has quantified in detail the rural and remote health worker recruitment, turnover and retention patterns that underpin long standing and ongoing rural and remote health workforce shortages. In order to redress this dearth of knowledge, this thesis focuses specifically on quantifying primary health care workforce turnover and retention in rural and remote areas.

Exactly how 'rural' and 'remote' are defined is a vexed and complex issue. Within this thesis, rural location is accepted as defined within the context of individual studies. However, it is research relating to geographically large countries with sparsely populated rural areas that is of most relevance for Australian health workforce policy-making. Similarly, research undertaken in high income, industrialised countries where the health care settings have considerable similarities to those found in Australia, are of greater interest to Australian rural and remote policymakers. Research undertaken in countries such as Canada, USA, Germany, France, New Zealand and the Scandinavian countries therefore falls well within the scope of this thesis. In comparison, research emanating from other more densely populated countries such as Japan, or from less economically developed countries such as many sub-Saharan African countries is of less relevance, and therefore falls outside the scope of this thesis.

The health workforce includes paid workers from many different professional groups, usually trained and accredited by a range of agencies and institutions. It is also acknowledged that there is a large informal workforce providing important health care services in an unpaid capacity. However, the informal workforce is not considered within the scope of this thesis. Instead, this thesis is mainly focussed on professionally qualified health workers who provide clinical services directly to patients (although there is one exception: one study reported in this thesis collected primary data on workforce retention of health service managers). By and large, consideration of administrative and other staff employed in the health sector, albeit in important support roles, is beyond the scope of this thesis. Of specific interest to this thesis are those doctors, nurses, allied health professionals and Aboriginal health workers providing primary health care (first contact or un-referred health care) directly to rural and remote populations.

The research of this thesis, whilst endeavouring to investigate the patterns, determinants and measurement of rural primary health care workers across a broad range of health professions, has necessarily placed a far greater emphasis on the medical profession than on other professional groups. This has mostly related to the better availability of quality workforce data for rural and remote doctors compared to other health professional groups. The methodological approach taken in this thesis requires a high level of detail on individual health workers, and complete data on populations of health workers. These data have been regularly collected by the State and Territory Rural Workforce Agencies in Australia for some years now, enabling this research. Unfortunately, there have been no comparable data collections occurring for most other professions, especially the allied health professions. Additionally, the focus of the extant literature has also been on doctors, and the majority of Commonwealth Government rural and remote health worker turnover and retention initiatives have also targeted doctors. Unavoidably, therefore, the focus of this thesis is mainly on the medical profession.

To summarise, the domain of enquiry for the program of research that comprises this thesis is primary health care workers, especially doctors, in rural and remote areas in developed countries. Whilst the scope of the research in the thesis has necessarily been confined in these ways, the research will nevertheless have relevance far beyond the specified scope, since it is widely recognised that geographical maldistribution of health workers and retention of primary health care workers in rural and remote areas is an issue of global importance. As such, the methods used in this research can equally be applied to problems of geographical maldistribution of health workers occurring in other contexts not considered in this thesis, such as in metropolitan underserved areas and rural health settings in low income countries. Moreover, whilst the methods used to measure retention in this thesis are applied in relation to retention in the rural primary health care workforce, retention is important at many different levels of the health system. These methods could equally be applied to investigate retention of health workers within a specific profession or within a country. These issues, too, are of global significance.

In broad terms, this is a thesis by publication which comprises an outline of the rural primary health care workforce problem and its significance, the background to the problem (including both a review of existing literature and policy contextualisation), methods, results from the studies undertaken, and a synthesis and discussion of the significance of the research findings for current and future policy-making. Within this structure are six peer-reviewed journal articles and linking text. The first article, a review and appraisal of turnover and retention metrics identifies a suite of five metrics which can be used to measure rural and remote turnover and retention, and leads in to the methods chapter (Chapter 5). The next four publications, applying turnover and retention metrics to rural and remote health workforce datasets to identify existing patterns of turnover and retention and inform health workforce policy-making and planning, are to be found in the results chapters (Chapters 6 and 7). A sixth paper, framing the research of the thesis within the broader, vitally important but complex concept of access to primary health care, is found in the final integrative discussion chapter (Chapter 8). Those expert readers already conversant with some of these various aspects may wish to focus on those chapters of greatest utility for their needs. This may include focusing on specific sections, such as the literature review (Chapter 3) or the research design and methodology chapter (Chapter 5), or on Chapter 8's integrative discussion of the research findings and its policy implications. Further, more detailed guidance on the structuring of the thesis can also be found towards the end of Chapter 1.

Executive Summary

Health workforce supply and geographical maldistribution are amongst the most important issues affecting the provision of accessible primary health care services and improving the equity of health outcomes for populations living in rural and remote areas throughout the world. It is crucial that policymakers attempting to redress these issues have accurate and timely information so that workforce planning and policy-making is well-informed. In particular, it is critical that policy interventions effectively optimise the turnover and retention of the existing rural and remote primary health care workforce, as these are frequently a scarce and valuable resource.

The aim of this research, therefore, is to understand the patterns, determinants and metrics of rural and remote Australian primary health care workforce turnover and retention, with a view to developing appropriate indicators and benchmarks to support rural and remote health service workforce retention and inform rural and remote health workforce policy-making.

The research of this thesis takes a quantitative approach to investigate rural health workforce turnover and retention. Firstly, five metrics, well suited for measuring turnover and retention in rural and remote Australian contexts, are identified. These include simple metrics, such as turnover rates and retention rates, as well as metrics requiring more advanced analytical capabilities, such as survival probabilities and proportional hazards ratios. These metrics, particularly those calculated using survival analysis, are applied to five different Australian rural and remote primary health care workforce datasets to explore how rural primary health care workforce retention differs according to profession, geographical location, population size and a range of other financial and economic, professional and organisational, educational and regulatory, and personal and family factors. The empirical findings are then used to derive tentative benchmarks for length of stay of primary health care professionals that differ according to profession and geographic location.

This research reveals substantial and significant differences in rural and remote Australian primary health care workforce retention according to profession and geographical location and population size. Doctors and allied health professionals have approximately 1.80 times the risk of leaving a rural or remote health service at any point in time compared with nurses and Aboriginal health workers. Substantial differences in retention are evident within the allied health professions. Podiatrists, for example, are more than twice as likely to leave compared to occupational therapists (Hazard Ratio 2.13). The risk of rural and remote GPs leaving small communities (population size<5,000) also increases with increasing geographical remoteness (Outer regional Hazard Ratio 1.33; Remote Hazard Ratio 2.65, compared to Inner regional GPs).

Additionally, the research of this thesis reveals that a range of professional and organisational variables are strongly associated with rural primary health care workforce retention. These include practice ownership, hospital appointments and undertaking advanced procedural activities (for GPs) and grade of employment (for Allied Health Professionals). Income source, health workers' age group, country of primary training and regulatory restrictions on practice location are each strongly associated with retention. The research also proposes tentative benchmarks for the retention of rural Australian primary health care workers that differ according to profession and geographical location. The median survival of rural NSW GPs is predicted according to geographical location and population size, coastal location, country of primary medical degree, and certain workload characteristics.

Aside from better understanding rural and remote PHC workforce retention patterns and determinants, the research of this thesis has extensive and broad-ranging policy implications. At the most fundamental level, the use and demonstration of how best to measure retention in the rural and remote PHC context is critical for informing future research, for future evaluation and monitoring of retention interventions, and for the collection and management of workforce data. Importantly, the new empirical knowledge generated by this research has also highlighted the need to modify national workforce retention policy to take both geographical location (remoteness) and population size into account when targeting retention incentives, as was recommended by the 2013 "*Review of Australian Government Health Workforce Programs*".

Further, the findings suggest that strengthening and expanding rural generalist pathways providing advanced procedural training and up-skilling of rural and remote GPs may support their long-term retention, as may the funding and support of rural and remote hospital infrastructure. Retention of Allied Health Professionals in rural and remote communities can be supported by developing specific rural and remote career pathways.

Finally, coercive recruitment mechanisms can be expected to be associated with higher retention whilst the coercion is in place, but a substantially increased risk of leaving once the period of coercion ends. Mitigating the risk that PHC workers fulfilling return-of-service obligations may exacerbate retention of rural and remote PHC workforce in the longer term is likely to require careful matching of individuals to the location in which they fulfil their obligations and ongoing investment in vocational training and professional support programs.

Monash University

Declaration for thesis based or partially based on conjointly published or unpublished work

General Declaration

In accordance with Monash University Doctorate Regulation 17.2 Doctor of Philosophy and Research Master's regulations the following declarations are made:

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes six original papers published in peer reviewed journals and no unpublished publications. The core theme of the thesis is the turnover and retention of rural primary health care workforce in rural and remote areas. The ideas, development and writing up of five of the papers in the thesis were the principal responsibility of myself, the candidate, working within the School of Rural Health under the supervision of Emeritus Professor John Humphreys and Dr Matthew McGrail. In one paper, publication 4 as noted on the next page, I was principally responsible for the data management, analysis and interpretation. Whilst I had substantial involvement in the ideas, development and writing up of the manuscript, I was not principally responsible for these aspects.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

In the case of Chapters 5, 6, 7 and 8, my contribution to the work involved the following:

Thesis chapter	Publication number and title	Publication status	Nature and extent of candidate's contribution
5	1. How Best to Measure Health Workforce Turnover and Retention: Five Key Metrics	Published	Substantial contribution to conception and design of the paper, drafting and re-drafting and final approval of the version to be published
6	2. What Factors Contribute Most to the Retention of General Practitioners in Rural and Remote Areas?	Published	Substantial contribution to conception and design of this work. Principally responsible for the acquisition, analysis and interpretation of the National Minimum Data Set data, and led the drafting and critical revision of the manuscript.
6	3. The Value of Survival Analyses for Evidence-Based Rural Medical Workforce Planning.	Published	Substantial contribution to conception and design of the study, data acquisition, data analyses, drafting and re-drafting of the manuscript and final approval of the version to be published
7	4. Measuring Rural Allied Health Workforce Turnover and Retention: What are the Patterns, Determinants and Costs?	Published	Principally responsible for data management and analysis, contributed substantially to data interpretation and made substantial contribution to drafting and critically revising the final manuscript.
7	5. What is a Reasonable Length of Employment for Health Workers in Australian Rural and Remote Primary Health Care Services?	Published	Substantial contribution to conception and design of the study, data acquisition, data analyses, drafting and re-drafting of the manuscript and final approval of the version to be published
8	6. Helping Policy-makers Address Rural Health Access Problems	Published	Substantial contribution to conception and design of the publication, review of the literature, drafting and re-drafting of the manuscript and final approval of the version to be published

In order to generate a consistent presentation within the thesis, sections of published papers have been renumbered, with the thesis page numbering appearing in the bottom centre of each page.

Signed: [redacted]

Date: 6/8/2014

Publications and Presentations

1. Peer Reviewed Publications
(in order of appearance in this thesis)

1. Russell, D.J., Humphreys, J.S., and Wakerman, J., *How best to measure health workforce turnover and retention: Five key metrics.* Australian Health Review, 2012. **36**(3): p. 290-295.

2. Russell, D.J., McGrail, M.R., Humphreys, J.S., and Wakerman, J., *What factors contribute most to the retention of general practitioners in rural and remote areas?* Australian Journal of Primary Health, 2012. **18**(4): p. 289-294.

3. Russell, D.J., Humphreys, J.S., McGrail, M.R., Cameron, W.I., and Williams, P.J., *The value of survival analyses for evidence-based rural medical workforce planning.* Human Resources for Health, 2013. **11**: p. 65.

4. Chisholm, M., Russell, D., and Humphreys, J., *Measuring rural allied health workforce turnover and retention: what are the patterns, determinants and costs?* Australian Journal of Rural Health, 2011. **19**(2): p. 81-8.

5. Russell, D.J., Wakerman, J., and Humphreys, J.S., *What is a reasonable length of employment for health workers in Australian rural and remote primary healthcare services?* Australian Health Review, 2013. **37**(2): p. 256-261.

6. Russell, D.J., Humphreys, J.S., Ward, B., Chisholm, M., Buykx, P., McGrail, M., and Wakerman, J., *Helping policy-makers address rural health access problems.* Australian Journal of Rural Health, 2013. **21**(2): p. 61-71.

2. Non Peer Reviewed Publications
(not included as part of thesis)

1. Humphreys, J.S., Wakerman, J., Kuipers, P., Wells, R., Russell, D., Siegloff, S., and Homer, K., *Improving workforce retention: developing an integrated logic model to maximise sustainability of small rural & remote health care services* 2009, Australian Primary Health Care Research Institute (APHCRI): Canberra. Retrieved from: http://aams.aphcri.anu.edu.au/site/subscribe_article.php?did=13&tid=123.

2. Humphreys, J.S., Chisholm, M.C., and Russell, D.J., *Rural allied health workforce retention in Victoria: modelling the benefits of increased length of stay and reduced staff turnover. Final Report for Victorian Department of Health, Workforce Innovation Grant Program 2008-2009*. 2010, Monash University: Bendigo. Retrieved from:

   http://docs.health.vic.gov.au/docs/doc/Rural-allied-health-workforce-retention:-Modelling-the-benefits-of-increased-length-of-stay-and-reduced-staff-turnover.

3. Russell, D.J., Chisholm, M.C., Wakerman, J., and Humphreys, J.S. (2011). *Rural health workforce retention: Strengthening the evidence base.* In G. Gregory (Ed.), *Proceedings of the 11th National Rural Health Conference: Rural and Remote Australia. The heart of a healthy nation,* Perth WA, 13-16 March, National Rural Health Alliance. p. 184-185. Retrieved from:

   http://nrha.org.au/11nrhc/papers/11th%20NRHC%20Russell_Deborah_C1.pdf

3. Invited Presentations

1. Chisholm, M. Russell, D. & Humphreys, J. S. (2011). *Patterns of turnover and retention amongst Victorian rural Allied Health Professionals.* Oral presentation to the Loddon Mallee Allied Health Conference, 'This is how we do it here – showcasing Allied Health', Swan Hill, 4 March.

4. Peer Reviewed Presentations

1. Russell, D. J., Chisholm, M.C., Wakerman, J., and Humphreys, J.S. (2011). *Rural health workforce retention: Strengthening the evidence base.* Oral presentation to the 11th National Rural Health Conference, 'Rural and remote Australia: The heart of a healthy nation', Perth, 13-16 March.

2. Russell, D.J., Wakerman, J., and Humphreys J.S. (2013). *How long will you stay?* Oral presentation to the Primary Health Care Research Conference, 'Allies for better primary health care', Sydney, 10-12 July.

3. Russell, D.J., Humphreys, J.S., McGrail, M., Cameron, I., and Williams, P. (2014). *The value of survival analyses for evidence-based rural medical workforce planning.* Oral presentation to the Primary Health Care Research Conference, 'Integrating knowledge exchange to improve primary health care outcomes', Canberra, 23-25 July.

5. Non Peer Reviewed Presentations

1. Russell, D.J., Humphreys, J. S., and McGrail, M. (2013). *What is a reasonable length of employment for health workers in Australian rural and remote PHC services?* Oral presentation to the Centre of Research Excellence in Rural and Remote Primary Health Care National Advisory Committee, Canberra, 14 May.
2. Russell, D.J., Humphreys, J. S., Ward, B., Chisholm, M., Buykx, P., McGrail, M., and Wakerman, J. (2013). *Helping policymakers address rural health access problems.* Oral presentation in the Centre of Research Excellence in Rural and Remote Primary Health Care virtual Seminar series, Bendigo, Broken Hill, Alice Springs, 13 November.

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I have been privileged to have had the opportunity to collaborate with industry and academic partners external to Monash University. I would particularly like to thank Dr Ian Cameron and Mr Peter Williams, from the New South Wales Rural Doctors' Network for their expertise and willingness to facilitate this research.

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But most of all I am thankful for the love and support of my husband, Robert. During this journey he has frequently shouldered the lion's share of domestic responsibilities, never complaining and always believing in me. I also feel most fortunate to have three wonderful children, who have been able to adapt in many ways to the difficulties associated with their mother undertaking this PhD, and who continue to bring great happiness into my life.

Chapter 1: Thesis Introduction

1.1 Background to thesis

Maintaining an adequate and balanced supply of health care workers – especially primary health care (PHC) workers – is a major issue for rural and remote populations across the globe. Inadequate and imbalanced supply of essential PHC workers contributes to poorer and inequitable health outcomes in underserved areas (Starfield, 2009; Starfield, Shi, & Macinko, 2005). For example, in developing countries gradients in health worker densities translate to gradients in immunisation rates and in skilled coverage of births. These in turn are associated with gradients in infant, child and maternal survival (Anand & Barnighausen, 2004; Chen et al., 2004; World Health Organization, 2006). Beyond mortality, the density of physicians is also negatively associated with global morbidity outcomes, as measured by Disability Adjusted Life Years (DALYs) (Castillo-Laborde, 2011). It is evident that these patterns, whilst perhaps not quite so stark, also manifest in developed countries. In Organisation for Economic Cooperation and Development (OECD) countries, for example, mortality has been shown to vary substantially according to physician supply (Or, 2001).

In Australia, rural and remote populations are characterised by relative socio-economic disadvantage, increased occupational risks and other risk behaviours, and poorer access to health services and health workers compared with metropolitan populations. In 2004-05 these combined factors translated to 4,600 excess deaths outside major cities (Australian Institute of Health and Welfare, 2010a). Hospitalisations also show a gradient according to geographical location, with remote and very remote Australians experiencing substantially higher rates of hospitalisation for acute, chronic and vaccine preventable conditions compared with metropolitan populations (Australian Institute of Health and Welfare, 2010a).

Health care, being a labour intensive, knowledge-based service industry, relies heavily on highly trained health workers to deliver appropriate health care (Bloor et al., 2003; World Health Organization, 2006). It is hardly surprising therefore, that Chen et al. (2004), in their landmark analysis of the global workforce, pronounce the impossibility of having a strong and vibrant health system without the presence of an adequate health workforce. Therefore the imperative remains: efforts to strengthen health systems and improve health outcomes for unfairly disadvantaged rural and remote populations must find effective solutions to the long standing, severe problems of PHC workforce undersupply that characterises rural and remote areas across the world.

Comprehensive health workforce planning requires policymakers to concurrently consider a broad range of health workforce issues including health worker competence (knowledge, skills and experience), productivity (motivation and support) and responsiveness (World Health Organization, 2006; Zurn, Dolea, & Stillwell, 2005). However, the generation of a sufficient volume of generalist PHC workers, and subsequently ensuring their optimal geographic distribution according to population need has long been, and remains, amongst the most critical health workforce issues for rural and remote populations (Mason, 2013; World Health Organization, 2006, 2010a).

Rural and remote Australia has experienced long standing and ongoing rural and remote health workforce shortages. Shortages have been evident both in terms of the absolute numbers of health workers in rural and remote areas as well as relative to supply in major cities of Australia (Access Economics, 2002; Australian Government Department of Health and Ageing, 2008; Australian Medical Workforce Advisory Committee, 2000; Australian Medical Workforce Advisory Committee & Australian Institute of Health and Welfare, 1996; Johnston & Wilkinson, 2001; Karmel, 1973; Mason, 2013; Productivity Commission, 2005; The Senate Community Affairs References Committee, 2012; Wilkinson, 2000). Recent workforce projections forecast future shortages of doctors and nurses as a result of increasing demand for their services, and problematic supply (Health Workforce Australia, 2012a, 2012c). Even worse, for allied health professions there is such a lack of comprehensive data on the workforce that there are no current forecasts of the adequacy of future workforce supply (Health Workforce Australia, 2013b). Without a doubt, though, any future shortages are likely to disproportionately affect rural and remote Australia.

Australian policymakers recognise the inequities in health outcomes for rural and remote Australians, and have a vision that “people in rural and remote Australia are as healthy as other Australians” (Standing Council on Health, 2012). However, despite many years of Australian policy-making attempts to correct health workforce imbalances, geographical maldistribution and localised shortages of various cadres of health workers persist. This is evident in the Standing Council on Health’s recent publication, “*National Strategic Framework for Rural and Remote Health”* which acknowledges rural and remote health workforce supply as being at a critical level in many rural and remote communities (Standing Council on Health, 2012).

One of the underlying reasons for policy failure is a lack of sound evidence to inform workforce planning and policy-making. Recent reviews of the effectiveness of interventions to increase workforce supply in rural and remote areas, have each concluded that the evidence is scanty and mostly of low quality (Buykx, Humphreys, Wakerman, & Pashen, 2010; Dieleman, Kane, Zwanikken, & Gerretsen, 2011; Dolea, Stormont, & Braichet, 2010; Grobler et al., 2009; Wilson, Couper, et al., 2009). Addressing these deficiencies in the evidence-base informing health workforce policy has been identified as being of utmost urgency and of international significance (Huicho et al., 2010).

The reasons for the lack of sound evidence to underpin health workforce planning are multiple and complex. However central amongst them is a lack of agreement and understanding on how best to measure workforce supply and its different components (Dal Poz, Gupta, Quain, & Soucat, 2009; Dal Poz, Kinfu, Dräger, & Kunjumen, 2007). This manifests as an inability to effectively monitor baseline patterns of workforce recruitment, turnover and retention and evaluate the effects of workforce recruitment and retention interventions. Particularly noticeable has been a lack of metrics and indicators of geographical movements of health workers within a nation's health workforce (Dal Poz et al., 2009). Whilst the work of Dal Poz et al. has partially addressed this gap, it is nevertheless acknowledged that additional indicators of health workforce movements are likely to be required according to the unique workforce contexts of each country or region.

The unique context of rural and remote Australia has led Australian health policymakers to recognise that recruitment and retention of skilled health workers in rural and remote areas are key challenges which require policy prioritisation (Standing Council on Health, 2012). However, what is less well understood is how best to measure health workforce recruitment, turnover and retention in rural and remote contexts and what the patterns and determinants of Australian rural and remote workforce recruitment, turnover and retention are. For example, what factors explain why health workers choose to stay or leave rural and remote areas, and how these vary according to profession and geographical location? Additionally, a lack of precise knowledge of rural and remote Australian health worker recruitment, turnover and retention rates, and how they are changing over time and in response to existing policy, hampers policy evaluation, workforce forecasting and planning for future rural and remote health worker requirements.

1.2 Aim and objectives of thesis

The aim of this research is:

> *To understand the patterns, determinants and metrics of rural and remote Australian primary health care workforce turnover and retention, with a view to developing appropriate indicators and benchmarks to support rural and remote health service workforce retention and inform rural and remote health workforce policy-making.*

The objectives of this thesis are:

1. To review and evaluate how rural and remote primary health care workforce turnover and retention can be measured.
2. To assess patterns of rural and remote health workforce turnover and retention, and investigate differences according to profession and geographic location.

3. To describe, quantify and explain the factors associated with rural and remote Australian primary health care workforce turnover and retention.

4. To develop health workforce indicators and benchmarks for rural and remote Australian primary health care workforce retention taking into account differences according to profession and geographic location.

1.3 Research Questions

The specific research questions investigated by this thesis are:

1. What primary health care workforce turnover and retention metrics are best suited for use in rural and remote Australian contexts?

2. What does use of these metrics reveal about patterns of turnover and retention amongst the rural and remote Australian primary health care workforce, including any variation according to profession and geographic location?

3. What is the magnitude, direction of association and relative importance of factors associated with rural and remote primary health care workforce turnover and retention?

4. What are appropriate benchmarks for reasonable length of stay for the rural and remote Australian primary health care workforce that take account of differences according to profession and geographical location?

1.4 Overview of study methods

A wide range of research methodologies characterise the considerable literature on rural and remote workforce recruitment, turnover and retention. In Australia, and elsewhere, much qualitative research has been undertaken to identify which factors are associated with decisions to move to, stay in or leave rural and remote areas. However, a comparatively small amount of research has been undertaken to quantify these associations. To date, research using existing national and jurisdictional health workforce quantitative data sets has rarely reported turnover or retention statistics, and in instances where these have been provided, descriptive statistics, with little use of inferential statistics have more typically been reported.

In the broadest sense, the methodology underpinning this thesis is firstly informed by a thorough review of the literature. This is required to identify research using quantitative methods that has already been undertaken to investigate the various factors associated with rural and remote PHC worker actual turnover and retention. The literature review is also necessary to help inform how best to measure health workforce turnover and retention in rural and remote PHC settings, as it is evident that retention research, including evaluations of the effectiveness of retention interventions, is frequently hampered by a lack of consistency and clarity about which turnover and retention measures to use.

A key aspect of this study is therefore the use of quantitative methods, especially multivariate regression methods where possible, so that simultaneous adjustments can be made for the effects of multiple different factors on health worker turnover and retention. Importantly, these methods allow for an assessment of both the statistical significance of associations between each of the different factors and PHC worker retention and the magnitude of any effect. Nevertheless, these types of analyses demand considerable analytical expertise. High quality individual level data are also an essential requirement. Policymakers in rural and remote settings may not always be supported by this level of resourcing. It is therefore also considered important that other more straightforward methods of measuring turnover and retention are also incorporated in the methodological approach of this thesis, so that at least some information on health worker turnover and retention might be accessible to policymakers in under-resourced settings.

To this end, the measurement of turnover and retention is reviewed and a suite of five key workforce turnover and retention metrics is identified. Critical appraisal of these metrics focuses on their suitability and usefulness for rural and remote PHC workforce planning. Quantitative analysis of rural and remote health workforce datasets subsequently use this set of key PHC workforce turnover and retention metrics to address the previously identified research questions.

Data include both primary data collected by postal surveys, and secondary data collected for administrative or workforce planning purposes. Data were available at de-identified unit level, and whilst two datasets were cross-sectional in nature (the baseline Medicine in Australia: Balancing Employment and Life (MABEL) data and the Australian State and Territory Rural Workforce Agencies (RWAs) General Practitioner (GP) National Minimum Data Set) which prevented calculation of the five key turnover and retention metrics, remaining datasets were longitudinal.

Longitudinal, individual-level workforce data enable calculation of the full set of five key turnover and retention metrics – specifically crude turnover rates, stability rates, survival probabilities, median survival and Cox proportional hazard ratios. These metrics are used to assess the patterns of turnover and retention amongst different populations of rural and remote Australian health workers: a national sample of doctors, nurses, allied health professionals (AHPs), Aboriginal health workers (AHWs) and health service managers; a Victorian sample of AHPs; and the New South Wales (NSW) population of rural and remote GPs. Differences in health worker retention and turnover metrics according to geographic location and profession, together with health service manager perceptions of reasonable length of stay, formed the basis for proposing provisional retention benchmarks for health professional groups in both rural and remote settings.

Chapter 5 details the research design and methodology more fully. Specific aspects of the methodological approach to the analyses of each of these datasets are provided in detail in each of the published articles included in this thesis.

1.5 Thesis structure

This thesis is organised into eight chapters (see Figure 1.1). Each chapter includes a brief introductory paragraph that outlines the chapter's contents and structure

- **Chapter 1: Thesis Introduction**

- **Chapter 2: Rural and remote primary health care workforce supply**

  Chapter Two provides definitions of important terms relevant to rural and remote PHC worker supply, turnover and retention, and highlights the critical importance of optimising rural and remote PHC workforce retention. It then contextualises the main current rural and remote health workforce supply issues, describing patterns of supply from both international and national perspectives, with an emphasis on the medical PHC workforce.

- **Chapter 3: Review of the literature**

  Chapter Three presents the conceptual model underpinning the research of this thesis. A comprehensive review of existing literature investigating factors associated with the actual retention of rural or remote PHC workers is also provided. The review highlights important evidence gaps that the research of this thesis aims to address.

- **Chapter 4: Australian rural workforce policy context**

  Chapter Four contextualises the research of this thesis, by providing a chronological overview of key events, organisations, sentinel publications and their recommendations relevant to Australian rural and remote PHC workforce distribution in the past forty years. Key Australian Commonwealth Government policy responses to rural and remote health workforce distributional issues that have arisen in this period to address rural and remote health workforce supply issues are outlined.

- **Chapter 5: Research design and methodology**

  Chapter Five details the research design and methodological approach of the thesis. A peer reviewed publication identifies and critically appraises the measurement of rural and remote PHC worker turnover and retention, indicating that measures based on survival analysis are particularly advantageous in rural and remote PHC worker settings.

  Critical methodological issues for the measurement of turnover and retention amongst Australian rural and remote PHC workers are raised. Challenges are considered in four broad categories: limitations imposed by the nature of the PHC workforce data available, the need to appropriately take time into account, the need to maximise the use of partial information on PHC workers (which includes the appropriate handling of censored data on those remaining in rural employment), and the need to make valid comparisons and predictions of PHC worker retention. Chapter Five concludes by discussing and illustrating the basics of survival analysis as it applies to the measurement of PHC workforce retention.

- **Chapter 6: Patterns of retention amongst rural and remote GPs**

  Chapter Six presents two peer-reviewed published journal articles which use quantitative methods to identify factors associated with the retention of rural and remote PHC workers. Both papers in this chapter are specific for the PHC medical profession: one study analyses cross-sectional data on two different samples of rural and remote Australian GPs, whilst the other study is an analysis of longitudinal data on the entire population of rural and remote NSW GPs.

- **Chapter 7: Patterns of retention amongst rural and remote nurses and allied health professionals**

  Chapter Seven presents a further two peer-reviewed published journal articles which use quantitative methods to identify and quantify factors associated with the retention of rural and remote PHC workers. Both papers required the collection of primary data on Australian PHC workers from more than one profession, thus allowing comparisons of retention to be made across professions. The first paper investigates the factors associated with the retention of Victorian AHPs. AHP groups compared include dietitians, occupational therapists, physiotherapists, podiatrists, psychologists, social workers and speech pathologists. The other paper reports on the factors associated with the retention of rural and remote Australian GPs, nurses, AHPs, AHWs, and health service managers.

- **Chapter 8: Integrative Discussion**

  Chapter Eight provides an integrated discussion of the policy implications of the research of this thesis. A peer-reviewed published article discussing the concept of access to PHC is presented which translates a vast and complex literature about access into a form that is readily accessible and relevant for policy-making in rural and remote areas. This provides context by placing rural and remote health worker turnover and retention within a broader framework which considers dimensions of access in addition to those related to spatial accessibility of PHC workers. This chapter then proceeds to synthesise the main findings of the research undertaken in each of the research papers of this thesis according to the four research questions driving the research. The position and consistency of this body of research with respect to other comparable studies in this field is appraised. Chapter 8 also identifies the strengths and methodological limitations of the research. Finally, an integrated discussion of the significance of this research for rural and remote health workforce planning and policy-making is provided. Readers requiring a synthesis and 'executive summary' of the findings and policy implications of this thesis, without requiring details of the background, previous research undertaken in this field and methods used in this research, could proceed directly to this chapter.

Figure 1.1 Diagrammatic representation of thesis structure

Chapter 1: Thesis Introduction

Chapter 2: Rural and remote primary health care workforce supply

Chapter 3: Review of the literature

Chapter 4: Australian rural workforce policy context

Chapter 5: Research design and methodology

[linking text]

1. **Russell DJ**, Humphreys JS, Wakerman J. How best to measure health workforce turnover and retention: five key metrics. *Australian Health Review* 2012; **36:** 290-295.

Chapter 6: Patterns of retention amongst rural and remote GPs

[linking text]

2. **Russell DJ**, McGrail MR, Humphreys JS, Wakerman J. What factors contribute most to the retention of general practitioners in rural and remote areas? *Australian Journal of Primary Health* 2012; **18:** 289-294.

[linking text]

3. **Russell D,** Humphreys JS, McGrail M, Cameron I, Williams P. The value of survival analyses for evidence-based rural medical workforce planning. *Human Resources for Health* 2013; 11:65.

Chapter 7: Patterns of retention amongst rural and remote nurses and allied health professionals

[linking text]

4. Chisholm M, **Russell D**, Humphreys J. Measuring rural allied health workforce turnover and retention: what are the patterns, determinants and costs? *Aust J Rural Health* 2011 Apr; **19:** 81-88.

[linking text]

5. **Russell D**, Wakerman J, Humphreys J. What is a reasonable length of employment for health workers in Australian rural and remote primary health care services? *Australian Health Review* 2013; **37**(2): 256-261.

Chapter 8: Integrative Discussion

[linking text]

6. **Russell D**, Humphreys JS, Ward B, Chisholm M, Buykx P, McGrail M, Wakerman J. Helping policymakers address rural health access problems. *Australian Journal of Rural Health* 2013; **21**(2): 61-71.

[linking text]

Chapter 2: Rural and remote health workforce supply

As outlined in Chapter 1, this thesis seeks to add to the existing evidence of patterns, determinants and measurement of rural and remote Australian PHC worker turnover and retention. This chapter comprises 5 sections. Firstly, definitions of the terms 'PHC workers' and of 'rural' are examined in Section 2.1. Secondly, the related concepts of PHC worker 'supply', 'recruitment', 'turnover' and 'retention' are explained, the notion of a 'retention profile' is introduced, and the importance of optimising PHC worker retention in rural and remote contexts is highlighted in Section 2.2. Thirdly, in Section 2.3, difficulties associated with determining the adequacy of health workforce supply are described, and a broad range of indicators identified that are used to help determine workforce supply adequacy. Section 2.3 also investigates international and Australian patterns of workforce supply and geographical distribution. The fourth section of this chapter, Section 2.4, provides an overview of Australian patterns of rural health workforce turnover and retention. Section 2.5, the fifth and final section of this chapter describes the gaps in the existing evidence about patterns of rural and remote Australian PHC worker turnover and retention that the research of this thesis will address.

2.1 Defining rural PHC workers

2.1.1 Who are PHC workers?

In accordance with the work of Dal Poz et al. (2009; 2007) it is necessary to clearly define the PHC workers that are the focus of this thesis. This is important because clear definitions facilitate the ability to make meaningful comparisons of health worker supply across countries and jurisdictions.

Whilst health workers can be defined as 'all people engaged in actions whose primary intent is to enhance health' (World Health Organization, 2006, p. 1), it is the turnover and retention in rural or remote areas of a more confined group of health workers that is within the scope of this thesis. The health workers within the scope of interest of this thesis are those in paid employment in rural or remote Australia, as doctors, nurses or midwives, AHPs, AHWs or health service managers and who have provided or are continuing to provide PHC services, as defined below. These health professional groups fit within the International Standard Classification of Occupations (ISCO-08) structure sub-major group 22 (health professionals), sub-major group 26 (legal, social and cultural professionals), sub-major group 32 (health associate professionals) and sub-major group 13 (production and specialized services managers) as shown in Table 2.1 (International Labour Office, 2012).

Table 2.1 Occupations of relevance to the research of this thesis

Occupation Group	International Standard Classification of Occupations ISCO-08 code	Examples of occupations classified here
Generalist medical practitioners	2211	General Practitioner, Family physician, Family medical practitioner, Primary health care physician, Primary care physician
Nursing and midwifery professionals	2221 and 2222	Registered Nurse, Professional Nurse, Division 1 Nurse, Nurse practitioner, Practice Nurse, District Nurse, Public health nurse, Professional midwife
Physiotherapists, Dietitians and nutritionists, Audiologists and speech therapists, Health professionals not elsewhere classified, Social work and counselling professionals, Non-health professionals not elsewhere classified	2264, 2265, 2266, 2269, 2634, 2635	Allied Health Professionals: Physiotherapist, Dietitian, Speech therapist, Podiatrist, Occupational Therapist, Social worker, Psychologist
Community health worker	3253	Aboriginal health worker
Health service managers	1342	Health service managers

The ISCO-08 classification has the advantage of occupational definitions being based on tasks or duties performed by each of the sub-major groups rather than being based on qualifications. By grouping together workers performing the same or similar tasks, even though they may have different qualifications according to the requirements of the jurisdiction or country in which they work, the ability to make comparisons is facilitated. For some occupational groups that are still emerging, however, the classification still has limitations. In the case of Aboriginal and Torres Strait Islander health workers, for example, quite different tasks are undertaken in different jurisdictions of Australia (Health Workforce Australia, 2011). These are not necessarily well captured by the ISCO-

08 classification. Nevertheless, the ISCO-08 still represents a useful framework for health worker classification. The specific definitions based on tasks or duties of the health workers identified in Table 2.1 are not reproduced here, but are readily available in the ISCO-08 documentation (International Labour Office, 2012).

Within the context of this thesis, PHC workers include workers from the classifications shown in Table 2.1 who are directly providing clinical care to rural and remote populations, or who manage the health services where direct clinical care is provided. The Australian Primary Health Care Research Institute (APHCRI) and Australia's Primary Health Care Reform Strategy documentation define PHC as follows:

> *Primary health care is socially appropriate, universally accessible, scientifically sound first level care provided by health services and systems with a suitably trained workforce comprised of multi-disciplinary teams supported by integrated referral systems in a way that: gives priority to those most in need and addresses health inequalities; maximises community and individual self-reliance, participation and control; and involves collaboration and partnership with other sectors to promote public health. Comprehensive primary health care includes health promotion, illness prevention, treatment and care of the sick, community development, and advocacy and rehabilitation. (Commonwealth of Australia, 2009, p. 22)*

This definition, however, does not specifically define what is meant by 'first level care'. The Australian Primary Health Care Research & Information Service's current interpretation is as care provided at the first level of contact that individuals, families and communities have with the health system (Primary Health Care Research & Information Service, 2014).

According to this interpretation, whether a health care provider is strictly providing PHC will vary according to each care episode. For example, patients may present first to a GP (first level of contact), and then be referred to an AHP (second level). Alternatively, the reverse may occur and a patient may first see an AHP who may refer to a GP. Of course, in some situations patients may first present to the local hospital emergency department with a new and acute condition. In this instance, the first level of contact may be with a range of clinicians, including hospital nurses, AHPs and GPs or other generalist medical practitioners providing non-referred hospital care.

Of course it is not feasible to define PHC providers according to each episode of care. Therefore, within the context of this thesis, PHC providers are defined as including health workers who deliver health services (or manage the delivery of health services) either in rural or remote communities or in the hospitals of those communities. The definition of PHC providers used in this thesis additionally excludes doctors specialising in areas other than primary care, and therefore providing a restricted range of health services.

2.1.2 What is meant by rural and remote?

In addition to defining what is meant by PHC providers within the context of this thesis, it is also important to define what the terms ‘rural’ and ‘remote’ mean. Different definitions of these terms are in use throughout the international health workforce literature, with no single definition having universal acceptance (Humphreys & Solarsh, 2008; Wilson, Couper, et al., 2009). The reasons why definitional differences occur are threefold. Firstly, there may be differences in the threshold values of a specific criterion used to define ‘rural’ and ‘remote’ according to the characteristics of the location and its population. For example the threshold value of population density for ‘rural’ in Japanese studies is likely to be much higher than for ‘rural’ in Australian studies, because overall Japan is characterised by far higher population density than Australia.

Secondly, definitional differences also occur when different criteria are used to define ‘rural’ and ‘remote’. For example, one study may define geographical remoteness based on settlement population size, whilst in another study, the definition may be based on population density thresholds.

Thirdly, and adding further complexity, the definitions used in some studies include a combination of criteria, often developed specifically to capture the range of geographies, settlement population sizes, or other characteristics that best distinguish rural and remote areas in the country that the study is being conducted. Within Australia, for example, the now superseded Rural, Remote and Metropolitan Area (RRMA) classification was based on city or town population size in one of 3 levels of geographical remoteness: metropolitan, rural and remote (see Table 2.2). The 3 levels of geographical remoteness were determined by the weighted sum of 5 standardised indicators of either population density or straight line distances to the nearest city or town in each of four classes based on population size. This complex and multi-layered definition was tailored specifically for the Australian geographical context: a geographically large country, with vast tracts of land which are very sparsely populated. It would be inappropriate to apply the same RRMA classification to much smaller countries, or to countries where population density is much greater.

The identified lack of a universal definition of ‘rural’ or ‘remote’ leads to difficulties when making comparisons of rural and remote PHC worker supply. This is especially evident when comparing countries, but it also can be an issue when comparing health workforce measures within a country. Within Australia, for example, a range of geographical classification systems have been developed over the past four decades in attempts to standardise and strengthen the definition of whether a geographical location is rural, remote or metropolitan. In recent years, geographical classifications of importance to medical health workforce distributional policy have included RRMA, Accessibility/Remoteness Index of Australia (ARIA), and Australian Standard Geographical Classification – Remoteness Areas (ASGC-RA). McGrail et al. provide a useful summary of the strengths and weaknesses of these classifications (McGrail & Humphreys, 2009a). Whilst RRMA had substantial strengths as a remoteness classification, including its simplicity and intuitive appeal, other features were criticised (Australian Institute of Health and Welfare, 2004; McGrail & Humphreys, 2009a). These included its reliance on population counts and SLA boundaries from the 1991 Australian Census of Population and Housing. These weaknesses led to the development in 2001 of an alternative classification system, the ASGC-RA, which classifies all of Australia based upon the road distance to the nearest city or town in each of five classes based on population size (Australian Bureau of Statistics, 2010). In July 2010 the ASGC-RA classification was adopted by the Australian government as the basis for distributing health worker retention incentives. The ASGC-RA, however, is also not without its critics (The Senate Community Affairs References Committee, 2012). Chief among the weaknesses of the ASGC-RA are its substantial heterogeneity whereby many towns and cities that are quite unalike are nevertheless grouped in the same remoteness category(McGrail & Humphreys, 2009a).

The transition from the use of RRMA to ASGC-RA for health workforce policy purposes occurred during the timeframe of this thesis, and within the period captured by the longitudinal datasets analysed in this thesis. Consequently, the geographical classification used in earlier data analyses was RRMA, whilst the ASGC-RA classification was used in the later analyses reported in this thesis. Specific details of the structure of different categories of remoteness for the RRMA and ASGC-RA classifications are provided in Table 2.2. The RRMA locations within the scope of this thesis are those defined as rural and remote (RRMAs 3-7), whilst the ASGC-RA locations within the scope of this thesis are those in ASGC-RAs 2-5. According to ABS 2011 Census of Population and Housing data, ASGC-RAs 2-5 comprise 4 million people, or 30% of Australia's population (Australian Bureau of Statistics, 2011). This includes 19% of Australia's population who live in ASGC-RA 2 (inner regional), 9% in ASGC-RA 3 (outer regional), 1% in ASGC-RA 4 and 1% in ASGC-RA5).

The discussion and international contextualising of the research included in this thesis therefore is predicated on the fact that the studies reported do not all use the same agreed definitions of 'rural' or 'remote'. This is unavoidable given the need, demonstrated above, to tailor definitions of 'rural' and 'remote' to the specific characteristics of each nation. This approach is also in keeping with the United Nations' approach, which considers that the concept of 'rural' does not lend itself to a single, precise definition that is equally applicable on a global scale (World Health Organization, 2010a).

Table 2.2 Structure of RRMA and ASGC-RA classifications

Geographical Classification	Levels	Description
Rural, Remote and Metropolitan Area (RRMA)	metropolitan	1. Capital Cities
		2. Other metropolitan centres (urban centre population>100,000)
	rural	3. Large rural centres (urban centre population 25,000-99,999)
		4. Small rural centres (urban centre population 10,000-24,999)
		5. Other rural areas (urban centre population<10,000)
	remote	6. Remote centres (urban centre population>4,999)
		7. Other remote areas (urban centre population<5,000)
Australian Standard Geographical Classification (ASGC-RA)	1	Major Cities of Australia
	2	Inner regional Australia
	3	Outer regional Australia
	4	Remote Australia
	5	Very remote Australia

Therefore, throughout this thesis, author definitions of 'rural' or 'remote' will be accepted, with no standard definition required.

2.2 The concepts of health worker supply, recruitment, turnover and retention

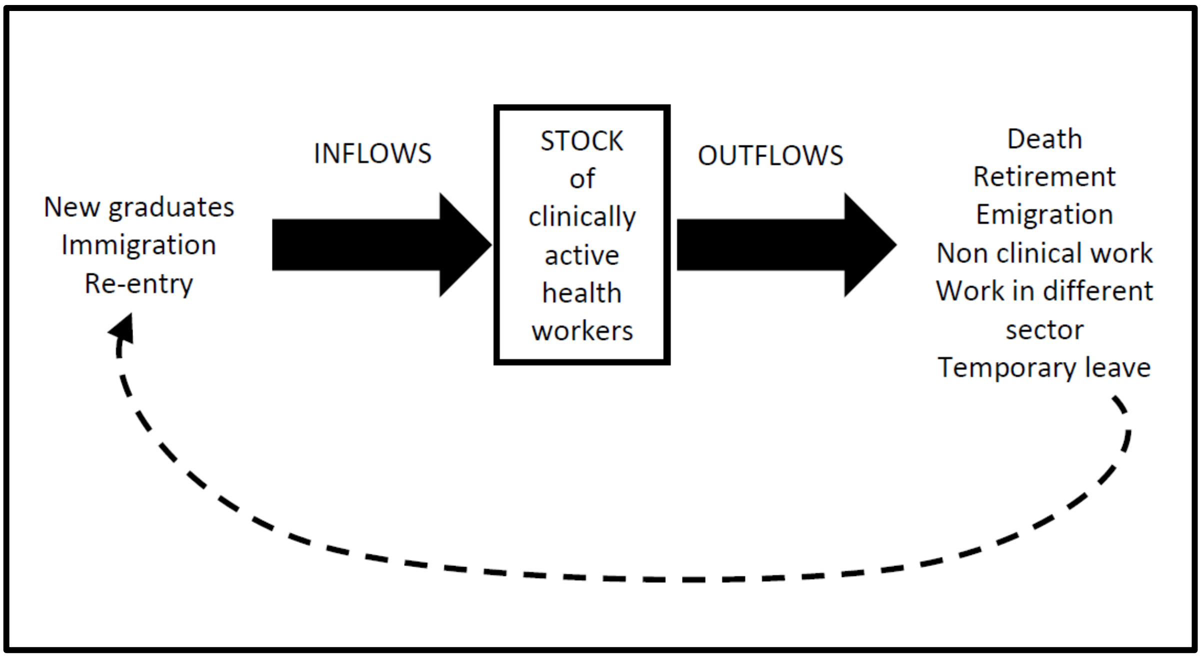
Supply, in the context of the health workforce, is the aggregate or overall amount of health care that is available to consumers. Overall health worker supply is a function of the stocks (or current supply) of health workers providing health care services at a specified point in time and changes subsequently occurring as a result of health workers entering (inflows) and exiting (outflows) the workforce.

Workforce supply is therefore dynamic – that is, it changes over time, depending on pre-existing stocks of health workers, increasing with subsequent inflows, and decreasing with subsequent outflows. In the case of the supply of active clinicians within a country such as Australia, inflows may occur, for example, as a result of new graduates entering the workforce, immigration of health professionals to Australia, or health workers re-entering the clinical workforce after a period of absence (which may include non-clinical work). Similarly, outflows may occur, for example, as a result of permanent retirement from the workforce, deaths, emigration, various types of temporary leave, and moves towards non-clinical work or work in sectors outside of the health profession. These changes are represented schematically in Figure 2.1.

Health workforce supply is generally further segmented according to ISCO-08 occupational classifications, as discussed earlier. However it is also useful to segment supply according to geographical location (Duckett & Willcox, 2011). In the case of this thesis, the geographical segments of primary interest are rural and remote areas, as described in Sub-section 2.1.2.

For the purposes of this thesis, *recruitment* is broadly defined as the commencement of employment, whilst *turnover* is broadly defined as the exit or leaving of employment (Australian Department of Labour and Immigration, 1974). *Retention* is broadly defined as the length of time between recruitment occurring (commencement) and turnover (exit). Research has established that

Figure 2.1 Stock and flow model of health worker supply



recruitment and retention are distinct processes and the factors are associated with recruitment and retention differ (Pathman, Konrad, Dann, & Koch, 2004). It is the retention of PHC workers in rural or remote areas that is the primary focus of the research of this thesis. Waldman, in 2004, highlighted an important reason why it is of critical importance to measure retention:

> *"What we want is retention, not turnover, of our workforce. We should measure what we want – net retention " (Waldman, 2006, p. 13).*

Whilst it is the retention of rural and remote PHC workers that is of high interest to health workforce planners, the definition of retention (the time between recruitment and turnover) means that turnover and retention are often necessarily considered together, although they are quite distinct concepts. To illustrate this point, the method of survival analysis, which is extensively used in this thesis, is based on the 'survival' time – or the time from commencement until turnover occurs. Modelling quantifies the risk of turnover (leaving) at any point in time during a period of employment (retention). The research of this thesis therefore relates to the turnover *and* retention of the rural and remote PHC workforce.

2.2.1 Why is rural PHC workforce retention important?

Poor retention, accompanied by high rates of staff 'burnout' and turnover in the rural health workforce, is a commonly reported barrier to being able to provide sustainable PHC services to rural and remote Australians (Health Workforce Australia, 2013b). Improving on current poor retention is crucial because the delivery of PHC is enhanced by the establishment and development of strong relationships between patients and their PHC providers. Relationships take time to develop, sometimes over many years and across multiple generations of families. Secure relationships with PHC providers are especially important for populations that are the most marginalised and needy, including Aboriginal Australians. Optimal PHC worker retention is likely to be associated with improved interpersonal continuity of care for patients and enhanced trust. Cornelius and colleagues demonstrated that low continuity of care for poor and underserved populations is associated with one-third higher average health care expenditure (Cornelius, 1997). This is important in the context of increasingly constrained health budgets. Further, interpersonal continuity of care is associated with improved quality of care, especially for patients with chronic conditions (Cabana & Jee, 2004), improved adherence to provider recommendations, improved preventive care (Doescher, Saver, Fiscella, & Franks, 2004), and improved patient outcomes (Saultz & Lochner, 2005). Continuity of care within a health system is also linked to more equitable patient health outcomes (Haggerty, Lévesque, Hogg, & Wong, 2013).

Time in a job is also required for PHC workers to attain optimal efficiency within a new workplace. Efficiency is ever more important due to increasing health system resource constraints. Good staff retention enables organisational knowledge to be maintained and provider's knowledge of the socio-cultural environments in which their patients function to accrue, which creates increased possibilities for better patient health outcomes and reduces the risk of adverse health outcomes associated with high staff turnover.

In particular, retention has added importance in the context of chronic workforce undersupply and recruitment difficulties as has been experienced in rural and remote Australia. In these circumstances it is very costly and difficult to replace health workers. Positions are more likely to be vacant for longer and unfilled positions place increased strain on remaining staff. This leads to increases in staff 'burnout' and increases the likelihood that they, too, will leave, thus exacerbating existing shortages further. Burnt out staff may well leave clinical care or even the health sector and thus represent a massive loss of investment in health system human resources.

The direct costs of replacing health workers are high, particularly in rural and remote areas because the often perceived lack of attractiveness of living in these areas makes recruitment of replacement staff far more difficult. Because of these often high costs associated with replacing rural PHC staff who leave, even small gains towards optimising PHC worker retention have the potential to result in large overall benefits when accrued across multiple PHC positions within rural health systems.

Optimising retention of the existing health workforce is also likely to be more politically and ethically acceptable and more cost-effective than heavy reliance on increased recruitment to alleviate shortages of rural health care workers. This is borne out in Kamien's sentinel report, handed down more than 25 years ago, which was a synthesis of the most critical issues around rural medical workforce supply in Western Australia (Kamien, 1987). Kamien recognised the importance of PHC worker retention and gave it appropriate priority:

> *'The first priority in alleviating the shortage of country doctors is to retain the services of those doctors already in rural areas'.* (Kamien, 1987, p. xvii)

Since Kamien's landmark report, evidence has emerged that policies targeting retention have the potential to be particularly effective, since the factors associated with retention include many modifiable professional and organisational factors (Pathman et al., 2004). The shortages of PHC practitioners in rural and remote Australia, as identified by Kamien in 1987, is an issue which remains a key concern of policymakers today, over a quarter of a century later (Mason, 2013). In a climate of increasing resource constraints on health systems both globally and locally, there is a high level of policy interest in the potential for improving PHC worker retention in rural and remote locations through cost-effective PHC workforce retention interventions. Improving rural PHC worker retention, however, requires a high degree of clarity about what is meant, as rural retention can have a range of different meanings. These are explored in the next sub-section.

2.2.2 What is a retention profile?

It is critical to understand that the literature comprises a multitude of different rural or remote health worker retention *profiles*. A retention profile provides a more specific definition than is provided by the broad definition of retention – the length of time between recruitment occurring (commencement) and turnover (exit) – given in Section 2.2 above. The term 'retention profile' was evident in the work of Pathman and colleagues as early as 1992 (Pathman, Konrad, & Ricketts, 1992). The illustrative examples of retention profiles used in Pathman et al.'s 1992 paper also provide a useful explanation of what is meant by retention profiles. In this paper, the authors listed three different retention profiles, or ways in which they had defined and operationalised rural health worker retention:

> *'The retention profile, as used here, simultaneously measures for each physician the total years of retention within the index practice, within the index community (within 24 km of the index practice), and within any nonmetropolitan county…'* (Pathman et al., 1992, p. 1554)

Unfortunately, since this pioneering work, authors have not always been careful to explicitly state which profile is being used, and this has caused confusion (Humphreys et al., 2001). Confusion occurs when different authors are measuring retention in relation to different geographic or organisational levels, but this is not made clear. That is, the underlying or broad concept of retention, the length of time between rural clinical practice commencement and exit is consistent, but the geographical or organisation level at which 'rural clinical practice' is defined – that is, the profile – often varies.

Within this thesis a range of different retention profiles are of relevance and interest. Rural PHC worker retention will be investigated at the rural community level, the rural health service level and the rural practice level. The literature review will also explore the evidence about the factors associated with a range of different retention profiles: staying in a specific rural practice, a rural town, city or community, a rural region or in any rural location within the country.

The inclusion of a range of rural retention profiles within the scope of this thesis is linked to the importance of having different levels of information for health workforce planners operating at different levels of the health system. For example, having evidence about the factors associated with retention at a rural health service helps answer questions of interest to workforce planners and policymakers at that health service. However, questions of interest to policymakers concerned with ensuring adequate retention within the jurisdiction, for example, require retention analyses to occur at the level of the jurisdiction. Similarly national workforce planners require information about PHC worker retention in rural areas for the nation as a whole.

However, a caveat surrounds the use of studies and findings throughout the thesis which reflect a range of retention profiles. This broad inclusion criteria results in the possibility that the findings of individual studies reported in this thesis may not be strictly comparable. Nevertheless, each is considered to add information of relevance and the critical unifying concept is that of rural or remote retention – that is, PHC worker length of stay outside of metropolitan locations.

The next section investigates the difficulties associated with determining whether a workforce shortage exists or not, and then goes on to outline patterns of overall PHC worker supply from an international (Sub-section 2.3.3) and national (Sub-section 2.3.4) perspective. Sub-sections 2.3.5 and 2.3.6 outline international and national patterns of geographical distribution of PHC workers.

2.3 Patterns of PHC worker supply and distribution

Having specified what is meant by ‘PHC worker’ (Section 2.1), PHC worker supply can be quantified or counted in a number of ways. These include:

- Numbers of actual workers (headcounts)
- Level of workforce participation (full-time, part-time, total hours worked, full-time equivalent [FTE] etc.)

PHC worker supply can also be characterised according to:

- The type of workforce contribution (for example, clinically active, administrative, researcher)
- Demographic characteristics (for example, age, gender)
- Other characteristics (for example, qualifications)
- Services provided (for example, types of services, quantity of services)
- Skills and tasks undertaken

A critically important but distinct attribute of health worker supply, especially given the importance accorded by government to the notion of “access to care”, is their distribution.

How overall health worker supply is distributed can also be quantified in a number of different ways. Distribution is commonly (but not only) determined according to:

- Jurisdictional and geographical classifications, including down to a small area level

- Mix of professions
- Mix of generalists versus specialists within a profession
- Socio-cultural mix of health workers
- Sectoral mix (for example, private versus public)

In the following sections an overview of global and Australian overall health worker supply will be given. However, it is the geographical distribution of health workers, particularly their distribution in rural and remote areas that is the main focus of this thesis, and it is these aspects that will be explored in Sub-sections 2.3.5 and 2.3.6.

2.3.1 How can we determine adequacy of health worker supply?

Determining whether health worker supply is in a state of oversupply, adequacy or shortage, requires that an evaluation of supply is made with respect to the level of population health needs and/or demands. Thus each of the above measures of health worker supply can be evaluated against various measures of population health needs or demands to determine whether the supply relative to needs/demands is excessive, optimal, or inadequate.

If supply exceeds demand, a situation of oversupply or surplus exists; when supply is exceeded by demand a situation of undersupply or shortage exists; and when supply is about the right amount for the demand, a situation of balanced or adequate supply exists

Unfortunately, difficulties measuring both supply and demand (or needs), together with health sector market imperfections create considerable difficulties and frequent controversy in ascertaining the degree to which supply and demand are balanced (Mooney & Scotton, 2000). Reasons for the health market being prone to 'market failure' (imbalanced workforce supply and demand) include imperfections caused by regulation of entry into health professions, long lag times prior to entry into health professions, low mobility of some sectors of the workforce, the substantial potential for monopolies to occur, the existence of agency relationships creating opportunities for supplier-induced demand, and potentially unlimited population health care needs.

These difficulties result in a lack of well-established current international and national benchmarks, as there are no methodological 'gold standards' for measuring health worker supply relative to population needs/demands (World Health Organization, 2006). Over many years Australian governments have sought information to determine whether current or future workforce supply is sufficiently adequate. A number of major reports have been produced in an attempt to provide this information (Access Economics, 2002; Australian Government Department of Health and Ageing, 2008; Australian Medical Workforce Advisory Committee, 2000, 2005; Australian Medical Workforce

Advisory Committee & Australian Institute of Health and Welfare, 1996; Health Workforce Australia, 2012a, 2012b, 2012c; Productivity Commission, 2005). Invariably these have fallen short in accuracy because of the necessarily simplistic methodological approaches taken, the realities of making a range of assumptions with insufficient evidence to support them, the long lead times for education and training, and the high complexity of the problem at hand (Productivity Commission, 2005).

Nevertheless, it remains critical to undertake these analyses, measuring current and past adequacy of health worker supply, predicting future adequacy of health worker supply, making incremental adjustments to policy, and then repeating the process. In order to understand the adequacy of health workforce supply, it is important to understand the underlying metrics used to measure health workforce supply.

2.3.2 Indicators of adequacy of health worker supply

i. Provider-Population Ratios

The most widely used indicator of the adequacy of health worker supply is the Provider to Population Ratio (PPR). At its simplest it is a ratio of the numbers of health workers to the numbers of population living within a geographically defined area, for example within a country. However, PPRs can be further refined, with regards to how the supply component is measured. For example, the PPR may attempt to quantify the level of a particular type of workforce participation, reporting full-time workload equivalent (FWE) clinically active health workers, rather than simply the aforementioned headcount of health workers. The determination of District of Workforce Shortage (DWS) status by the Australian Government Department of Health (DOH) relies on the calculation of FWEs as explained in Table 2.3.

PPRs can also be refined with regards to how the population needs or demand component is measured. However it is beyond the scope of this thesis to consider in any detail the measurement of population health needs and demands for health care, suffice to say that population headcounts (as often reported in the denominators of PPRs) may give a relatively poor indication of population health needs or demands. For further information on measures of population needs and their limitations when used to enumerate rural populations, see Pegram et al. (Pegram, Humphreys, & Calcino, 2006).

Thus whilst important strengths of PPRs include that they are easy to calculate and understand and data requirements are generally small, there are some important limitations associated with their use as an indicator of the adequacy of workforce supply. These include the need for care in ensuring that the numerators and denominators of PPRs are exactly the same when making comparisons, the

Table 2.3 Districts of Workforce Shortage

DISTRICTS OF WORKFORCE SHORTAGE (DWS)

The Australian Government Department of Health (DoH) defines a DWS as a geographical area of Australia in which the population's need for healthcare has not been met. Population needs for medical services are deemed to be unmet if a district has less access to medical services than the national average.

Australian Bureau of Statistics (ABS) Population data are used to determine population need, and the latest Medicare billing statistics are used to determine Full-time Workload Equivalent (FWE) as an indicator of supply.

FWE is calculated by dividing each doctor's Medicare billing by the average billing of full-time doctors for the period of time. The FWE is capped at 1.0 for each individual doctor.

A national average PPR is calculated using these data. DWS status for each Statistical Local Area is determined by making a comparison with the national average PPR and taking into account additional factors such as whether a doctor is replacing an existing doctor, whether the employer is an Aboriginal PHC service, and whether the surrounding catchment areas are also DWS (Deloitte Access Economics, 2011).

Because DWS is a *relative* measure of supply adequacy, there will always be around half of the SLAs defined as being in shortage, irrespective of absolute supply levels and whether population health needs are being met or not. To illustrate, in 2011, 72% of Australian SLAs were reported as DWSs (Deloitte Access Economics, 2011).

restriction of catchment populations to artificial jurisdictional boundaries, and the earlier mentioned limited ability to define national and international PPR benchmarks for various groups of health workers because of the heterogeneity and complexities of health systems and their organisational structures. There is also the problem that aggregating the data over large geographical areas, for example at a national or state level, may hide substantial variations within these areas.

A thorough assessment of the adequacy of the health workforce to meet population health needs therefore requires not only the reporting of PPRs over a range of geographies, but importantly, the use of a broad suite of indicators (Zurn, Dal Poz, Stillwell, & Adams, 2002). A number of additional indicators of health workforce shortages have been proposed (Buchan, 2002; Dolea, Stormont, Zurn, Shaw, & Braichet, 2009; Zurn et al., 2002) and include the following:

ii. Health worker employment indicators:

- Vacancy data (for example, vacancy rates, average time until vacancies are filled)
- Occupational unemployment rates

- Extent to which labour is imported from international or other non-traditional sources (including workforce substitution)
- Turnover rates
- Attrition rates
- Absenteeism

iii. Health workforce monetary indicators:

- Income/wage levels
- Extent to which pricing (co-payment required) is above average

iv. Health worker activity indicators:

- Degree to which temporary agency and locum staff are used
- Extent to which overtime or excess hours are worked
- Waiting times for appointments

v. Health outcome indicators

- Mortality indicators
- Morbidity indicators

Inevitably, each of these indicators has strengths and limitations. As before, it is not within the scope of this thesis to elucidate specific strengths and weaknesses of each indicator of the adequacy of workforce supply, however for further information on this the reader is referred to the work of Zurn et al. (Zurn et al., 2002).

The implications for policymakers, workforce planners and researchers alike is that the complexity of evaluating the adequacy of supply necessitates that several indicators are used to help build a consistent picture of workforce supply, and corroborate the evidence obtained from single indicators. This approach will help reduce controversy associated with using a single indicator to determine whether the health care workforce supply is in a state of surplus, shortage or balance relative to demand. Unfortunately, however, PPRs are still mostly reported as an isolated indicator of health worker supply. There remains limited availability of information on differences in PHC worker supply adequacy using other types of indicators. The following sub-sections, therefore, assess the adequacy of supply for each health professional group and for different geographical areas. These assessments are, however, necessarily largely reliant on reports of the PPR indicator.

2.3.3 How adequate are international levels of overall health worker supply?

The adequacy of global health workforce supply will be briefly examined to provide a broad contextual background to this thesis.

i. Doctors and nurses

At a global level, several sentinel studies have measured the adequacy of global workforce supply. Much of this work has used a benchmark for national supply of doctors, nurses and midwives set at a PPR threshold of 250 workers per 100,000 population, a level suggested as the minimum to enable 80% coverage of birthing and immunisation (Chen et al., 2004; Joint Learning Initiative, 2004; World Health Organization, 2006). By summing the health worker shortages in each country, including in the 57 countries with critical shortages, these studies have provided evidence of a massive global shortage of health workers. The size of the global shortage has been estimated at 2.4 million doctors, nurses and midwives, representing 10% of the total global workforce of 24 million doctors, nurses and midwives (World Health Organization, 2006).

In keeping with these findings, Scheffler and colleagues estimated the adequacy of the future global supply of *doctors* only, based on data from 1980 to 2001 from 158 countries (Scheffler, Liu, Kinfu, & Dal Poz, 2008). Their methodology was somewhat different, however, determining the global PPR (across all 158 countries), which indicates that by 2015 the overall global supply of doctors is likely to be in balance with the projected economic demand, and in surplus of needs-based requirements (based on minimum level of workforce PPRs required to provide basic health services). These findings, of course, are constrained by the caveat that the supply of doctors is not, and is unlikely to ever be, evenly distributed across countries. It is unsurprising, therefore, that in the same study Scheffler et al. forecast regional shortages in 2015, especially in Africa (Scheffler et al., 2008).

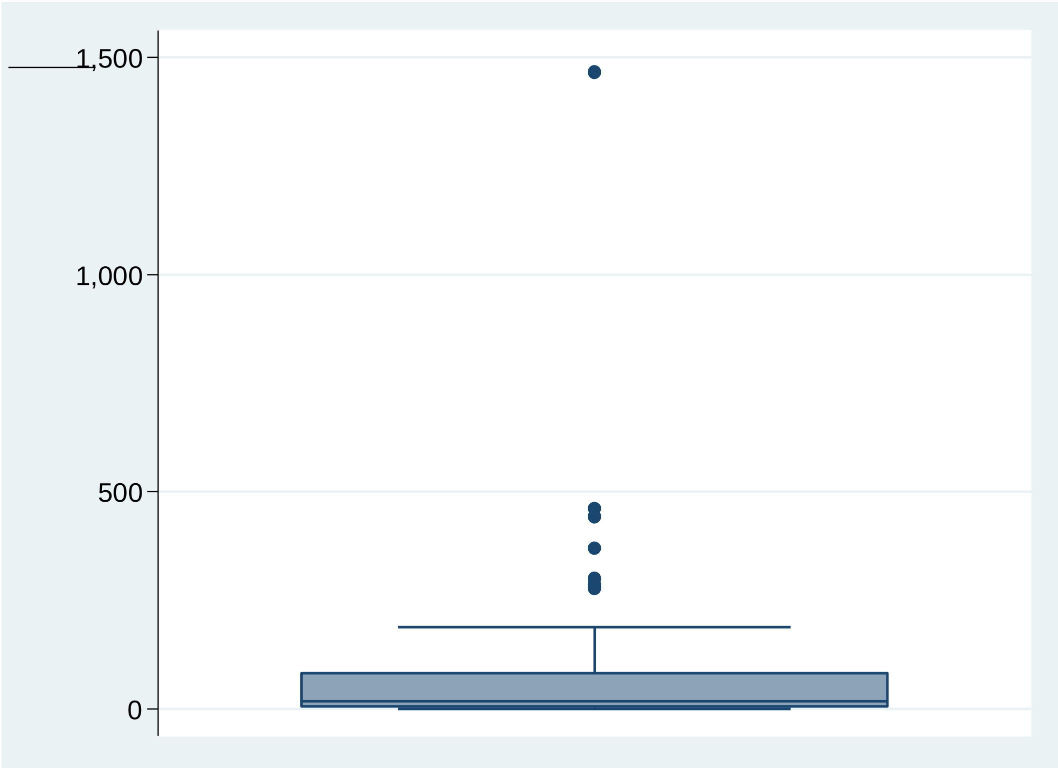
Health outcomes in Africa, especially Sub-Saharan Africa, and South East Asia, when measured using the morbidity indicator DALYs per 1,000 population, are worse than in the Western Pacific, Americas or Europe, (Crisp & Chen, 2014). These findings are consistent with the PPR indicator of workforce shortage which shows that these regions also have lower PPRs for doctors, nurses and midwives, although the relationship between PPRs and DALYs appears to be only approximately linear at low PPRs (<400 doctors, nurses and midwives per 100,000 population) (Crisp & Chen, 2014).

ii. Allied health professionals

Allied Health Professionals comprise a diverse range of professions, and there is a lack of international agreement about what professions comprise the allied health professions. There are also international differences in scopes of practice for professional groups. Further, national data collections are more likely to focus on the medical and nursing professions, rather than on any individual allied health profession or on a comprehensive enumeration of all allied health professions. For these reasons, the global health workforce supply of AHPs is difficult to enumerate with even a moderate level of accuracy. When global data were compiled for the 2006 World Health Report "*Working Together for Health",* for example, more than half of the 192 WHO member states were unable to supply data on 'Other health workers' (the category which best equates with Australian notions of which professions comprise the allied health professions, as it includes dietitians and nutritionists, occupational therapists, physiotherapists, podiatrists, prosthetists and orthotists, psychologists, speech pathologists etcetera) (Dal Poz et al., 2007; World Health Organization, 2006). Of note, the data that were provided by 84 UN member states revealed a highly skewed distribution of 'Other health workers', as shown in Figure 2.2. Thus whilst the USA has almost 1,500 'Other health workers' per 100,000, and 6 additional countries had more than 200 'Other health workers' per 100,000 population (shown as outliers in Figure 2.2), the median supply was only 16 'Other health workers' per 100,000 population.

Given what is known about the global undersupply of doctors, nurses and midwives, and what little can be learned about the supply of 'Other health workers' from the limited data available, it is evident that the global AHP workforce is grossly maldistributed, and that much of the world's population has little, if any, access to health services provided by AHPs.

Figure 2.2 Boxplot of distribution of 'Other' health worker PPRs for UN member states



Source: (World Health Organization, 2006)

2.3.4 How adequate are Australian levels of overall health worker supply?

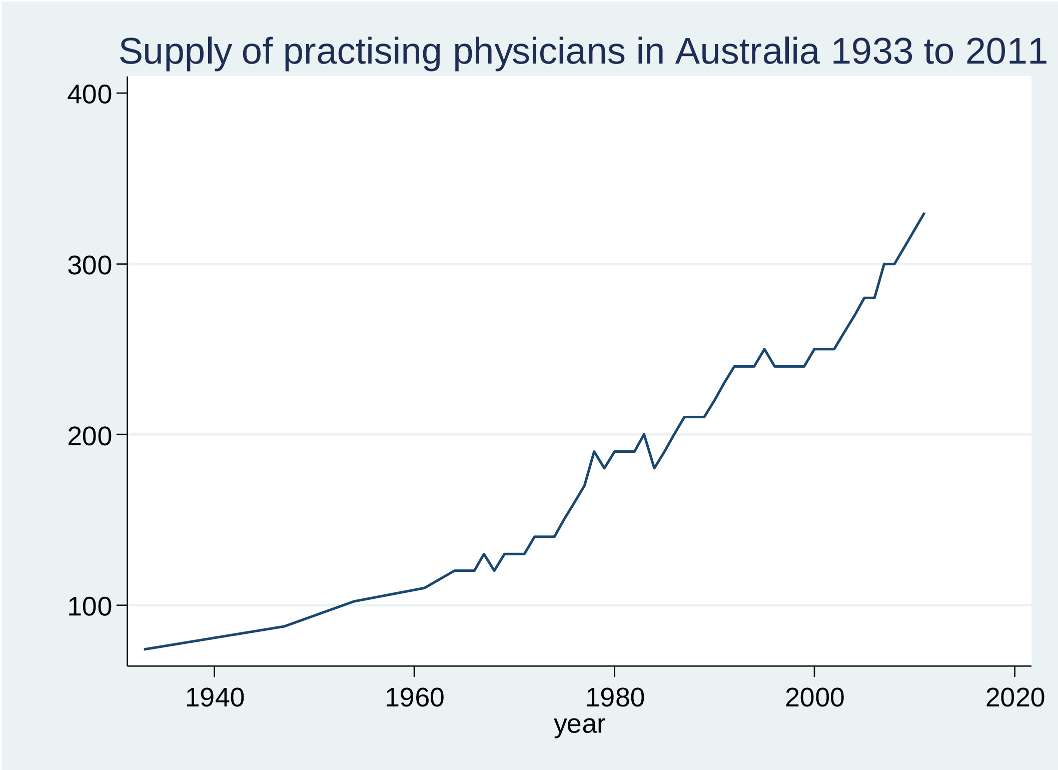
i. Doctors

Over the past several decades there have been large increases in the overall numbers of Australian doctors (Organization for Economic Co-operation and Development, 2014). Consequently, Australia does not currently have an overall *critical* shortage of doctors when compared with many other World Health Organization (WHO) member states. However, most developed countries, Australia included, would aspire to achieve greater population health coverage and better population health outcomes than could be achieved with global minimum PPR thresholds as defined by *"The World Health Report 2006: Working Together for Health*". More appropriate comparators for Australian levels of overall health worker supply are other OECD countries. Australia has a ratio of approximately 330 doctors per 100,000, which is close to the average for OECD and emerging countries of 320 doctors per 100,000 (Organization for Economic Co-operation and Development, 2014). Indeed many comparable countries have lower PPRs than Australia, including New Zealand (260), Canada (240), United States of America (USA) (250) and United Kingdom (UK) (280).

Graphing historical trends in practising doctor PPRs for Australia reveals rapid recent growth in doctor PPRs in Australia (related to increased numbers of domestic medical graduates and high numbers of International Medical Graduates (IMGs) migrating to Australia). Periods of low growth in PPRs are also evident for the five or so years around 1980 and again in the late 1990's (see Figure 2.3), reflecting the often cyclical nature of perceptions of workforce supply adequacy and government workforce planning responses.

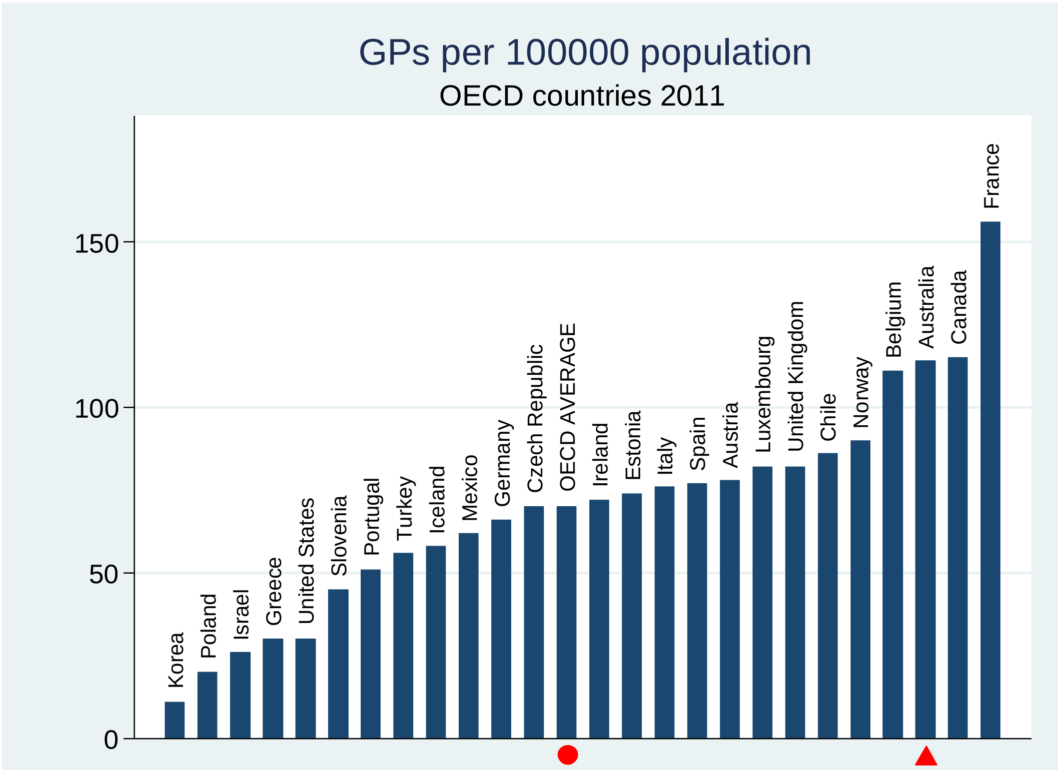
Whilst the most recent PPR data for doctors indicate that Australia currently has an adequate overall supply of doctors by OECD standards, it is also important to specifically consider the overall supply of PHC doctors, that is, GPs in Australia. 2011 OECD PPR data for GPs, as shown in Figure 2.4, reveal that Australia (marked with a red triangle) had 114 GPs per 100,000 population which compared with the OECD average of 70 (marked with a red circle) (Organization for Economic Co-operation and Development, 2014). Australia's PPR for GPs was, however, almost the same as Canada's (115). Canada is an important country with which to benchmark Australia's health worker supply, because of the many similarities with regard to geography and population dispersion and also similarities in the structures of the health systems in each country.

Figure 2.3 Practising Australian physicians per 100,000 population 1933 to 2011



Sources: (Organization for Economic Co-operation and Development, 2014; Scotton, 1967)

Figure 2.4 GPs per 100,000 population in OECD countries



Source: OECD Stat Extracts for Health Care Resources (Physicians by categories), 2011 (Organization for Economic Co-operation and Development, 2014)

Nevertheless, a range of differences in the structure of health systems exist, including the balance of specialists to GPs, and the mix of doctors to other types of health professionals. These factors make it difficult to draw strong and valid conclusions about the adequacy of Australian health worker supply levels on the basis of international comparisons (even with other OECD countries) of PPRs alone.

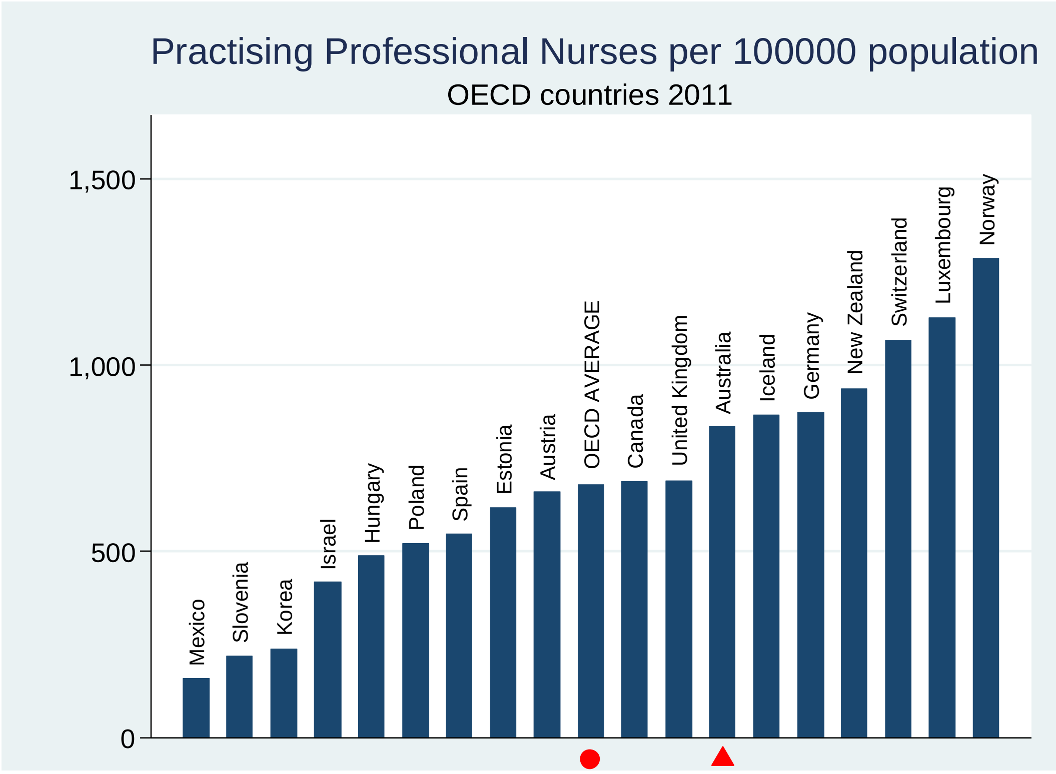
Therefore, even given evidence that current GP PPRs are comparable or slightly better than those of other OECD countries, controversy remains about the adequacy of GP supply. Birrell, for example, argues that GPs are in oversupply in Australia, using selective evidence related to current bottlenecks in the GP supply pathway (increased competition for GP Registrar places, increased competition for prevocational hospital positions), and the rapid expansion of commercial organisations such as Tristar to support his argument (Birrell, 2011, 2013). Australia's national agency for health workforce reform, Health Workforce Australia (HWA), on the other hand, currently asserts that there is an overall GP workforce shortage. These claims are based on alternative indicators of adequacy of supply: current GP vacancies, waiting times to see a GP and expert opinion from jurisdictions, private employers and GPs themselves (Crettenden et al., 2014; Health Workforce Australia, 2012c).

ii. Registered Nurses and midwives

According to available OECD data, Australia had 138 midwives per 100,000 women in 2011, which was approximately double the OECD average of 70 midwives per 100,000 women, and the fourth highest overall (Organization for Economic Co-operation and Development, 2014). 2011 OECD data on practising nurses indicate that Australia has 1,010 nurses per 100,000 population, which is just above the OECD average of 880 nurses per 100,000 population. Similarly, Australia has more practising Professional Nurses compared to the OECD average (see Figure 2.5). These PPR statistics therefore suggest that the current supply of nurses is well balanced by OECD standards, whilst there may be a relative oversupply of midwives compared to other OECD countries.

Other data sources reveal similar PPRs for nurses: the overall national supply of employed nurses and midwives was 1,120 FTE nurses and midwives per 100,000 population in 2012 (Australian Institute of Health and Welfare, 2013c). However, national statistics are not specifically reported for nurses and midwives providing PHC in Australian Institute of Health and Welfare (AIHW) and OECD reporting, nor in the nursing workforce modelling undertaken by HWA, so it is not possible to assess the extent to which the overall PHC nursing or midwifery workforce supply is adequate based on PPRs (Australian Institute of Health and Welfare, 2013c; Health Workforce Australia, 2012a, 2012b; Organization for Economic Co-operation and Development, 2013).

Figure 2.5 Practising Professional Nurses per 100,000 population in OECD countries



Source: OECD Stat Extracts for Health Care Resources (Nurses), 2011 (Organization for Economic Co-operation and Development, 2014)

Labour market research indicates that Australia has experienced national overall shortages of registered nurses and midwives almost continuously between 1986 and 2011, which have only abated in the past year or two (Australian Government Department of Education Employment and Workplace Relations, 2013; Australian Government Department of Employment, 2014). These conclusions are based on Department of Education, Employment and Workplace Relations (DEEWR) surveys of employers who have recently advertised, from which the following indicators of adequacy of supply were calculated: proportion of vacancies filled, the number of applicants per vacancy and the number of suitable applicants per vacancy.

iii. Allied Health Practitioners

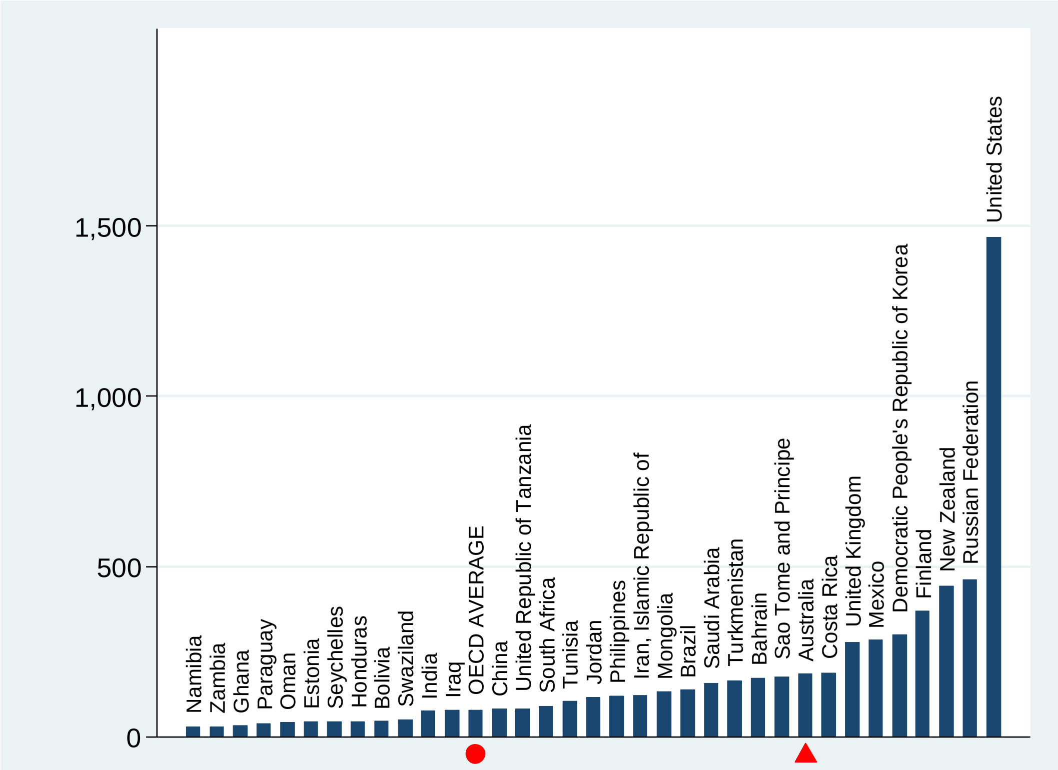
As elaborated in Sub-section 2.3.3, for a variety of reasons, the allied health professions are challenging to enumerate. This makes it difficult to benchmark the Australian supply of AHPs against the supply of AHPs in other countries, particularly since many allied health professions are not included in Australia's National Registration Accreditation Scheme (NRAS). As a result, there are few data available on the adequacy of Australia's national supply of AHPs (Allied Health Professions Australia, 2013; Mason, 2013).

Nevertheless, comparisons are possible using data from the *'World Health Report 2006'*, although the many limitations of these data must be acknowledged (World Health Organization, 2006). According to these data, the supply of AHPs in Australia, at 185 'Other' health workers per 100,000 population, was the 9th highest of all countries (see Figure 2.6 which shows 34 countries with the highest reported PPRs, the average PPR (marked with a red circle) for 'Other' health workers amongst the 84 countries providing data, and Australia's PPR (marked with a red triangle).

Some recent OECD data are also available for specific allied health professions. These data indicate that Australia has near average supply of physiotherapists (see Figure 2.7), slightly above average supply of practising pharmacists (see

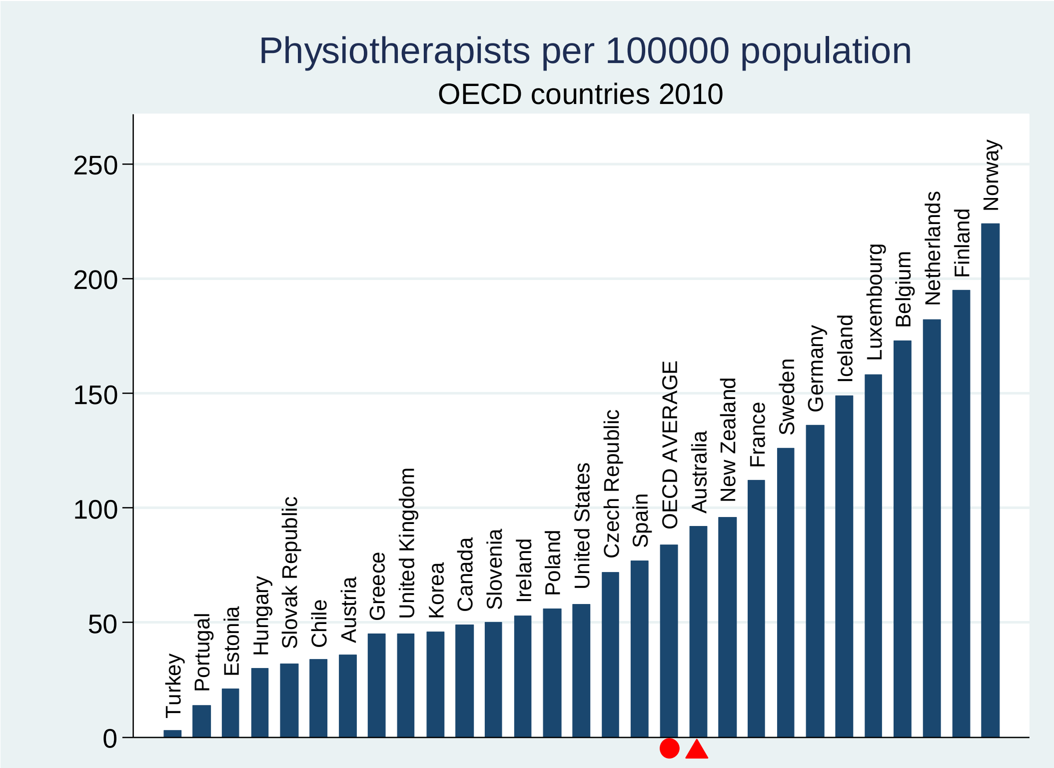
Figure 2.8) and a slightly below average supply of practising dentists (see Figure 2.9) compared to the mean PPRs in all OECD countries for which data were available.

Figure 2.6 'Other' health workers per 100,000 population in UN Member States



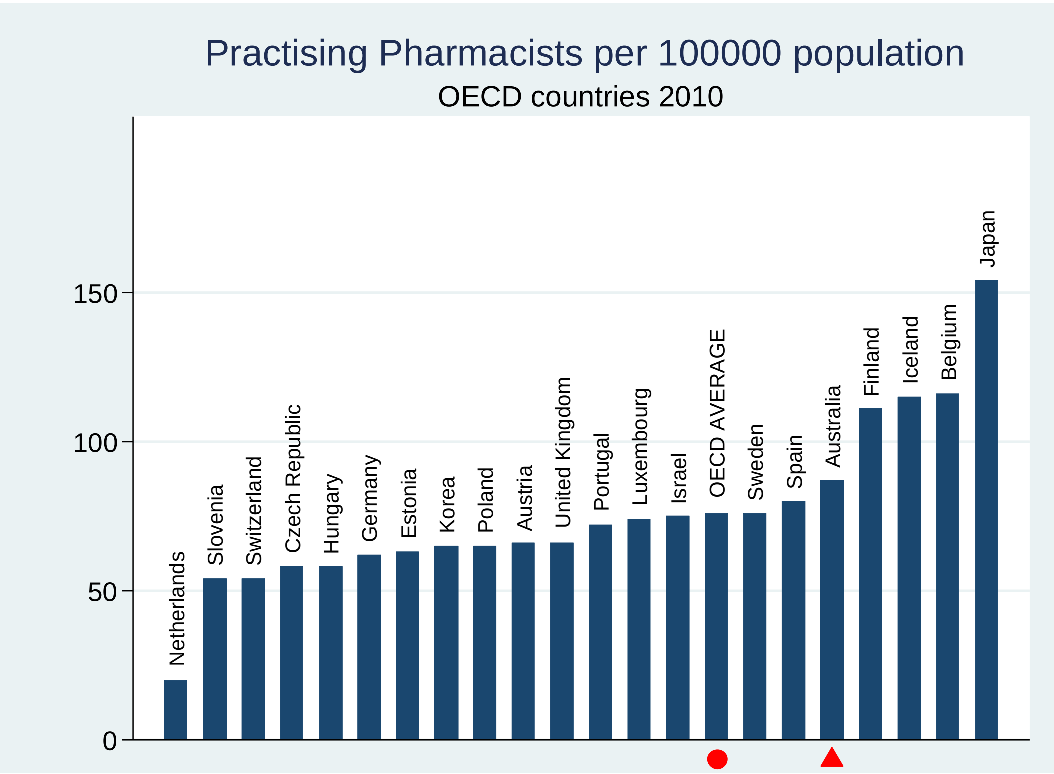
Source: (World Health Organization, 2006)

Figure 2.7 Physiotherapists per 100,000 population in OECD countries



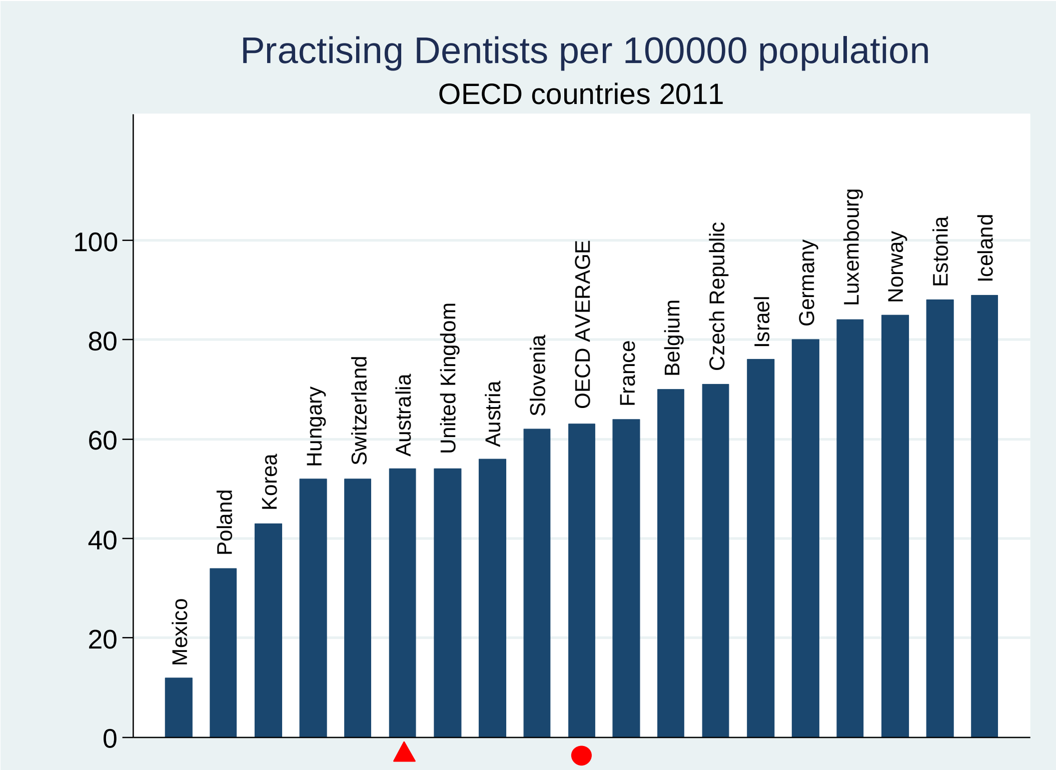
Source: OECD Stat Extracts for Health Care Resources (Physiotherapists), 2010 (Organization for Economic Co-operation and Development, 2014)

Figure 2.8 Practising Pharmacists per 100,000 population OECD countries



Source: OECD Stat Extracts for Pharmacists, 2010 (Organization for Economic Co-operation and Development, 2014)

Figure 2.9 Practising Dentists per 100,000 population OECD Countries



Source: OECD Stat Extracts for Dentists, 2011 (Organization for Economic Co-operation and Development, 2014)

Table 2.4 shows current (2011) and past (2006) national PPRs for eight health professions included in the NRAS (Australian Institute of Health and Welfare, 2013a). As can be seen, the NRAS data do not capture many important allied health professions, including speech therapy, dietetics, audiology and social work. There is also a lack of agreed national or international benchmarks for allied health PPRs for each of the professions. Therefore, whilst it is evident that there is an enormous range in PPRs across professions, the extent to which the supply is adequate in any allied health profession is not clear from current PPR data alone. It is evident, however, that PPRs for AHPs increased faster between 2006 and 2011 compared with PPRs for generalist medical practitioners, dentists, midwives and registered nurses.

The finding of improvements in the overall supply of AHPs is consistent with labour market research by DEEWR which shows recent improvements in labour market supply for most of these professions (Australian Government Department of Employment, 2014). Nevertheless, DEEWR data indicate that Australia has experienced national overall shortages for clinical psychologists, pharmacists, physiotherapists, occupational therapists, optometrists, podiatrists, audiologists and speech therapists in at least 5 and up to 9 of the past 10 years. OECD comparative data and DEEWR data tend to indicate that, at least for some allied health professions, Australia has recently moved to have an overall adequate supply.

Table 2.4 Provider to Population Ratios for selected health professions 2006 and 2011 Census data

Allied health profession	Health professionals per 100,000 population in 2006	Health professionals per 100,000 population in 2011	Growth in PPRs between 2006 and 2011 Censuses (%)
Occupational therapists	34	43	25
Physiotherapists	62	74	20
Podiatrists	11	13	23
Chiropractors and Osteopaths	17	20	22
Dental practitioners	46	51	12
Generalist Medical Practitioners	178	202	13
Midwives	62	66	6
Registered Nurses	821	962	17

Data sources: ABS 2006 Census of Population and Housing, 2006. ABS 2011 Census of Population and Housing, 2011. Data generated using ABS TableBuilder (Australian Bureau of Statistics, 2006, 2011)

To summarise, whilst many nations have overall critical shortages of PHC workers, current data indicate that Australia has recently been able to attain an adequate overall supply of nurses and midwives, and most allied health professions. The supply of GPs, however, continues to garner controversy, although in balance is most probably also adequate. Clearly, an important and ongoing workforce planning issue will be to ensure that – as Australia's population ages, new technologies emerge, the health workforce itself ages, and other forces act on the supply and demand of PHC services – overall PHC worker supply in each of the professions, and especially of generalist health care providers, remains adequate.

However, it has been repeatedly argued that it is not the overall supply, but the *geographical distribution* of PHC workers that is the most critical workforce planning issue, from both a global and national perspective, particularly given the health outcome inequities experienced by rural and remote populations (Buchan et al., 2013; Chen, 2010; Dolea et al., 2010; Mason, 2013). Ensuring an equitable geographical distribution of the PHC workforce is particularly problematic for Australia due to its vast geographical size, the very low population density across much of the land mass, and the resulting substantially higher costs associated with delivering PHC services to widely dispersed rural and remote populations (Standing Council on Health, 2012).

The crucial importance of ensuring adequate PHC worker distribution is highlighted in the executive summary of the recent Australian review of Australian Government health workforce programs:

> *"The most significant health workforce issue, particularly in the area of general practice medicine, is not one of total supply but one of distribution, which is to say inadequate or non-existent service provision in some rural and remote areas, and to populations of extreme disadvantage, most particularly the Aboriginal and Torres Strait Islander communities and some outer metropolitan communities". (Mason, 2013, p. 6)*

Equally, access to PHC, particularly the spatial accessibility (which relates to the overall supply and geographical distribution) of PHC workers is also a highly ranking health priority for populations living in rural areas, who are frequently both vulnerable and disadvantaged (Committee on the Future of Rural Health Care, 2005; Standing Council on Health, 2012).

The next sub-sections, therefore, will explore historical and current geographical patterns of distribution of PHC workers.

2.3.5 International patterns of geographical distribution of PHC workers

Within the context of this thesis, the term 'geographical distribution' of PHC workers refers to how the overall supply of various types of PHC workers is spread within nations relative to the spread of population and their health needs and demands. Across the globe, 52% of the world population lives in metropolitan areas whilst 48% of the world population lives in rural areas (United Nations Department of Economic and Social Affairs, 2012). It is evident that substantial inequities exist in the geographical distribution of health workers: globally, the distribution of doctors is almost universally relatively higher in metropolitan areas and lower in rural areas, with 76% of doctors worldwide working in metropolitan areas, and only 24% in rural areas (Dolea et al., 2009). Whilst the geographical maldistribution of nurses is not quite as extreme as it is for doctors, nevertheless 62% of nurses worldwide work in metropolitan areas and 38% in rural areas, figures that contrast with the 52%/48% global population distribution (Dolea et al., 2009).

Patterns of geographical maldistribution of health workers are evident in developing, emerging and developed economies alike, especially for physicians. Amongst 31 OECD countries responding to the OECD Health System characteristics survey in 2012-13, the most frequent physician supply issue related to the geographical maldistribution of doctors. (Lafortune, 2013). In Canada and the USA, for example, 9% of the physicians work in remote and rural areas compared to 24% and 20% of their respective populations living in those areas (Committee on the Future of Rural Health Care, 2005; Dumont, Zurn, Church, & Le Thi, 2008). Moreover, rural-metropolitan differentials in the distribution of health workers have been reported since the early 1900's, and have tended to increase over the years (Ricketts, 2005).

What aren't as readily evident are the global patterns of distribution of AHPs. Dal Poz and colleagues reported considerably lower availability of information on the geographical distribution of 'Other Health Workers' (this term captures professions that in Australia would be referred to as AHPs) across the globe, with only 84 countries (out of 192 WHO Member States) able to provide information on their numbers of 'Other Health Workers' and only 55 countries providing data on the geographical (rural/metropolitan) distribution of any health workers (Dal Poz et al., 2007).

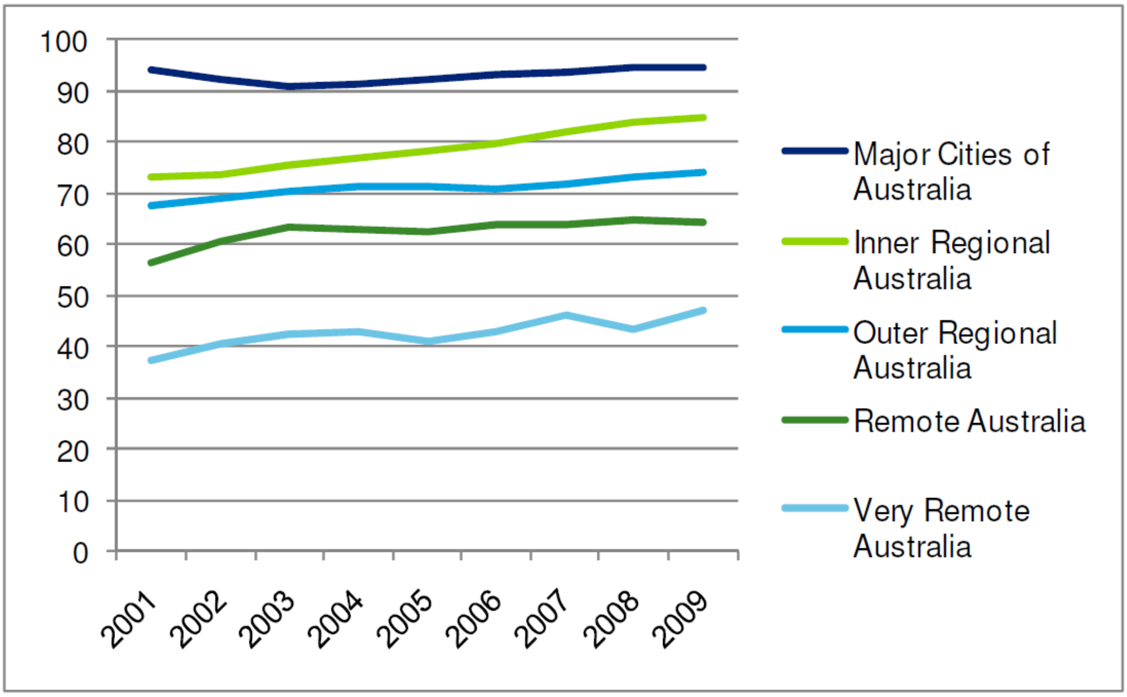
Despite these limitations in the extent of available data on the geographical distribution of AHPs, it seems likely that the patterns for AHPs are consistent with those found for doctors and dentists, with a comparative metropolitan oversupply (except perhaps in lower socio-economic suburbs) and a comparative rural undersupply. Wilson and colleagues showed that in the USA the geographical maldistribution of rehabilitation therapists (physical therapists, occupational therapists and speech-language pathologists) between 1980 and 2000 corresponded with areas designated as Health Professional Shortage Areas (HPSAs) for doctors, dentists and/or mental health workers. Additionally, they were able to show a pattern of increasing absolute differences between HPSAs and non-HPSAs in therapist supply with the passage of time (Wilson, Lewis, & Murray, 2009). Historical data from the USA Institute of Medicine corroborate this pattern of geographical maldistribution of AHPs, showing that for dietitians, speech therapists, physical therapists and occupational therapists the PPRs in rural areas are between 38% and 84% lower than PPRs in metropolitan areas (US Congress Office of Technology Assessment, 1990).

It is against this backdrop of long standing and serious geographical maldistribution of health workers, affecting many health worker professions and most nations of the world, that the research of this thesis is undertaken. The next sub-section explores the extent to which global patterns of geographical maldistribution of health workers have manifested in Australian rural and remote communities.

2.3.6 Australian patterns of geographical maldistribution of health workers

Patterns of geographical maldistribution of health workers between rural and metropolitan settings – with rural and remote areas experiencing a relative undersupply of health workers – have been consistently documented across Australia, especially for GPs (see Figure 2.10).

Figure 2.10 GP Full-time Workload Equivalent per 100,000 population



Source: Used with permission from Deloitte Access Economics (Deloitte Access Economics, 2011)

Workforce geographical maldistribution has also been documented for AHPs and, to a lesser extent, for nurses (Australian Institute of Health and Welfare, 2003; Australian Medical Workforce Advisory Committee, 1996, 2000; Australian Medical Workforce Advisory Committee & Australian Institute of Health and Welfare, 1998; Department of Health and Ageing, 1996, 2000, 2005; Joyce & Wolfe, 2005; O'Kane & Curry, 2003; Productivity Commission, 2005). These patterns of relative and absolute PHC workforce shortages in rural and remote areas of Australia have been long standing and independent of which classification system has been used to classify geographical remoteness. As can be seen from Figure 2.10, there were modest improvements in GP FWE PPRs in rural and remote Australia between 2001 and 2009, however outer regional and remote areas of Australia still had substantially fewer FWE GPs per 100,000 population in 2009 compared to major cities.

The Australian Government 2008 audit of the health workforce in rural and regional Australia found that nationally there were gradients with reducing adequacy of supply of GPs and dental workers as geographical remoteness increased, based on comparison of PPRs with those found in Major cities as shown in Table 2.5 and Figure 2.11 (Australian Government Department of Health and Ageing, 2008). The distribution of nurses, however, showed little variation according to remoteness. The 2008 audit also reported that

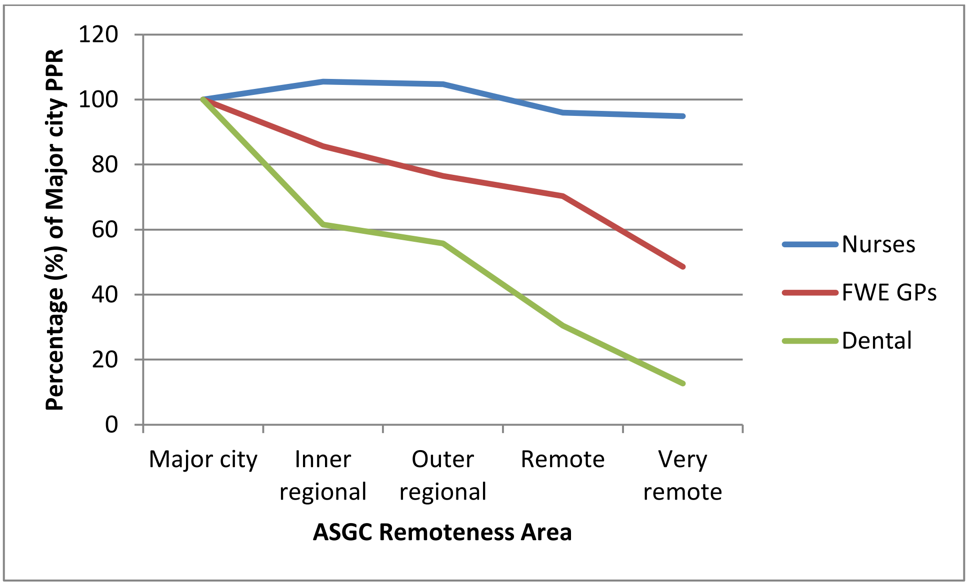
> *'The allied workforce is largely based within 'major cities', with low numbers working in more regional and remote areas'. (Australian Government Department of Health and Ageing, 2008, p. 18)*

Table 2.5 Australian health workers per 100,000 population by remoteness, 2005-2006

Provider	Major city	Inner regional	Outer regional	Remote	Very remote
Nurses	1136	1199	1190	1090	1078
Fulltime Workload Equivalent (FWE) GPs	97	83	74	68	47
Dental workers	174	107	97	53	22

Source: (Australian Government Department of Health and Ageing, 2008)

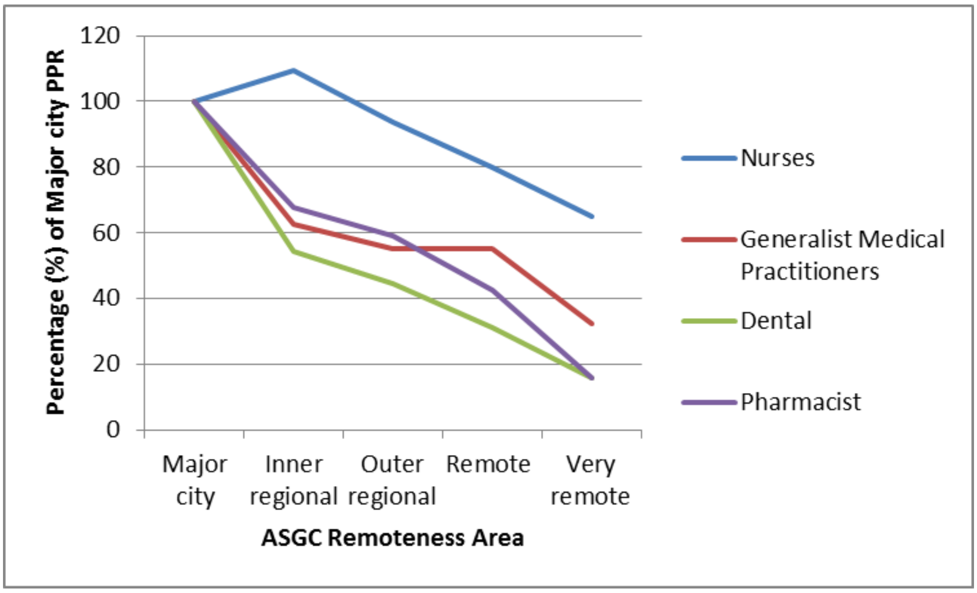
Figure 2.11 Distribution of GPs, nurses and dental workers by ASGC-RAs, 2005-2006



Sources: 2006 ABS Census data (dentists), AIHW Nursing and Midwifery Labour Force Survey 2005 (Nurses), 2006-07 Medicare data (doctors) as cited by (Australian Government Department of Health and Ageing, 2008)

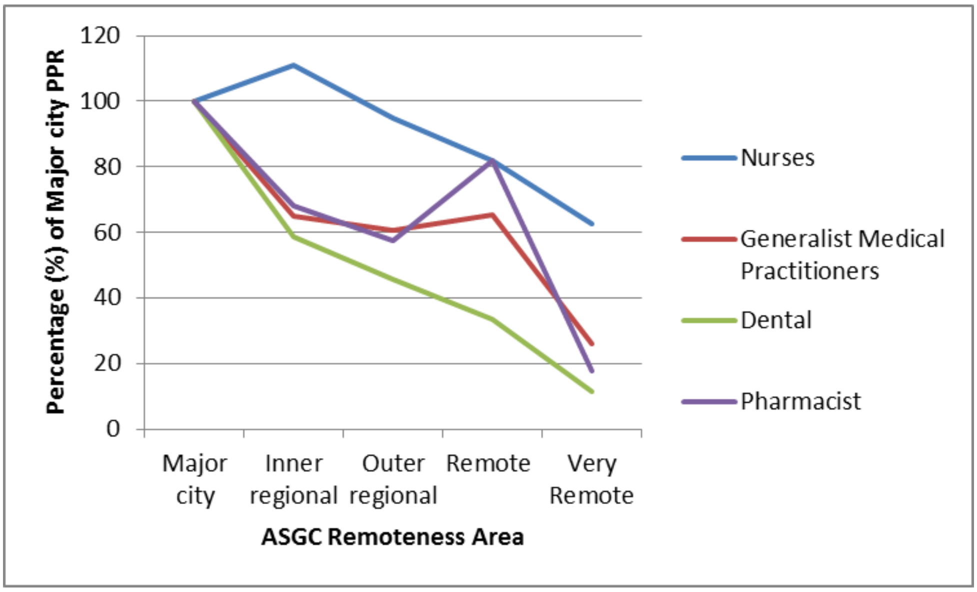
However, the audit did not substantiate claims of AHP geographical maldistribution by reporting PPRs or other statistics measuring workforce supply according to geographical location. Nevertheless, other data sources confirm marked gradients in PPRs according to geographical remoteness for most health care workers, including AHPs and nurses. As can be seen in Figures 2.12 to 2.15 overall there has been little change in the geographical distribution of PHC workers between the two most recent Australian censuses (Australian Bureau of Statistics, 2006, 2011). An exception to this overall observation is noted for pharmacists in remote Australia whereby a substantial increase in remote pharmacist PPRs as a percentage of major city PPRs is seen. Modest improvements in PPRs as a percentage of major city PPRs were also seen for very remote physiotherapists, and remote podiatrists, registered midwives (not shown) and generalist doctors.

Figure 2.12 Distribution of nurses, generalist doctors, dental workers and pharmacists by ASGC-RAs, 2006



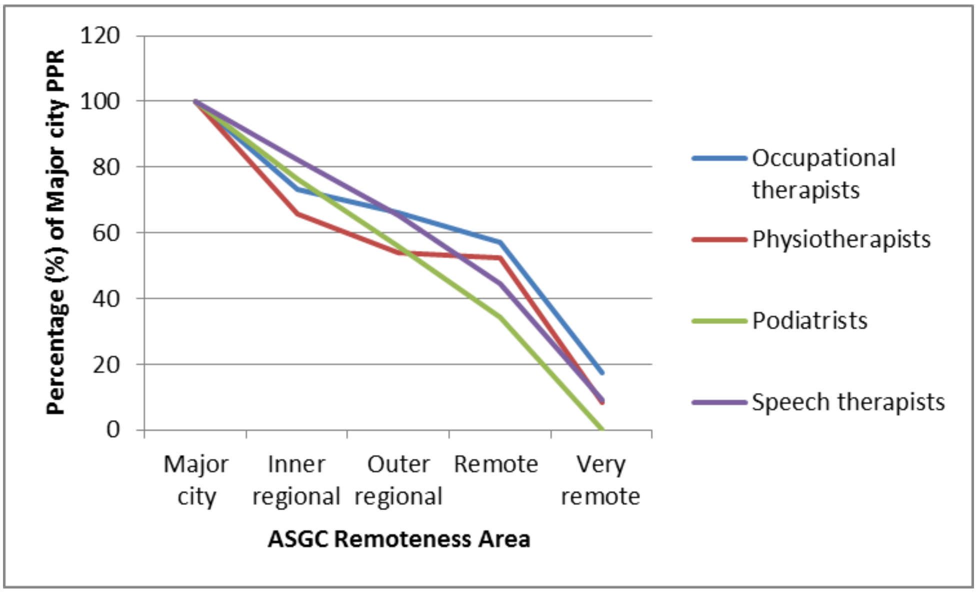
Source: (Australian Bureau of Statistics, 2006)

Figure 2.13 Distribution of nurses, generalist doctors, dental workers and pharmacists by ASGC-RAs, 2011



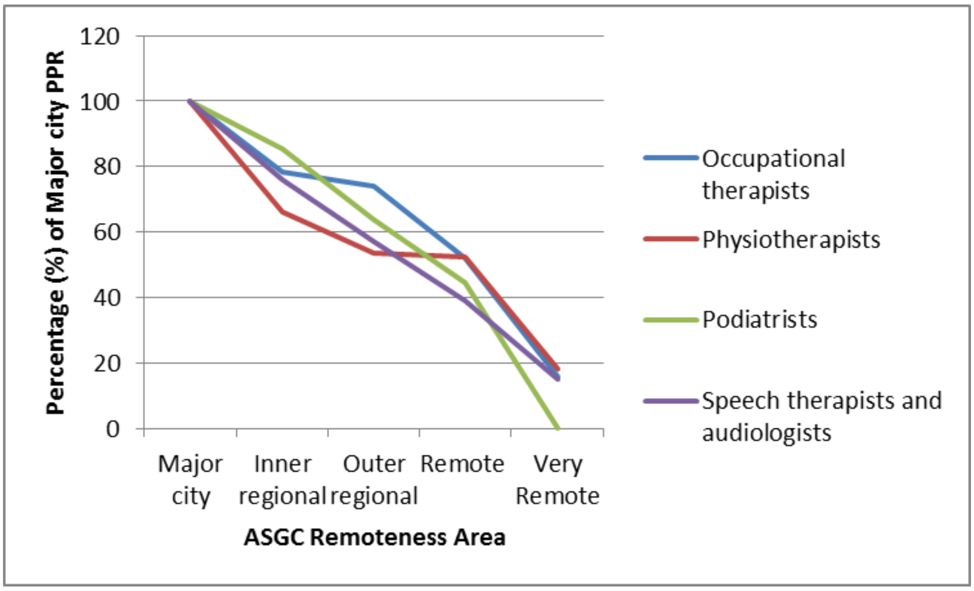
Source: (Australian Bureau of Statistics, 2011)

Figure 2.14 Distribution of selected AHPs by ASGC-RAs, 2006



Source: (Australian Bureau of Statistics, 2006)

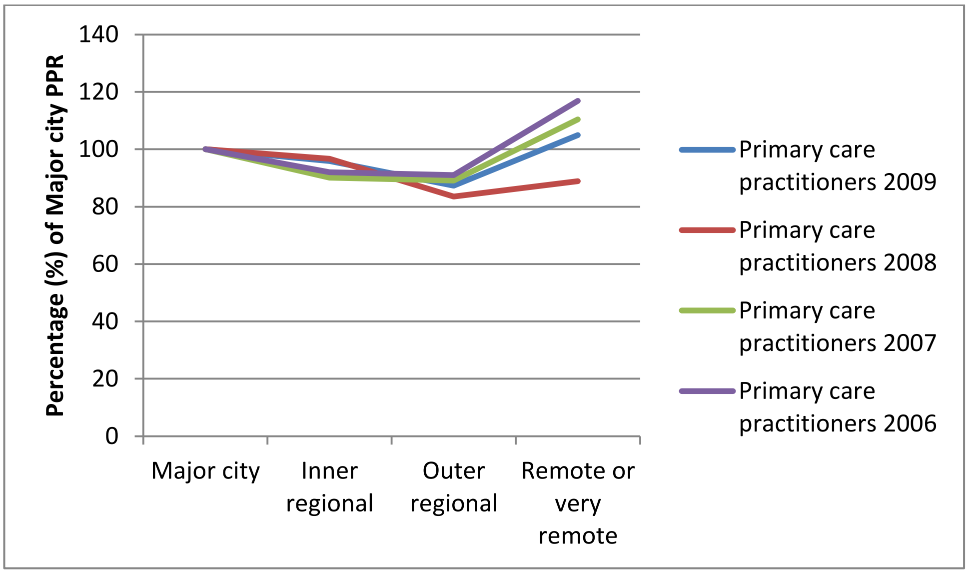
Figure 2.15 Distribution of selected AHPs by ASGC-RAs, 2011



Source: (Australian Bureau of Statistics, 2011)

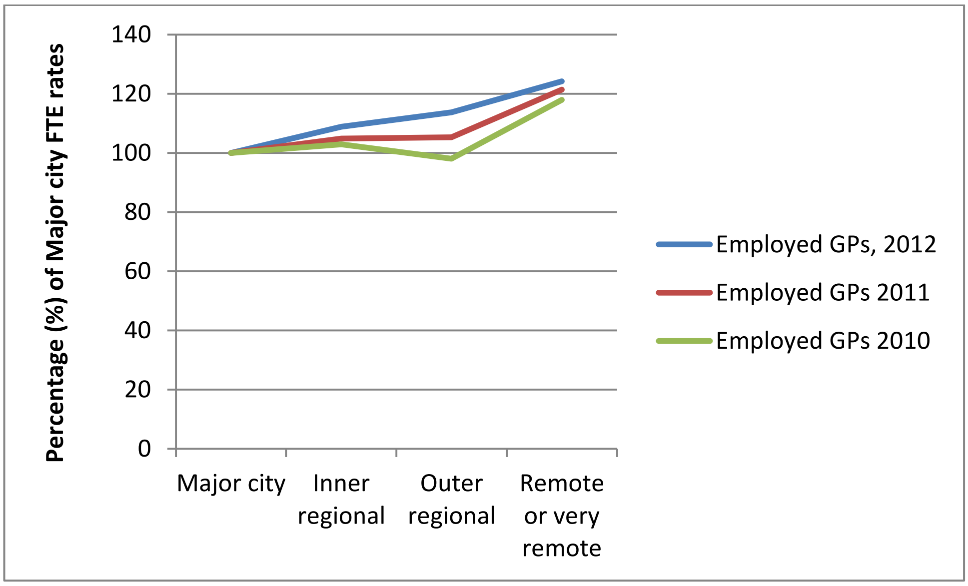
It must be noted, however, that not all Australian health workforce data analyses show a gradient of reducing PHC medical supply as remoteness increases. The findings reported in the AIHW Medical workforce annual series (or calculated using data provided in these reports) provide contrasting results which indicate that primary care practitioners or employed FTE GPs are relatively equitably distributed according to geographical location, going back as far as 2006 (see Figures 2.16 and 2.17).

Figure 2.16 Distribution of Primary Care Practitioners by ASGC-RAs, 2006 to 2009



Sources: (Australian Institute of Health and Welfare, 2010b, 2011, 2013b, 2014)

Figure 2.17 Distribution of FTE Employed GPs by ASGC-RAs, 2010 to 2012



Sources: (Australian Institute of Health and Welfare, 2012, 2013b, 2014)

It is not entirely clear why these AIHW analyses are so at odds with census and Medicare data on GP workforce supply. However, the AIHW workforce series are produced using data provided through voluntary participation in a medical workforce survey at the time of annual registration. The overall Australian response rates to the medical workforce annual surveys have ranged between 53% and 90% in the 6 years to 2012 and non-responses to questionnaire items further increase the extent of missing data (Australian Institute of Health and Welfare, 2014). It is possible, therefore, that survey response bias and imputation of missing values in the AIHW data may be factors that partially account for the different pattern of geographical distribution reported for GPs in AIHW medical workforce reports. It is also possible that Medicare data underestimate the overall supply of GPs, particularly in remote and very remote areas, where alternative funding models support the provision of medical care services that are not funded through Medicare. It is perhaps most likely, therefore, that the true geographical distribution of GPs in Australia lies somewhere between the patterns depicted in Figures 2.10, 2.12 and 2.13, and the patterns depicted in Figures 2.16 and 2.17.

Whilst most health worker groups demonstrate a negative gradient of supply according to geographical remoteness, with relative and absolute decreases in PPRs as ASGC-RA categories increase, the gradient of supply of AHWs is quite the reverse. Relatively more AHWs per 100,000 population work in remote and very remote areas compared to major cities. Calculations of ratios of AHWs to Aboriginal and Torres Strait Islander population according to ASGC-RA reveals a similar distributional pattern, with fewer AHWs per 100,000 Aboriginal and Torres Strait islanders in major cities and progressively more AHWs per 100,000 Aboriginal and Torres Strait islander as remoteness increases (see Table 2.6).

Evidence of widespread geographical maldistribution of most health worker professions (except in an inverse direction for AHWs) provided by calculating PPR differentials across ASGC-RAs is corroborated by researchers measuring PHC workforce distribution using alternative measures and scales of measurement. In 2000 Wilkinson's analysis of inequalities in access to GPs in ABS Statistical Divisions across Australia found marked differences in GP access between States and Territories, as well as substantial differences within States and Territories (Wilkinson, 2000). The capital cities of each State or Territory experienced up to 64% oversupply of all GPs once need was taken into account (Sydney) whilst rural and remote areas experienced as low as a 59% relative undersupply (NSW). Johnston and Wilkinson also demonstrated that geographical maldistribution of GPs in Australia increased between 1986 and 1996 (Johnston & Wilkinson, 2001).

Table 2.6 Aboriginal health worker supply by remoteness, 2006

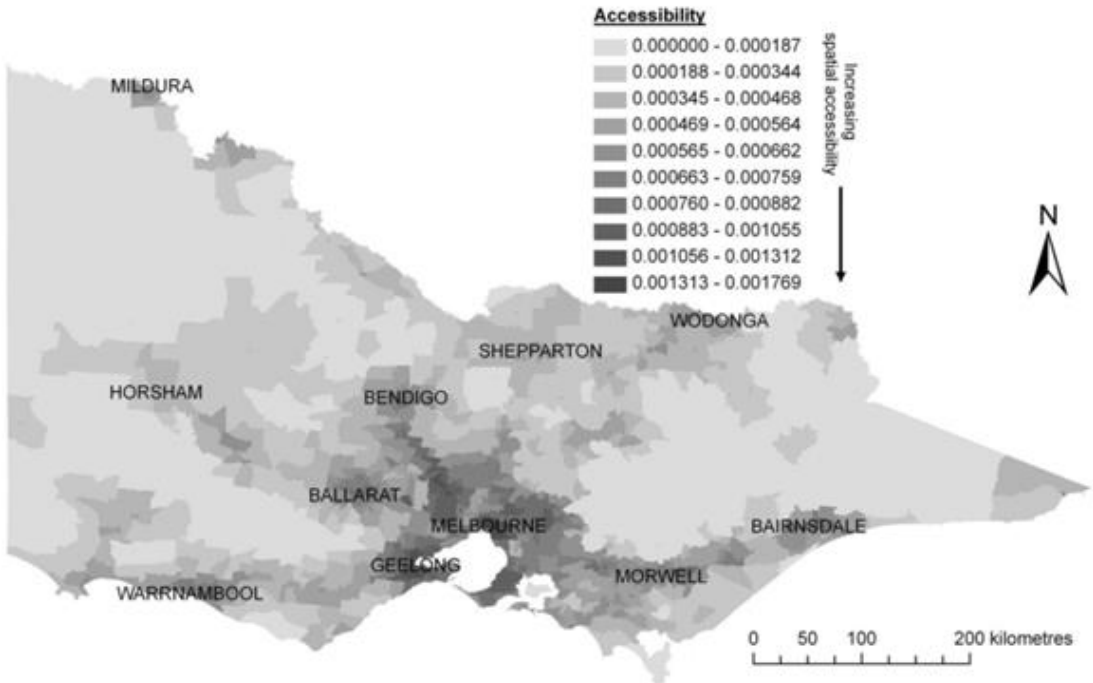
Provider	Major cities	Inner regional	Outer regional	Remote	Very remote
Aboriginal health workers per 100,000 population	1	4	10	50	190
Aboriginal health workers per 100,000 Aboriginal and Torres Strait Islander population	124	156	220	394	504

Source: ABS 2006 Census of Population and Housing, 2006. Data generated using ABS TableBuilder (Australian Bureau of Statistics, 2006)

Sophisticated methods based on geospatial analysis have also been used to measure distribution of health care providers as a component of population access to PHC care. McGrail and Humphreys' mapping of the accessibility of access to GP care in Victoria (see Figure 2.18), for example, uses the 'Two Step Floating Catchment' method and similarly reveals a gradient of access to GPs as remoteness increases, albeit with small area variations on this overall pattern (McGrail & Humphreys, 2009b).

A great range of other, more indirect indicators of rural and remote PHC provider supply adequacy also support the conclusion that rural and remote Australia is relatively and absolutely undersupplied with PHC providers. Wells, in 2000, showed a gradient in the proportion of Medicare claims for GP services that were provided in the same region: a substantially smaller proportion (65%) of patients in 'other remote' areas received GP services in their region compared with patients in 'major cities' (98%) (Wells, 2000). Other indicators showing similar gradients according to geographical location included bulk-billing rates, Medicare expenditures for GP visits, hours worked by doctors, nurse substitution and use of temporary resident doctors.

Figure 2.18 Spatial accessibility of GPs in Victoria



Source: Reproduced with permission from (McGrail & Humphreys, 2009b)

In order to better understand these differences in the geographical distribution of health workers, it is critical to dissect the issue further by undertaking analysis according to the subcomponents of workforce supply. As previously discussed, and depicted in Figure 2.1 supply is related to pre-existing stocks of health workers and subsequent rates of recruitment, turnover and retention. When aiming to build up stocks of rural and remote health workers from historically low baselines, it is imperative that the rates at which health workers leave rural and remote areas are less than the rates at which they are recruited to those areas. It is also important, as discussed in Sub-section 2.2.1, that both rates are sufficiently low so as to ensure that health workers are retained in rural and remote communities for optimal lengths of time, thus enhancing interpersonal continuity of health care.

The focus of this thesis is on the turnover and retention sub-components of supply. Detailed examination of the patterns of rural health worker recruitment, whilst acknowledged as being crucial to rural and remote health workforce planning, is not within the scope of this thesis. Readers wishing to explore the recruitment aspect of Australian rural and remote PHC worker supply are referred to the seminal papers of Strasser on rural GPs (Strasser, 1992a, 1992b) as well as to more recently published HWA research on the recruitment of nurses and AHPs to rural and remote Australia (Morell, Kiem, Millsteed, & Pollice, 2014) and the work of Hawthorne on IMG recruitment (Hawthorne, 2011; Hawthorne, 2012).

The next section, therefore, examines what is already known about the patterns of turnover and retention amongst Australian rural and remote PHC workers.

2.4 Patterns of rural Australian health worker turnover and retention

2.4.1 Patterns of Australian rural health worker turnover

Current Australian rural and remote health workforce strategy documentations recognises that high levels of staff 'burnout' and turnover are a commonly reported barrier to delivering health care in rural and remote Australian health services (Health Workforce Australia, 2013b). However, HWA also acknowledges, in the same document, a lack of detailed workforce data on specific professions, especially AHPs, for rural and remote areas. This lack of data extends to information about levels of turnover and length of retention of health workers in rural and remote Australia. The existing evidence-base about rates of health worker turnover and retention experienced in rural and remote Australia is piecemeal and incomplete. Just as a range of different retention profiles are relevant and of interest for different policy-making and workforce planning purposes, so too it is also important to consider a range of different turnover profiles (for example, turnover from rural health services, turnover from rural communities, turnover from each ASGC-RA category). However, published turnover statistics do not comprehensively address different turnover profiles. Additionally, some of the existing statistics are quite dated. Nevertheless, in the absence of more recently published information, they may be broadly indicative of current health worker turnover patterns.

In the peer-reviewed rural and remote Australian health workforce literature, the work of Adikhari and colleagues is a rare example of national analysis of turnover patterns (Adikhari, Calcino, & Dickinson, 1993). Adikhari and colleagues analysed Medicare data from 1991, and found a gradient in the turnover of GPs according to the geographical remoteness category (defined at that time according to the Rural and Remote Areas classification) (Adikhari et al., 1993). In general, the turnover of doctors increased as the Rural and Remote Areas classification level increased (although the 'remote major' category, which comprised larger communities with a population size >20,000, was an exception to the pattern). Turnover from 'rural other' locations (population size <10,000) and remote areas was higher than in metropolitan or major rural centres. Amongst cohorts of recent graduates a gradient of turnover risk was noted, whereby the risk of leaving an initial practice was higher for doctors in more geographically remote practices, and when GPs left their initial practice, they moved to less geographically remote locations. Turnover rates were similar for female and male recent graduates. Overall GP turnover was reported to be 'relatively low' for most areas and 'higher' in remote areas, however no objective turnover statistics were reported to quantify these assertions.

Various government reports, at both national and jurisdictional levels, have also reported on turnover patterns amongst rural and remote PHC providers in an *adhoc* way. In 1996, the Australian Medical Workforce Advisory Committee (AMWAC) and DOHA reported on the analysis of Medicare data, showing that since 1987 Australian GPs and 'Other Medical Practitioners' experienced annual turnover levels averaging 13% in metropolitan areas, 14% in rural areas, and around 30% in remote areas (Australian Medical Workforce Advisory Committee, 1996; Department of Health and Ageing, 1996). During the decade 1985 to 1995 an upward trend in GP turnover rates was noted in remote areas. Since that time, national reports have referred to high turnover rates of both rural and remote GPs and appropriately skilled nurses, especially in certain settings such as Aboriginal Controlled Community Health Services (ACCHSs), however few turnover statistics have been reported (Australian Government Department of Health and Ageing, 2008; Australian Medical Workforce Advisory Committee, 2005; Productivity Commission, 2005). More recent national workforce reports, however, neither comment on, nor report, turnover statistics (Australian Institute of Health and Welfare, 2013a, 2013c, 2014).

Jurisdictional reporting of rural and remote GP turnover patterns has been undertaken in a regular, systematic way by the Western Australian RWA since its inception. However, this is the exception rather than the rule. The reporting of rural and remote GP turnover in Western Australia (WA) undertaken by Rural Health West reveals that between 2002 and 2013 annual turnover rates (leaving rural and remote WA) for all GPs varied between 11.1% and 15.9% with a mean annual turnover rate of 14.0% (Rural Health West, 2010, 2013). Turnover rates were more than twice as high, on average, in Aboriginal Medical Services during this period, ranging between 14.3% and 45.9%, with a mean annual turnover rate of 34.4%. Rural Health West workforce analyses also reveal a gradient with increasing annual turnover rates as geographical remoteness increases (as measured by ASGC-RA) (Rural Health West, 2013). In 2013, for example, annual turnover of GPs was 10.4% from inner regional areas, 12.5% from outer regional areas, 24.6% from remote areas and 27.4% from very remote areas. These patterns of increasing turnover rates as geographical remoteness increases concur with the findings of Adikhari and colleagues 20 years earlier.

Garnett and colleagues reported on turnover rates of nurses and midwives employed by the NT Department of Health and Families (DHF), demonstrating that in the 9 years from 1994 to 2002 annual turnover was between 55 and 68%, but steadily declined to nearly 40% between 2002 and 2006 (Garnett et al., 2008). Queensland Health also reported a 20% mean annual turnover rate for Queensland Health permanent nurses between 1993 and 1998 (Queensland Health, 1999). However, 7 rural or remote Health Service Districts were identified which were experiencing far higher annual turnover rates than the average, ranging from 27% to 58%. Age was reported as having an important but non-linear association with turnover, with annual turnover averaging 31.85% amongst 20-29 year old Queensland Health nurses, 12.5% amongst 40-59 year olds and 25% amongst 60-69 year olds. A further pattern was revealed in this analysis, whereby turnover rates progressively decreased as length of service with Queensland Health increased (up to 10 years' service). Turnover patterns did not vary according to gender.

Data reporting annual turnover rates for rural and remote AHPs are scant. In 2000, Queensland Health reported higher turnover for AHPs than for all other health employment groups except doctors, whilst a Western Australian Allied Health Taskforce on Workforce Issues in 2002 was unable to calculate turnover statistics due to a lack of reliable AHP turnover rate data provided by health services in response to their survey (Paskevicius, 2002; Queensland Health, 2000). The Tasmanian State Health Department reported turnover rates for a range of individual allied health professions using 2001-02 data on publicly employed AHPs. Annual turnover was considered to be low for some allied health professions, such as psychologists (6%), moderate for others, such as social work (13%) and speech pathologists (16%), and high for physiotherapists (28%), occupational therapists (25%), podiatrists (22%), orthotists and prosthetists (21%) and dietitians (21%) (Tasmania Department of Health and Human Services, 2003). Data from the NT Department of Health and Families (NTDH&F) from 2007-08 also shows that annual turnover rates for AHWs employed by NTDH&F was 16.9%, which was considered to be 'not extremely high' in comparison to the turnover of members of other health profession groups in NT (Human Capital Alliance for Northern Territory Department of Health & Families, 2009). Whilst the numbers in some health professions are small and the figures are only reported for single financial years, these figures indicate that patterns of turnover differ according to allied health profession and according to geographical context.

A further important turnover pattern hinted at in the 2003 Tasmanian health department report was the low turnover rates of AHPs in senior positions, which tended to hinder career progression of more junior AHPs within the department (Tasmania Department of Health and Human Services, 2003). So, too, the NTDH&F reports that turnover rates are higher amongst AHWs on the middle pay classification levels, as well as amongst younger or newly commenced AHWs (Human Capital Alliance for Northern Territory Department of Health & Families, 2009). The analysis methods, however, precluded teasing out the degree to which any of these factors had an independent association with AHW turnover. Nevertheless, the limited data available for AHPs indicate that the association between AHP or AHW career progression and turnover or retention warrants further investigation.

2.4.2 Patterns of Australian rural health worker retention

As indicated in the previous section, Australian rural health worker retention is not systematically or comprehensively reported upon, either in the black or grey literature. Whereas the reporting and comparison of health worker turnover is simplified by the regular use of a single metric (annual turnover rates), identifying consistent patterns of health worker retention is made more difficult by the use of a range of different retention metrics.

Nevertheless, some patterns are evident. Rural Health Workforce Australia (RHWA) (the national peak body for the RWAs) report that there is a gradient in the retention of rural and remote GPs across ASGC-RA or RRMA categories: the proportion of GPs who have been in their current role for less than 2 years is 43% in very remote Australia, 41% in remote Australia, 36% in outer regional Australia and 35% in inner regional Australia. In 2008, Garnett and colleagues found differences in nurse retention according to geographical remoteness: NTDH&F employed nurses in non-remote community health positions had higher stability rates after 1 year (76.2%) than nurses in remote health positions (68.8%) (Garnett et al., 2008).

Health Workforce Queensland data also demonstrate differences in retention patterns between domestically trained rural and remote GPs and overseas trained doctors (Health Workforce Queensland, 2013). A greater proportion (71.5%) of overseas trained doctors, for example have been working in rural and remote Queensland for less than 5 years, compared to 42.3% of domestically trained GPs (and the proportions reverse for lengths of stay in excess of 10 years).

Recent national and jurisdictional data on rural and remote GP retention provided by RHWA and NSW Rural Doctors Network also indicate that there are differences in retention according to jurisdiction: the national average length of stay in current principal practice is 7.6 years whilst the NSW average is 8.6 years (New South Wales Rural Doctors Network, 2013; Rural Health Workforce Australia, 2013). Jurisdictional differences in AHP retention have also been found, with a far greater proportion (52.7%) of AHPs in Western Australia having been in their current location for less than 2 years compared with AHPs in NSW (37.4%) or Victoria (27.8%), for example (Fitzgerald, Hornsby, & Hudson, 2000).

Differences in retention according to rural health worker profession are also evident in the literature, although the evidence is patchy. A 2002 report on the retention of AHPs in a rural Victorian health district, for example, found an average length of employment in their current health service of 1.5 years for Podiatrists, compared with 2.2 years for Occupational Therapists, 2.8 years for Speech Therapists, 3.7 years for Dietitians and 4.2 years for Physiotherapists (Data & Performance Evaluation Unit Loddon Mallee Region Department of Human Services, 2002). Unfortunately, it is infrequent that different professions are compared within the same study, and often retention statistics reported in different studies are not truly comparable because of factors such as different metrics, different sources of data, and other contextual differences that limit study comparability.

There is a dearth of studies which report on the probability of Australian rural or remote health workers being retained in a position, or on the median survival time for rural and remote health workers. The research by Garnett and colleagues on nurses employed by the Northern Territory Department of Health and Families (NTDH&F) is an exception (Garnett et al., 2008). However, unfortunately, the survival data were only presented in a graphical format, so estimates of the numerical figures for median survival (time until half the population have left NTDH&F) are all that is available. Nevertheless, it can be estimated that on average, NTDH&F nurses remain with DH&F for just under 20 months. Minor differences in retention were also seen according to health service type, however no tests for significance of these differences were reported.

2.5 Summary of evidence and research gaps

This chapter has revealed systematic and fairly extensive reporting on the national stocks of health workers of various types – but particularly of doctors, albeit with some inconsistencies noted that relate to data quality. Overall the national supply of health workers continues to increase, as does the adequacy of this supply with respect to growth in population size, as was illustrated for Australian practising physicians in Figure 2.3. The adequacy of supply of PHC workers has been shown, however, to differ substantially according to the remoteness of a geographic location: there is substantial evidence of significant historical and current geographical maldistribution of Australian doctors, and a lesser, but nevertheless convincing level of evidence of geographical maldistribution of many allied health professions. An exception to this pattern was shown to exist for AHWs, whilst the supply of nurses showed a less marked gradient according to geographical remoteness.

Despite the long standing and critical nature of the geographical maldistribution of PHC workers, this chapter has revealed a relative dearth of measuring and quantitative reporting of the turnover and retention of these workers in rural and remote areas. As has been shown in the previous sections, there is limited current evidence about the patterns of rural and remote Australian PHC worker turnover and retention, and how patterns vary according to a range of different factors. There is some evidence to support associations between certain factors (including geographical location and population size, health worker profession, health worker age, career grade, country of training, jurisdiction and health service type) and turnover or retention. The data, however, are indicative of these associations rather than substantive – for instance, they lack information about the statistical significance and magnitude of effect of these associations. The methods used are also limited in their ability to adjust for multiple factors at once, so it is not clear, for example, the extent to which a factor such as health worker age may be confounding the associations of another factor, such as geographical location, with turnover or retention. These are important research gaps that require addressing with stronger methodological approaches, so that policymakers and workforce planners developing retention strategies can better understand what interventions might be most effective.

There is also a lack of normative benchmarks indicating what might be expected in terms of rural turnover or retention for different professional groups or in different geographical locations. Whilst there was some reporting of statistics for average length of stay in a current (rural) position, these data do not indicate how long, on average, until health workers leave that position. There are very few examples of published Australian rural retention studies that provide summary statistics of the probability of health workers remaining in a rural position. As a result, health service managers, health workforce planners and policymakers are often forced to rely on little more than anecdotal evidence, gut instinct or personal experience to inform their understanding of the length of stay that might be expected of different types of health workers in different geographical contexts, and the decisions they need to make in relation to this. Clearly the lack of normative retention benchmarks, especially for health worker median survival in rural positions, is a further important research gap that requires addressing.

The research reported in this thesis seeks to address these research gaps. In Chapter 3 a conceptual model is described and developed to underpin the rural and remote PHC worker turnover and retention research of this thesis. Chapter 3 additionally provides a comprehensive review and synthesis of the international literature investigating the specific factors associated with PHC worker actual retention in rural or remote areas. This includes highlighting the limiting features of the existing literature.

Chapter 3: Review of the literature

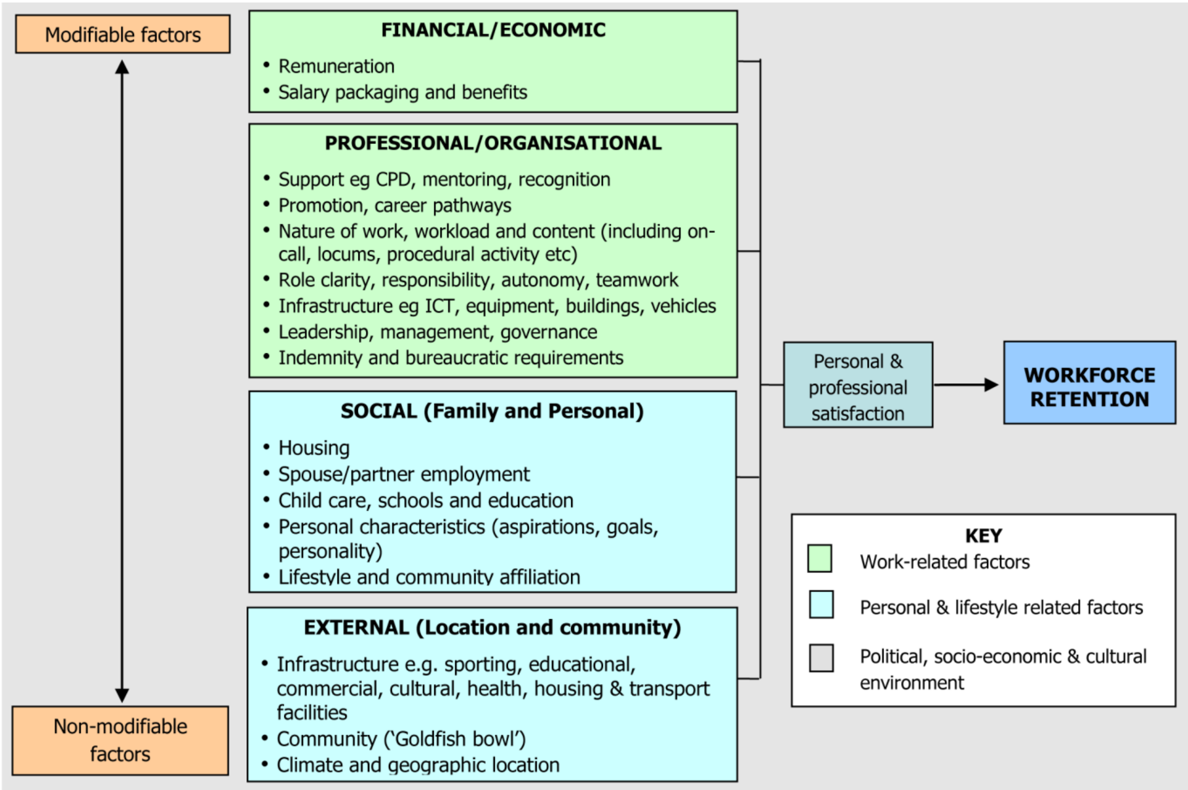
3.1 Conceptual framework and model of factors associated with turnover and retention

The literature on health worker turnover and retention in rural and remote contexts is not guided by a single, unifying conceptual approach. Rather, the literature encompasses a vast range of conceptual frameworks and models in attempts to determine what groups of factors are important, and to explain how different factors act to influence the decision-making of rural health workers about whether to stay or leave employment. Historical differences in the conceptual frameworks and models used relate to both the complexity and interconnectedness of the individual turnover and retention factors as well as to the differing purposes for which they were devised. For example, in some instances retention frameworks have been developed as a tool to help evaluate rural retention interventions (Buykx et al., 2010; Dussault & Franceschini, 2006). In other instances, the purpose of retention frameworks has been to help organise the broader rural recruitment, turnover and retention literature (Lehmann, Dieleman, & Martineau, 2008).

It is of little surprise, therefore, that within the Australian rural and remote health workforce retention literature, a variety of frameworks have usefully categorised and organised the distally antecedent factors associated with rural PHC worker turnover or retention. An early review of the literature on the retention of rural doctors by Hoyal, for example, organised retention factors into professional, family and community factors (Hoyal, 1995). Hays and colleagues also researched the retention of rural Australian doctors (Hays, Veitch, Cheers, & Crossland, 1997). Their research produced a conceptual model in which rural retention was the result of a dynamic interplay between influences to stay, influences to leave and the action of 'triggers'. Triggers acted to shift the dynamic balance between the various influences and led to doctors leaving rural practice. The framework used by Hays et al. considered retention factors to be professional, social and family, community or financial.

Humphreys and colleagues, in 2001, organised the factors associated with the retention of rural Australian doctors into professional, social (personal and family), and external (community and geographical) factors (Humphreys et al., 2001). Later work by Humphreys et al. (2009), substantially improved upon this conceptual framework. In the 2009 conceptual framework (see Figure 3.1) factors affecting rural retention of PHC workers included financial/economic, professional/ organisational, social (family and personal) and external (location and community) factors. Added to these were factors associated with the broader political, socio-economic and cultural environments in which health care was provided. Importantly, the conceptual framework proposed by Humphreys

Figure 3.1 Factors affecting retention



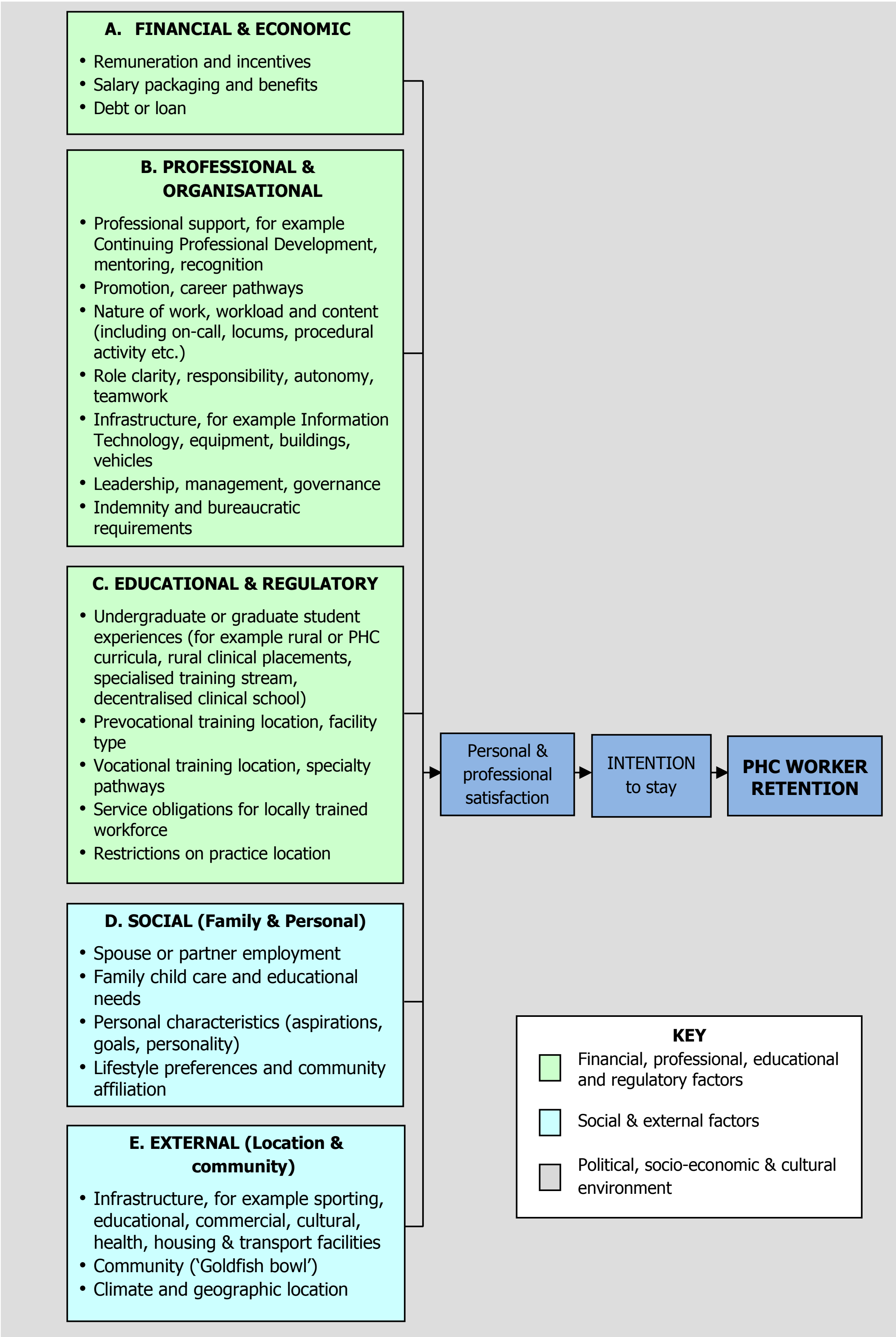
Source: Reproduced with permission from (Humphreys et al., 2009)

and colleagues shows that a broad range of distal factors act via personal and professional satisfaction to have an effect on the rural retention of health workers.

For the purposes of this thesis, the framework will be modified (see Figure 3.2) by adding a separate category for educational and regulatory factors. Educational factors which warrant investigation for their association with rural health worker retention include factors such as rurally oriented curricula, PHC oriented curricula, rural undergraduate practice learning experiences (placements, rotations), a decentralised location and specialised rural undergraduate training program. Educational exposures at prevocational and vocational stages of health workers' careers are also likely to be associated with subsequent rural retention. Within the Australian rural context, important regulatory factors have historically included restrictions applied to internationally trained workers which limit where they can practice, return-of-service obligations for graduates of Australian universities with bonded university places, and restrictions on access to Medicare provider numbers for non-vocationally registered doctors unless they work in certain locations.

It is the Russell conceptual model that underpins the analysis of the factors associated with turnover and retention undertaken in this thesis. The framework simplifies and organises the complex array of factors that contribute to workforce retention, and has been developed specifically with the Australian rural and remote PHC workforce retention context in mind.

Figure 3.2 Russell conceptual model of factors affecting PHC worker retention



Source: Adapted with permission from (Humphreys et al., 2009)

The empirical research of this thesis predominantly analyses data from existing longitudinal workforce datasets. This is a highly efficient methodological approach for providing information that can help policymakers improve their understanding of the strength and significance of different factors associated with actual PHC worker retention in rural Australia. Unfortunately, at this stage, existing workforce datasets do not capture measures of personal and professional satisfaction and therefore the research of this thesis is unable to model the data using the mediating variable of personal and professional satisfaction, as shown in Figure 3.1. Instead the research of this thesis directly models the associations between a range of financial and economic, professional and organisational, educational and regulatory, community and location, and personal and family factors on the actual retention of Australian rural PHC workers. Taking this methodological approach gives the research the considerable advantage of being able to use existing data to provide high quality, relevant and timely information to policymakers. Nevertheless, it is acknowledged that future research in this area could be strengthened and enabled if existing longitudinal workforce databases were to modify their data collections to include measures of rural PHC worker job satisfaction.

3.2 Which factors are associated with retention of rural PHC workers?

A substantial body of research into rural and remote health workforce issues has developed in response to the long standing and severe problems associated with the geographical maldistribution of health workers. Numerous peer-reviewed publications and other reports have emerged over the past 40 years exploring a wide range of factors that are associated with rural health worker supply, recruitment, turnover and retention. Over this time, research relevant to the Australian rural and remote geographical context has emanated particularly from USA and Canada as well as from within Australia itself. As a result of these publications, we now have a better understanding of the range of factors relevant to the retention of PHC workers in rural and remote locations.

3.2.1 Limiting features of existing retention literature

However, several features of the extant literature are of particular note for the research undertaken in this thesis. Therefore, prior to summarising and reviewing existing retention literature (see Sub-section 3.2.2), it is important to understand many of its limiting features. These include:

i. A focus on medical practitioners

Research exploring the factors associated with retention of rural PHC workers is most developed for medical practitioners. There is substantially less published research, particularly quantitative analyses, investigating the retention of PHC nurses and various allied health professions. This is despite nursing and AHPs comprising a substantial proportion of the total number of rural and remote health professionals, and their significance as providers of PHC within the Australian health care system, especially in remote areas. So too, a dearth of research on the retention of AHWs is evident. Arguably, the lack of access to appropriate data and a lesser developed research capacity in these disciplines until recent years, has contributed to the existing imbalance. Thus possible differences in turnover and retention across the full spectrum of rural and remote PHC professions are less well understood.

ii. Lack of rigorous quantitative methods

A second limiting feature of the existing literature has been the infrequent focus on rigorously quantifying the factors associated with rural and remote health worker turnover and retention. Much research has used cross-sectional survey methods and reported elementary descriptive statistics only. Descriptive statistics have included, for example, the frequencies with which different factors are important influences on PHC workers' decisions or intentions to stay or leave. A smaller number of studies have examined the relationship between factors and how long PHC workers actually stay using more sophisticated quantitative methods. Little is therefore known about the effect size of each factor in relationship to length of stay of PHC workers, and whether or not the effect is statistically significant, especially once potential confounders are taken into consideration. Thus, whilst it has long been thought that factors such as onerous on-call schedules and heavy workloads are important reasons for PHC workers to consider leaving or actually leave rural or remote areas, it is not as clear how much more likely PHC workers are to leave if they experience such conditions of work. There is also limited knowledge of how factors inter-relate in what is a complex process of decision-making about whether to stay in or leave a particular practice, community or rural practice. Further high quality quantitative studies of rural health worker retention are required to help answer these questions.

iii. Failure to differentiate sufficiently between different workforce supply components: recruitment, current stocks, turnover and retention

A third limiting feature of the extant literature has been the all-too-often lack of careful differentiation between factors associated with recruitment, factors associated with current stocks and factors associated with turnover or retention of PHC workers (Humphreys et al., 2001). This is despite agreement that the factors affecting each of these components of supply are likely to differ. Many studies, rather than focusing on factors associated specifically with rural PHC worker retention, actually assess the association between various factors and stocks of rural health workers at the time of the study. That is, the associations being investigated relate to a different component of health worker supply. Australian examples of these types of studies include Laven et al.'s analysis of Australian trained GPs (Laven, Beilby, Wilkinson, & McElroy, 2003), Rolfe et al.'s analysis of University of Newcastle medical school graduates subsequent practice locations (Rolfe, Pearson, O'Connell, & Dickinson, 1995) and McGrail et al.'s analysis of Australian medical practitioners

(McGrail, Humphreys, & Joyce, 2011). In each of these studies, cross-sectional surveys are used to identify factors association with the practitioners' current location. As previously discussed and depicted in Figure 2.1, current supply of rural PHC workers is a function of pre-existing rural PHC worker stocks and subsequent recruitment, turnover and length of retention.

Studies of current stocks (the supply at any single point in time) of rural PHC practitioners do not tease out the extent to which any of the identified factors are associated with a single supply component, whether it be recruitment, turnover or retention. Instead, current stocks of rural practitioners reflect prior recruitment to rural practice at some unknown point in time together with retention for some unknown length of time in rural practice. Studies of this design add new knowledge about factors predictive of being in rural practice at a single point of time. However, they do not establish whether any differences are related to different patterns of recruitment between groups, different patterns of retention, or whether the differences have been very long standing and have persisted despite similar recruitment and retention patterns in recent years. To do this, studies must carefully define each of the subcomponents of workforce supply (recruitment, turnover, retention, current stocks), and separately investigate the factors associated with each of these.

Other types of studies examine the career trajectories of PHC professionals, including patterns of movement into and out of rural or remote locations. These studies, might, for example, look at what factors are associated with a health professional being rurally located at multiple different points in time. Unless the study establishes the initial rural location of health workers, then it is not specifically distinguishing retention from recruitment. Matsumoto et al.'s study of factors associated with 'rural settlement' of Jichi Medical University graduates following completion of obligated service is an example of a study which uses an outcome measure that doesn't sufficiently distinguish recruitment and retention (Matsumoto, Inoue, & Kajii, 2008a). In their study 'rural settlement' was defined as having a rural address in 2000, 2004 and 2006. This requires that the graduates are initially recruited to, or are already working in, a rural location in 2000. However in this study obligated service can be fulfilled in underserved metropolitan areas as well as rural areas, so the researchers did not establish initial rural location, and the outcome measure is therefore a mix of recruitment and retention. Subsequent associations are therefore not purely with rural retention. Australian examples of this type of analysis include studies by Makkai and Western (Makkai, 1995; Western, Makkai, McMillan, & Dwan, 2000).

Rural retention studies of interest to informing this thesis must therefore establish that the PHC worker has been initially recruited to work in a rural setting. Just as a range of rural retention profiles are of interest to this thesis, as discussed in Chapter 2, a range of recruitment profiles are also relevant. Researchers may establish that the PHC worker has been initially recruited to a specific rural practice or organisation, to a rural community, to a rural region or to any rural location within the country.

As stated previously, definitions of what constitute a rural 'location' will vary according to the definition of 'rural' appropriate for the context of the study, but also according to the retention profile of interest for the study. Recruitment profiles may include recruitment to a specific rural practice, to a rural community, to a rural region and so on.

iv. Limited research on actual retention behaviour of PHC professionals

A fourth limiting feature of the current body of research in this field is that only a relatively small number of studies of factors associated with retention use measures of actual retention behaviour of health workers. Instead, many studies use a proxy measure of actual behaviour: health worker cognitions about retention. That is, rather than measuring actual length of stay within rural practice, studies more frequently measure only "stated intentions" to stay in or leave rural practice. These studies most frequently analyse the associations between distally antecedent factors and health worker withdrawal cognitions (intentions) as an intermediate step in the pathway to turnover. These types of studies generally do not investigate associations *per se* with voluntary turnover or actual retention behaviour. One rare exception is the important study of Western Australian GPs by Kamien, which linked the stated intentions of GPs to their actual rural turnover and retention behaviour (Kamien, 1998).

Studies which measure health worker cognitions can be differentiated into three main groups:

a. Studies measuring PHC worker retention cognitions

Australian examples of studies which use health worker turnover or retention intentions as an outcome variable include analyses by Keane et al. on the intentions of NSW rural AHPs to leave rural practice (Keane, Lincoln, Rolfe, & Smith, 2013), two studies by Gardiner et al. (Gardiner, Sexton, Durbridge, & Garrard, 2005; Gardiner, Sexton, Kearns, & Marshall, 2006) on factors associated with the intentions of South Australian GPs to leave rural practice, a study by Alexander on 104 GPs in the New England area of NSW (Alexander, 1998) and studies by Stagnitti et al. (Stagnitti, Schoo, Reid, & Dunbar, 2005) and O'Toole et al. (O'Toole, Schoo, Stagnitti, & Cuss, 2008) on the intentions of South Western Victorian AHPs to stay in their positions.

Clearly, studies of worker intentions make useful contributions to the body of knowledge in this field. It is known that behaviour can be predicted from intentions with moderate accuracy in certain circumstances (Steel & Ovalle, 1984). These circumstances include:

- Health worker intentions are measured with great specificity. For example, intentions to stay in their current practice are more specific than intentions to stay in rural practice.
- The level of control that health workers have over their workplace is also important: practice owners are more able to accurately predict their actual retention than sessional or salaried workers (Pathman, Konrad, & Agnew, 2003).
- The risk of burnout is also important: health workers at low risk of burnout can more accurately predict their behaviour, whilst those at higher risk, for example because of frequent on-call, are less able to accurately predict their retention (Pathman et al., 2003).
- The time frame is suitably short – thought by some to be around a year (Parasuraman, 1989). When longer time frames are used health worker withdrawal cognitions are less likely to reliably predict voluntary turnover or retention. This phenomenon was demonstrated by Kamien who examined the intended length of stay in rural practice of Western Australian doctors in 1986 (Kamien, 1987). These baseline data were followed up with a postal questionnaire in 1996 to ascertain whether or not each doctor had acted as they had intended 10 years earlier (Kamien, 1998). Kamien found that over this time frame only about half of the doctors accurately predicted leaving rural practice (intended to leave and subsequently left), whilst about three quarters of the doctors accurately predicted their retention in rural practice (intended to stay and subsequently stayed). Others, too, have found that health worker intentions to leave clinical practice are weakly predictive of actual departure from practice.

Many Australian rural and remote PHC workers work in stressful circumstances, however (Lenthall et al., 2009; Lindsay, Hanson, Taylor, & McBurney, 2008; Lloyd & King, 2004; Opie et al., 2010; Sondergeld & Nichols, 1997). Therefore the conditions under which their retention intentions are measured, may result in their stated intentions (of staying or leaving) having limited accuracy for predicting actual departure from rural practice. This implies that the retention intentions of rural and remote health workers may also have limited usefulness for medium to longer term workforce planning. For these reasons, it is imperative that retention research also includes studies which investigate retention directly by measuring actual turnover and retention behaviour.

b. Studies with a hybrid measure of PHC worker retention cognitions and actual behaviour

There are a small number of studies evident in the literature in which researchers have combined a measure of actual health worker retention behaviour with a measure of intended turnover or retention behaviour to produce a composite overall measure of retention. In studies such as these a health worker's retention may be calculated as the sum of their current tenure in a position and the length of time that they intend to remain in that position. In two separate studies of USA primary care physicians, Pathman et al. used a composite measure of retention: retention duration was the sum of the actual number of years worked in the practice up to the time of the survey plus any further years the physician intended working at that practice (capped at a maximum of 2 years) (Pathman, Konrad, & Ricketts, 1994b; Pathman, Williams, & Konrad, 1996). A problem with the use of composite overall measures such as these, which combine actual behaviour with cognitions or intended behaviour, is that their use obfuscates our understanding of exactly what associations in the conceptual model our statistical modelling is describing.

c. Studies of hypothetical retention scenarios to elicit PHC worker preferences

Another small but important body of studies investigates rural and remote PHC worker retention by presenting existing health workers with a range of hypothetical scenarios or choices, and forcing a choice of which factor is more important to their retention. This enables the stated preferences of the surveyed PHC workers to be quantified (Humphreys, Jones, Jones, & Mara, 2002). Studies such as these provide important evidence about the relative importance of the different factors studied and are particularly useful in situations where longitudinal datasets are not available (Lagarde & Blaauw, 2009). However, the methodology is based entirely on health worker cognitions, rather than on actual retention behaviour. As suggested above, health worker cognitions or preferences do not necessarily translate into actual turnover or retention behaviour and there remains a need to match the PHC scenarios not just with preferences but, importantly, with actual turnover or retention behaviour.

Given this assessment of the existing literature, it is clear that a comprehensive understanding of the factors associated with the length of stay of PHC workers in rural or remote areas requires analysis of actual retention behaviours. The following section provides an overview and critique of what the existing literature reveals about the factors associated with actual retention behaviour of PHC workers.

3.2.2 Literature review of factors associated with actual retention behaviour of PHC workers

A comparatively small body of literature directly examines the associations between PHC worker actual length of stay (actual retention behaviour) and financial and economic, professional and organisational, educational and regulatory, community and location, and personal and family categories of factors. It is this literature that is of primary importance for informing the research into the associations between various factors and the actual retention of Australian rural and remote PHC workers undertaken in this thesis. The literature review method adopted drew heavily on the guidelines underpinning systematic reviews. However, strictly speaking, this is not a systematic review, but rather a comprehensive review, undertaken systematically, and commensurate with the resources available. The dual purposes of the literature review are:

- Firstly, to maximise the reach and ensure that as much eligible literature as possible could be drawn upon to inform this thesis.
- Secondly, to exclude a vast amount of literature that has little or no relevance in terms of explaining the quantitative associations between length of stay of PHC workers in rural and remote settings and related factors.

Review inclusion and exclusion criteria

Inclusion and exclusion criteria used for the purpose of this research are summarised in Table 3.1. Those studies included are ones which report original quantitative analyses in the English language in peer-reviewed journals. Reviews and qualitative studies were excluded in this literature review. The quantitative analyses of interest were of the associations between rural PHC worker actual retention (length of stay in a rural setting, that is, time until turnover occurs) and distally antecedent factors (including financial and economic factors, professional and organisational factors, educational and regulatory factors, community and location factors, and personal and family factors). Studies which used composite measures of retention as the outcome measure, based on actual plus intended retention, were excluded. Articles about health worker retention intentions and preferences were also excluded if there was no measure of actual retention behaviour.

Studies were included only if the turnover or retention component of supply could clearly be distinguished from other components, especially recruitment. Therefore articles which quantified associations between distally antecedent factors and *stocks* of rural health workers at one or more points of time were excluded. Similarly, studies of health worker locational trajectories were only included if the health workers were initially identified as already being recruited into rural practice.

Studies that reported aggregated turnover rates for rural PHC workers, for example health service turnover rates, but did not measure health worker actual length of stay (or time until turnover) were also excluded as were studies that analysed factors or reasons associated with turnover without assessing the associations of these factors with health worker retention (time until turnover). Studies that measured PHC worker length of stay in a specific population but which did not measure associations with distally antecedent factors were also excluded.

Not all included studies were *exclusively* about the retention of rural PHC workers. Some included studies comprised of a mix of health worker types, not all of which would be considered to be PHC workers in an Australian context. Primary care workers in USA, for example, include paediatricians

Table 3.1 Inclusion and exclusion criteria for literature review

Criteria	Inclusion	Exclusion
Literature type	Peer reviewed journal publications	Grey literature
Language	English	Non-English
Methods	Original reports of quantitative analysis of distally antecedent factors and their relationship with actual health worker turnover or retention	Qualitative studies Reviews Quantitative studies which don't analyse associations between health worker retention (length of stay) and distally antecedent factors
Geography	Rural or remote, as defined by the researchers. If mixed rural and metropolitan, then analysis controls for rural location	Undifferentiated or metropolitan location
Retention measure	Actual employment retention behaviour. Retention is differentiated from recruitment (that is, the PHC workers are established as being in a rural location at the outset)	Intended employment retention behaviour. Retention is not sufficiently differentiated from recruitment or other supply components.
Retention profile	Staying in a specific rural or remote practice, facility or organisation; staying in a rural or remote town, city, community, region; staying in any rural location within a country or jurisdiction	Retention profile not specific for rural or remote location, for example, staying in a country or jurisdiction with mixed rural and metropolitan areas, staying in the first professional role after graduation, staying in underserved areas that include a mix of rural and metropolitan practice locations
Context	Substantial relevance for Australian context, that is, developed economies, advanced health systems, geographically dispersed populations	Substantially different to Australia, that is, developing economies or health systems, geographically densely populated and therefore not readily generalisable to Australian context
Workforce	Primary health care professionals providing direct patient care	Specialists, informal health care workers, health care workers in a secondary or tertiary health care setting or not providing direct patient care

and obstetricians and gynaecologists, as well as family physicians. These studies have been included in the review if the authors have differentiated between these groups in their analysis.

Other studies include both metropolitan and rural populations of health workers. Studies such as these have been included if the analysis adjusts for any differences in retention of metropolitan and rural PHC workers. Author definitions of ‘rural’ are accepted with no attempt to ensure that ‘rural’ is defined in a consistent way across different studies. This limitation is common to much research in rural settings, as has previously been highlighted by Humphreys and Solarsh (Humphreys & Solarsh, 2008).

Some included studies are also not exclusively about retention. These may include a range of analyses, for example reporting on recruitment or stocks of rural and remote PHC workers, with only a small part of the publication reporting actual rural retention behaviour of PHC workers. Only those findings relating to actual retention of rural PHC workers have been included in this review.

A range of different retention profiles were accepted for inclusion in this review. These included PHC worker retention in initial (index) rural practice, retention in a rural community, retention within a particular rural region and retention in any rural region within a country. Several studies which claimed to be measuring retention but which were actually measuring the number (or proportion) of physicians in rural practice at one point in time and comparing it with the number at a different point in time, were also excluded (Rabinowitz, 1993; Rabinowitz, Diamond, Markham, & Hazelwood, 1999).

26 articles meeting these criteria were reviewed and critiqued. Methodology was assessed across a range of domains, including study design, study size, response rates, number of years studied (length of follow up), sources of data, statistical methods used, consistency, plausibility and generalizability of results. In a number of instances only a part of the study was specific to the retention of rural PHC workers. In these instances, the study size and statistical methods used in the retention part of the study were assessed, rather than the study size and analysis used in the broader study.

Four studies included in the original cut were subsequently excluded because of inappropriate methodology or inadequate description of methodology and/or results. These short-comings were considered to substantially reduce the confidence that could be had in their findings (Boulger, 2000; Fisher, Pearce, Statz, & Wood, 2003; Hall, Garnett, Barnes, & Stevens, 2007; Lonne & Cheers, 2004).

Summaries including key findings and study critiques of the remaining 22 articles are presented in chronological order in Table 3.2.

Table 3.2 Retention studies meeting stated inclusion/exclusion criteria

Study details	Study design and analysis	Population & Context	Key findings	Study critique
Pathman, Konrad and Ricketts (1992)	Cohort with controls Multivariate analysis	National (USA) sample of 304 National Health Service Corps (NHSC) and non-NHSC rural primary care physicians who commenced in their positions between 1979 and 1981 and who responded to a follow up survey in 1990	NHSC physicians had an increased risk of leaving both their initial practice and rural practice compared with non-NHSC physicians Age was not significantly associated with physician retention	Seminal paper with high level methodological rigour and statistical analyses Use of multiple retention profiles demonstrated Introduced concept of 'inception cohort' Findings were of substantial value to policy-making
Horner, Samsa and Ricketts (1993)	Cohort with controls Multivariate analysis	1,947 clinically active primary care Physicians who first registered in North Carolina in 1981 or later and who weren't subject to federal program service obligations (for example, NHSC) and whose subsequent location was established in 1989	Longer retention in the initial practice was associated with undergraduate training in the same USA state (Hazard Ratio (HR) 0.81), type of practice setting (HR 0.46), solo practice or being in a partnership (HR 0.41), and urban location (HR 0.78) Age, gender and race were not statistically significant Median survival of rural physicians (unadjusted) was approximately three years	Analysis includes both rural and urban physicians (predictors are therefore of overall retention after adjusting for rurality) Analysis includes primary care physicians who would be considered specialists in Australian context (for example, Paediatricians)
Pathman, Konrad and Ricketts (1994a)	Cohort with controls Multivariate analysis	National (USA) sample of 202 rural primary care allopathic physicians who graduated between 1970 and 1980 and who were working in rural practices in 1981	No factors studied were significantly associated with rural retention of non-NHSC physicians (public or private medical school, residency in community versus university-based hospital, and rural rotations as students or residents) For NHSC-obligated physicians the only factor significantly associated with rural retention was graduation from a public medical school	Limited range of variables in multivariate modelling Substudy of 1992 paper, with inclusion of additional educational exposure variables

Study details	Study design and analysis	Population & Context	Key findings	Study critique
Fryer, Stine, Krugman and Miyoshi (1994)	Cohort with controls Descriptive analysis	251 physicians practising in rural Colorado towns in 1986 and who were still actively providing care in 1992	Preceptoring medical students was not associated with improved retention of rural Colorado physicians after 6 years	Descriptive analysis examined association of retention with only a single factor Length of physician stay in practice prior to 1986 wasn't taken into account
Rosenblatt, Saunders, Shreffler, Pirani, Larson and Hart (1996)	Cohort without controls Stratified analysis	258 USA medical school graduates from between 1980 and 1983 who had received NHSC scholarships and who were assigned by NHSC to work in general or family practice in rural areas and who were followed up in 1994	Physician retention in 1994, after completion of obligated service was 25% in the initial rural county and 52% in rural practice Practice retention rates were highest amongst physicians with longer periods of NHSC service obligation Retention rates fall steeply immediately after obligated service had been completed	Lacks assessment of the statistical significance of difference factors associated with retention Uses an inception cohort to minimise variability in length of stay
West, Norris, Gore, Baldwin and Hart (1996)	Cohort without controls Stratified analysis	358 graduates of the University of Washington Family Practice Residency Network between 1973 and 1990, who in 1991 responded to a survey and who were at least 4 years post-graduation and working in the USA in family practice	Retention rates in initial rural community (4 years after graduating from the residency program) were lower for more recent graduates There was no difference in their retention according to gender	Limited and mainly descriptive analysis of rural retention and the factors associated with it Cross-sectional measure of physician locations are imperfect proxies for rural retention
Cullen, Hart, Whitcomb and Rosenblatt (1997)	Cohort without controls Stratified analysis	2,903 NHSC scholarship recipients who graduated from USA medical schools from 1975 - 1983, who were initially assigned to practice in nonmetropolitan counties, and whose subsequent location was established in 1991	Retention rates in initial county of assignment were highest for family physicians and for those with longer periods of NHSC obligated service	Sample includes a range of specialists, not just primary care physicians The outcome measure, retention in 1991 reflects a mix of lengths of stay varying arbitrarily between 8 and 16 years

Study details	Study design and analysis	Population & Context	Key findings	Study critique
Singer, Davidson, Graham and Davidson (1998)	Cohort with controls Multivariate analysis	2,654 primary care NHSC obligated and non-obligated physicians working in USA Community Health Centres (which are located in medically underserved areas) at any time between 1/1/1990 and 30/9/1992, and who were hired in 1986 or later	Hazard of leaving employment at a Community Health Centre markedly increased for NHSC physicians after 4 years' employment Amongst NHSC physicians higher retention was associated with part-time work and younger age at hire, but not with the size of the facility or its geographical location Amongst non-NHSC physicians, higher retention was associated with older age at hire, Asian race, primary care specialty, part-time work, facility productivity, level of patients seen and facility budget, but not with geographical location	Short time frame of study (less than 3 years) Includes factors across a range of domains (personal, regulatory, professional and organisational) in univariate and multivariate modelling Factor analysis may have helped reduce the large number of related variables Community Health Centres were in rural and urban locations, however, analysis specifically controls for rural location Separate analyses of factors associated with NHSC and non-NHSC physician retention does not allow for comparison of retention according to NHSC status
Kamien (1998)	Cohort without controls Descriptive analysis	91 rural Western Australian General Practitioners who had been identified as being in rural practice in 1986 and who were followed up in 1996	49% of GPs who intended to leave rural practice had actually stayed in rural practice, whilst 24% of GPs who had intended to stay in rural practice had left	Important Australian study which links rural doctor retention intentions with actual retention behaviour Many factors were measured but not statistically modelled as predictors of retention
Rabinowitz, Diamond, Hojat and Hazelwood (1999)	Cohort with controls Multivariate analysis	Substudy of 123 USA Jefferson Medical College graduates from 1978 - 1986 practising in rural Pennsylvania in either 1986 or 1991 and who were followed up in 1996	No variables examined (including rural background, commencing medical student intentions for family practice, having received an NHSC scholarship, curriculum exposures to rural practice via Physician Shortage Area Program (PSAP) and student debt indicators) were associated with	Analytical method for retention substudy is not described, although it can be assumed to be logistic regression Study may have been insufficiently powered to detect significant associations with retention due to its small sample size Sample includes a range of specialists, not just primary

Study details	Study design and analysis	Population & Context	Key findings	Study critique
			retention in rural practice	care physicians Modelling retention as a binary outcome at a fixed calendar date is an imprecise proxy for actual length of stay of individual physicians
Pathman, Steiner, Jones and Konrad (1999)	Cohort without controls Multivariate analysis	National (USA) random sample of 370 non-NHSC primary care physicians who had moved to rural practices between 1987 and 1990 and were followed up in 1997	Physicians who had recently finished training had longer retention in their initial practice if they felt prepared for small-town living. Feeling prepared for medical practice was, however, not associated with retention Being prepared for small-town living was associated with rural postgraduate training but not with undergraduate rural rotations Retention of physicians who had prior rural practice experience was not associated with their undergraduate or postgraduate rural exposure	This study links educational factors directly with health worker retention, but additionally examines the role of a mediating variable related to psychological uncertainty (preparedness for small-town living)
Larson, Hart, Goodwin, Geller and Andrilla (1999)	Cohort with controls Stratified analysis	National (USA) random stratified sample of 2,119 Physician Assistants with at least 4 years' total practice experience and in active practice in 1993	Retention in first practice after qualification was lower amongst Physician Assistants who initially worked in a rural compared with an urban county Retention in first practice after qualification was similar for males and females who were in rural practice	One of the few retention studies of non-physician PHC workers Samples Physician Assistants working in rural and urban locations Physician assistants are a mix of specialist and generalist providers Not all retention profiles reported are relevant (for

Study details	Study design and analysis	Population & Context	Key findings	Study critique
				example, the 'all rural' career trajectory requires initial rural recruitment and subsequent retention) Statistical significance not assessed for some associations
Thommasen (2000)	Cohort with controls Stratified analysis	1,979 family physicians and general practitioners working in rural British Columbia in communities of less than 30,000 people between 1979 and 1999 and included in the British Columbia Medical Directories for these years. Physician communities were further restricted according to the health facilities available in the community and the geographical location within British Columbia	Communities with smaller population sizes had the lowest 12 month retention rates Typically, 12 month retention rates for communities with < 7,000 people were 70-80% Typically, 12 month retention rates for communities with population size 7,000-30,000 were 85-90% Mean stay of physicians was shortest in small communities with population size<3,500, intermediate in communities with population size 3,500-6,999, and longest in larger communities with population size > 7,000 Difference in physician mean stay between small and larger communities equated to about 3 years Comparisons of rural physician retention rates after 1, 2, 3 and up to 21 years showed that differences in retention according to community population size took several years to emerge	Stratified analysis by community population size. One of the few studies which examines the association between population size and PHC physician retention Studied an entire population of PHC workers, not a sample Large study size Longitudinal study design over a large number of years (21 years) facilitates comparisons at multiple time points No analysis of differences in retention between different cohorts of PHC physicians Descriptive statistical analysis limits the conclusions that can be drawn The authors did not state how the metric *mean stay* was calculated. It is likely that the data were skewed and the measure may also have captured a mix of censored and uncensored observations. Mean stay calculations should therefore be used with caution

Study details	Study design and analysis	Population & Context	Key findings	Study critique
Duttera, Blumenthal, Dever and Lawley (2000)	Cohort with controls Descriptive analysis	165 State Medical Education Board of Georgia (USA) medical student scholarship recipients (with return-of-service obligations) and 64 medical students who did not receive a scholarship and who attended the Georgia medical fair between 1979 and 1992 and subsequently entered rural practice in Georgia	The proportion of scholarship recipients who entered rural practice in Georgia and were still practising in their initial community of obligation in 1992 was 73% The proportion of non-scholarship recipients who entered rural practice in Georgia and were still practising in their initial community of practice in 1992 was 67% There was no statistically significant difference in the proportions retained in their initial practices according to scholarship status	Assessment of retention was only made at a single point in time (1992) and the outcome variable was binary (they were retained or had left in 1992). This method of analysis results in a loss of information about physician length of stay, and an inability to adjust for variations in length of stay, (which theoretically varied from having just commenced up to 15 years) The analysis did not adjust for whether the physician was still under obligated service or not at the time when retention was determined There was no adjustment for the length of obligated service of scholarship recipients Descriptive statistical analysis limits the conclusions that can be drawn
Rabinowitz, Diamond, Markham and Paynter (2001)	Cohort with controls Multivariate analysis	Retention substudy: 144 USA Jefferson Medical College graduates from the 9 classes of 1978 to 1986 who were in rural practice in 1986 or 1991 and who were still in rural practice 8-13 years later, in 1999	Participants in PSAP at university were significantly more likely to have remained in rural primary care in 1999 compared with non-PSAP graduates Retention was higher for participants who had attended a rural college for their pre-medical degree Rural preceptorship and rural background were not significant predictors of retention	Student self-selection into PSAP can result in selection bias. Differences in retention could be related to PSAP or to pre-existing student characteristics Sample includes a range of primary care specialists, in addition to family care physicians Retention was measured between two fixed points in time (1986 or 1991 and 1999) and the outcome measure was binary. This

Study details	Study design and analysis	Population & Context	Key findings	Study critique
				cohort had been in rural primary care for variable lengths of time (between 8 and 13 years). Associations are therefore not strictly between health worker length of stay and participation in PSAP
Jackson, Shannon, Pathman, Mason and Nemitz (2003)	Cohort with controls Bivariate analysis	44 medical student or physician recipients of West Virginian financial incentives with service obligations under 4 different programs operating between 1991 and 2001. Respondents were in rural West Virginian practice at the (unspecified) time of the survey Control group of 108 non-obligated rural physicians	Physicians with obligations had higher retention in their positions during their first four year of practice compared to physicians without service obligations After obligations were completed retention was similar in the two groups	Control group were not age-matched to the group receiving financial incentives (who were most commonly medical students or recent graduates) This was a sample rather than a population study. The sample of obligated physicians was small, which limits study power to detect differences between groups Response rates varied from 43% - 75% which may result in sampling bias The four programs analysed were heterogeneous (some targeted students, others targeted qualified health professionals)
Pathman, Konrad, Dann and Koch (2004)	Cohort with controls Multivariate analysis	National (USA) sample of non-obligated rural primary care physicians who had commenced in a rural position between 1987 and 1990, either in a rural health professional shortage area (308) or in a rural area not experiencing shortages (197), and who responded to a follow up survey in	Retention in rural areas was similar in workforce shortage areas and non-workforce shortage areas Factors associated with longer rural retention: having young children, working in a state where the physician grew up, practice ownership and being on-call less than 3 times per week Many variables found to be not significant: for example, age, gender, specialty,	Factor analysis may have been helpful because of the large number of related variables Collinearity of variables included in modelling may contribute to non-significance of some variables Sample is of USA primary care physicians (family physicians, paediatricians, general physicians and general practitioners), some of which are not considered

Study details	Study design and analysis	Population & Context	Key findings	Study critique
		1996/97	hours worked per week, starting income, solo practice, town population, county population, county physician-population ratios	to be PHC workers in the Australian context Created 'inception cohorts' in the analysis so that commencement dates were similar across the cohort
Lapolla, Brandt, Barker and Ryan (2004)	Cohort with controls Descriptive analysis	313 recipients of financial support provided by a range of different Oklahoma State programs and who completed their obligated service during the period 1976 to 2001. Each program has return-of-service obligations 38 recipients of NHSC scholarships who served their obligated service in rural Oklahoma up until the time of this study 69 physicians with J-1 visa obligations who served their obligated service in rural Oklahoma between 1995 and 2001	Overall 53% retention of physicians in community of obligated service after obligations have been met Overall 68% retention of physicians in either community of obligated service or rural Oklahoma Rural retention in Oklahoma (after service obligations had been met) was lower for student scholarship recipients (66%) than for residency scholarship recipients (86%) or physician incentive recipients (72%) Rural retention in Oklahoma (after service obligations had been met) was lower again for NHSC scholarship recipients (9/38=24%) and for physicians with expired J-1 visa obligations (21/69=30%)	Physicians complete service obligations in needy/underserved communities which are not necessarily rural A number of different retention profiles are included Analysis reports retention proportions but not the statistical significance of differences in proportions between different groups of recipients of financial support The exact definition of the point in time (after completion of service obligations) at which retention is assessed for each physician was not provided Despite longitudinal data being provided, retention is assessed as a binary outcome. This outcome measure does not capture the length of rural retention of each physician
Rabinowitz, Diamond, Markham and Rabinowitz (2005)	Cohort with controls Bivariate analysis	Retention substudy: 92 USA Jefferson Medical College graduates from the 9 classes of 1978 to 1986 who were in rural family medicine practice in 1986 or	Retention in the same or adjacent rural county was longer amongst physicians who had participated in PSAP at university	Student self-selection into PSAP results in selection bias Small cohort Bivariate analysis only Data quantifying the

Study details	Study design and analysis	Population & Context	Key findings	Study critique
		1991 and who were still in rural practice in the same or adjacent county 11-16 years later, in 2002		magnitude of the effect were not presented (no odds or hazards ratios stated)
Crouse & Munson (2006)	Cohort with controls Multivariate analysis	72 physicians with J-1 visa waiver service obligations compared to 58 physicians without service obligations, practising at any time between 1996 and 2002 in rural Wisconsin, USA	Retention was significantly shorter for physicians with J-1 visa waiver obligations Lower physician integration into the community was associated with reduced retention at 3 and 4 years Physician integration in to the medical community, gender, nationality and specialty were not significant	Small sample size increases risk of study being underpowered to find important differences Perceptions of integration were those of the organization Chief Executive Officer, not the physicians themselves Retention profile not explicitly defined Point estimates of non-significant associations not reported
Heng, Pong, Chan, Degani, Crichton, Goertzen, McCready, Rourke (2007)	Cohort with controls Multivariate analysis	All 194 physicians who graduated from two family medicine postgraduate training programs in Northern Ontario between 1993 and 2002 (Northeastern Ontario Family Medicine (NOFM) residency program and Family Medicine North (FMN) program) and whose 2002 practice location was determined to be within Canada	Graduates of the FMN Sudbury program had longer retention in rural Canada (Odds Ratio 3.0) but shorter retention in northern Ontario (Odds Ratio 0.5) compared with graduates of the NOFM program located in Thunder Bay There were no statistically significant differences in retention in rural areas or in northern Ontario between graduates of the FMN program and graduates of the NOFM programs As time since graduation increased, graduates from both programs were less likely to be retained in northern Ontario, but there were no differences in	One of the few studies from Canada Cohort and control groups are similar (both northern Ontario physician training programs) which may limit the usefulness of conclusions that can be drawn Several different retention profiles were reported: retention in rural areas outside northern Ontario, retention in northern Ontario, retention in rural areas or in northern Ontario Little description of any differences between the two programs (other than demographic differences of their graduates) limits ability to understand what

Study details	Study design and analysis	Population & Context	Key findings	Study critique
			retention in rural areas outside northern Ontario Gender, graduate age and additional training were non-significant	aspects of the programs may be related to differences in retention observed
Daniels, Vanleit, Skipper, Sanders and Rhyne (2007)	Cohort with controls Multivariate analysis	181 graduates from 12 health professional programs in New Mexico USA, between 1991 and 2002, who provided their employment history in response to a survey and whose first practice location was rural	Retention in rural practice was not different according to health profession discipline Practitioners who remained in rural practice were more likely to consider community size and returning to their hometown as important	One of the few studies that includes multiple health worker disciplines in a single study, allowing comparisons of rural retention across disciplines The binary retention outcome measure captures a range of lengths of rural retention (from 4 to 14 years) depending on graduation cohort Analysis method does not capture rural retention of 81 graduates who entered rural practice after their first urban practice

ASGC-RA Australian Standard Geographical Classification – Remoteness Areas

FMN Family Medicine North

HR Hazard Ratio

NHSC National Health Service Corps

NOFM Northeastern Ontario Family Medicine

PHC Primary Health Care

PSAP Physician Shortage Area Program

USA United States of America

The following sections synthesise the key findings from the 22 included studies. As indicated earlier, the organising framework for the synthesis is the Russell modification of the conceptual framework used by Humphreys et al. of factors affecting retention (see Figure 3.1 and Figure 3.2) (Humphreys et al., 2009). The key categories of retention factors are financial and economic factors, professional and organisational factors, educational and regulatory factors, community and location factors, and personal and family factors.

A. Financial and economic factors

Student debt, loans or scholarships

Few studies test the association between student debt and subsequent rural retention. However, Rabinowitz et al. in 1999 reported that the level of debt as a senior medical student was not significantly associated with retention in a rural area (Rabinowitz, Diamond, Hojat, et al., 1999). Daniels et al. also found that the extent to which financial obligations or loan repayments were important to health worker retention decisions was not significantly different between those who stayed and those who left rural practice (Daniels et al., 2007).

Several studies also investigated retention amongst recipients of a range of USA State-based schemes aiming to recruit and retain physicians in underserved rural areas by offering financial support to students in exchange for return-of-service (Duttera et al., 2000; Jackson et al., 2003; Lapolla et al., 2004). The study by Jackson et al. included only 6 student recipients of West Virginian financial incentives, so was too small to report retention specifically for this cohort. Duttera et al. found that Georgian medical students who accepted a scholarship in exchange for rural service had similar retention (73%) in their initial rural practices as non-recipients (67%). Lapolla and colleagues reported that 66% of students – who since 1975 had received financial assistance by accepting Oklahoma State scholarships with service obligation requirements – were retained in rural Oklahoma in 2000, having completed their service obligations. This compared favourably to the national NHSC scholarship program for medical students, which was associated with 30% physician retention in rural Oklahoma.

Over the years, a substantial body of evidence has also accrued in relation to the recipients of NHSC scholarships and their subsequent retention in rural areas in the USA. The NHSC, in operation in the USA since 1970, is a national program which provides financial support (scholarships) to health profession students in exchange for a year-for-year obligation to work in underserved areas once they graduate. This means that length of obligation varies and may be 2, 3 or 4 years. Cullen et al.'s study of 2,903 NHSC scholarship recipients found that retention in the original county of assignment was higher amongst physicians who had served a longer period of obligated service (Cullen et al., 1997). A year earlier Rosenblatt et al. had also published evidence that practice retention rates were highest amongst physicians with longer periods of NHSC service obligation (Rosenblatt et al., 1996). The Rosenblatt study also identified steep falls in retention immediately after obligated service had been completed. Singer et al.'s study of the retention of NHSC and non-NHSC physicians in USA Community Health Centres similarly identified a markedly increased hazard of leaving employment for NHSC physicians after 4 years of service (Singer et al., 1998). The Singer et al. study also found that whilst the median length of stay was approximately 3 years amongst both NHSC and non-NHSC physicians, the pattern of retention differed markedly between the two groups. The hazard of leaving employment increased on anniversary dates for both NHSC and non-NHSC physicians, however, for NHSC physicians, the effect was much more pronounced. The survival of NHSC physicians was higher in the first three years of (mostly obligated) employment but thereafter was lower than the survival of non-NHSC physicians. The Pathman et al. study of 1992 found that rural NHSC physicians had an increased risk of leaving their initial practice, their initial community and rural practice compared with non-NHSC physicians (Pathman et al., 1992). Once again this difference was not immediately apparent, but took time – about 3 years – to emerge. The only study which did not find an effect of NHSC scholarship recipient status on retention, was the small substudy by Rabinowitz et al. on 123 Jefferson Medical College graduates who had graduated between 1978 and 1986, identified as practising in rural Pennsylvania in either 1986 or 1991 and followed up in 1996 (Rabinowitz, Diamond, Hojat, et al., 1999). It is possible that Rabinowitz et al. modelled a variable representing whether the graduate had *ever* received an NHSC scholarship, and not a variable representing whether they were completing obligated service at the time of the study. In any case, with the exception of this small and possibly statistically underpowered study, there is consistent evidence that longer periods of obligation are associated with longer retention, and that retention falls markedly once obligations are completed.

1. Financial incentives targeting rural Physicians

Several studies included in this review assessed the association between rural retention and direct payment of a financial incentive to qualified PHC providers (Jackson et al., 2003; Lapolla et al., 2004). Lapolla et al. found that recipients of residency scholarships (payments to physicians in the family practice vocational training program) which were linked to service obligations experienced high retention rates (86%) in rural Oklahoma after completing their service obligations. Lapolla et al. also evaluated the effectiveness of a separate Oklahoma State-based program which provided financial incentives to physicians to help subsidise the costs of setting up a practice in return for a period of obligated service. This analysis revealed that 72% of practising physicians who received the incentives were retained in an Oklahoman rural county after completion of their service obligations.

Whilst Lapolla and colleagues provided separate analyses of the retention of physicians according to the financial incentives program that they were enrolled in, the study by Jackson et al. was unable to make such distinction. Jackson and colleagues investigated the retention of 44 recipients of 4 West Virginian financial incentives programs (each requiring return-of-service in an underserved area in exchange for financial support). Retention was compared to the retention of rural physicians who had not received financial support and were under no such service obligations. Those physicians with service obligations had higher retention for the first four years, but thereafter had lower retention. The effect of the service obligations was to delay the increased risk of leaving for members of the cohort for approximately two years (which was the minimum period of service obligations for two of the four programs). In this regard, the retention patterns were similar to those found amongst recipients of student scholarships with return-of-service obligations

There were no studies captured by this review which assessed the association between indirect financial incentives and subsequent PHC worker retention. However, in their seminal 1992 study, Pathman et al. analysed the association between retention in either an initial practice or in rural practice and the level of patient collection charges, as a proxy for overall remuneration (Pathman et al., 1992). This study found that amongst NHSC obligated physicians, retention was higher if the patient charges were higher, but that amongst non-NHSC obligated physicians there was no association between retention and patient charges. Pathman and colleagues in a later study, however, found that a physician’s starting income was not significantly associated with their rural retention (Pathman et al., 2004).

B. Professional and organisational factors

1. Practice ownership and other practice structures or settings

Over the years, researchers have investigated the associations between retention and a range of different professional or organisational factors. Horner et al., in 1993, found that physicians’ retention in initial practice was significantly greater amongst physicians in solo practices or partnerships compared with other practice structures (group health plan, other non-government structure, postgraduate practice) (Horner et al., 1993). Pathman et al., too, found better retention was independently associated with practice ownership (Pathman et al., 2004). However, when Pathman et al. separated out the effect of practice ownership and solo practice, they found that retention in HPSAs was no different between solo practitioners and group practitioners. In the same study, Pathman et al. did not find any significant associations between physician retention in HPSAs and whether the practice was profit or not-for-profit (and owned by others).

An earlier Pathman et al. study found that the setting in which PHC physicians provided care was not significantly related to length of retention: the retention duration of both NHSC and non-NHSC obligated physicians was not associated with working in a community or migrant health centre compared with other types of practice settings (solo practice, group practice, hospital satellite clinic, other) (Pathman et al., 1992). Horner et al. found that there was a significantly lower risk of leaving amongst physicians working in an office-based or professional association setting, compared with physicians working in a group health care facility, a free standing clinic or other non-federal facilities (Horner et al., 1993).

Singer et al. included a suite of organisational indicators in their analysis of predictors of retention (Singer et al., 1998) amongst Physicians working in USA Community Health Centres. Variables studied included size of the organisation (FTE numbers of workers), organisational total expenses and the federal 'grade' of the health centre which reflected organisational quality and stability. None of these indicators were significantly associated with retention duration amongst NHSC obligated or non-obligated physicians. However, this study did indicate that employees were at greater hazard of leaving on or about the anniversary of commencement of their employment. This periodicity in physicians' retention patterns was thought to coincide with the end of contracts.

2. Workload including on-call arrangements

Pathman et al., in 2004 found no significant relationship between retention and whether the workload in standard working hours exceeded 50 hours per week or not, however higher physician retention was associated with being on-call 2 or fewer times per week (Pathman et al., 2004). In the same study, other more indirect indicators of high workload were also not statistically significant in their association with physician retention. These included a comparison based on whether the physician worked in a HPSA or not, and a comparison based on county Physician-Population Ratios. Singer et al. also included an indirect measure of workload in their study of physicians employed at USA Community Health Centres. In this study organisational productivity was calculated as the number of patient visits per full time staff member, which was found not to be significantly associated with length of stay (Singer et al., 1998). A measure of workforce participation – whether the physician was working part-time or not – was significantly associated with the risk of leaving: part-time employees were less likely to leave, however the effect varied over time.

3. Prior rural clinical experience

Two studies by Pathman et al. both suggest that previous rural clinical experience is not significantly associated with the length of retention in subsequent rural employment situations for physicians (Pathman et al., 2004; Pathman et al., 1992)

4. Professional support and networks

Crouse and Munson found that physician adjustment and integration into the medical community (as distinct from the general community) was not a significant predictor of the retention of physicians with J-1 visa waivers after 3 or 4 years (Crouse & Munson, 2006).

5. Teaching role

Fryer et al. found that preceptors of rural medical students had an increased likelihood of remaining in rural practice after 6 years, however the association was not statistically significant (Fryer et al., 1994).

C. Educational and regulatory factors

1. Professional training as undergraduate/graduate

Student intentions for primary care work or rural work

Existing evidence indicates that health student intentions for rural or generalist PHC work are not associated with their subsequent actual length of stay as rural PHC workers. A single study by Rabinowitz et al. (Rabinowitz, Diamond, Hojat, et al., 1999) which measured medical student intentions in the first and in the last year of their medical course, indicates that neither intentions for PHC work nor intentions for rural work as a first year or senior medical student are significantly associated with subsequent length of stay in rural practice.

Rural curricula, rural exposure through clinical placements, decentralised location of clinical school, specialised rural training program

The greatest depth of evidence informing the association between undergraduate educational interventions and rural retention emanates from the work of Rabinowitz et al. ((Rabinowitz, Diamond, Hojat, et al., 1999; Rabinowitz et al., 2001; Rabinowitz et al., 2005) and Pathman et al. (Pathman, Konrad, & Agnew, 1994; Pathman et al., 1999), although a more recent study by Daniels et al. also contributes to the evidence-base (Daniels et al., 2007).

Rabinowitz and colleagues' work has analysed the rural retention of various cohorts of medical student graduates from the Physician Shortage Area Program (PSAP) at the Jefferson Medical College, Pennsylvania. The program recruits and selectively admits prospective medical students from a rural background who make a commitment to return to a rural area to practice family medicine (Rabinowitz & Paynter, 2000). A key feature of the PSAP educational program is a requirement for rural exposure through clinical placements in the last two years of the course. The analyses of Rabinowitz et al. have captured several retention profiles, including retention of graduates in rural practice, retention in rural primary care and retention of family medicine graduates in the same rural county or an adjacent county. The cohorts are similar between the studies, ranging from a maximum of 144 PSAP graduates to as few as 92. The earlier Rabinowitz et al. study (Rabinowitz, Diamond, Hojat, et al., 1999) included a broad range of educational and demographic covariates and found that PSAP was not associated with physician retention in rural practice. In contrast, two more recent Rabinowitz et al. studies suggest that PSAP is associated with longer retention in rural practice and longer retention in the same or adjacent county (Rabinowitz et al., 2001; Rabinowitz et al., 2005). However caveats also surround these studies, as retention is modelled as a binary outcome at a fixed point of calendar time in one study, thus not clearly testing associations between length of stay and educational or other factors (Rabinowitz et al., 2001). In the other study there is no adjustment for any other potential confounders or covariates, so once again we must be wary about these findings (Rabinowitz et al., 2005). Selection bias is a further limitation of most studies of educational interventions and subsequent rural retention, and the Rabinowitz studies are no exception to this limitation.

Several studies by Pathman et al. using nationally representative samples of USA primary care physicians suggest that rural rotations as medical students are not significantly associated with rural retention (Pathman, Konrad, et al., 1994a; Pathman et al., 1999). One of these studies (Pathman et al., 1999) investigated the role of a mediating variable, preparedness for small-town living, on retention. In this study Pathman et al. showed that whilst preparedness for small town living was significantly associated with longer retention, rural rotations as medical students were not associated with either feeling prepared for small-town living or with retention. The total length of time spent in a rural area as a medical student was also not significantly associated with retention duration. In the other study (Pathman, Konrad, et al., 1994a) physician length of stay in rural practice was not associated with medical student rural rotations in both NHSC obligated and in non-NHSC obligated physician groups. Daniels et al. found that the level of importance that health workers attributed to rural training programs is associated with rural recruitment but not rural retention (although this study did not model the effects of actually participating in rural training programs) (Daniels et al., 2007). The balance of evidence therefore indicates that rural health student rotations are not associated with retention in rural practice.

Undergraduate training 'in-area' vs 'out-of-area' (for example, Interstate, overseas)

The evidence to support an association between local training and length of stay of health workers in that locality is limited. The study by Horner et al. of 1,947 North Carolina primary care Physicians is perhaps the best evidence there is, however the retention profile used in this study is of retention in initial practice, and the population studied includes both rural and urban physicians. Amongst this population, longer retention in the initial practice was associated with undergraduate training in the same US state, after adjusting for rurality and other factors. Further research is required to determine whether this relationship holds for populations composed entirely of rural PHC workers.

2. Postgraduate training

The rural PHC worker retention literature explores associations between rural retention and a number of different aspects of rural postgraduate training. These include the geographical location where the training occurs (rural versus urban and same state versus out of state), whether or not post-graduate residency training specific for a primary care specialty was undertaken, and if so, what type of specialty and whether the PHC worker attained a higher level of PHC specialty certification, and the type of facility in which the training occurs (community-based or hospital-based).

Location of training

Rabinowitz et al. found that the location of residency training was not associated with whether a cohort of Jefferson Medical College graduates in rural practice in 1986 or 1991 remained in rural practice in 1996 (Rabinowitz, Diamond, Hojat, et al., 1999). A study by Pathman et al. similarly found that rural location of residency was not significantly associated with retention amongst NHSC obligated physicians but was weakly associated with retention amongst non-NHSC obligated physicians ($0.05<p<0.10$) (Pathman, Konrad, et al., 1994a). Another Pathman et al. study also found that rural location of residency training was associated with improved physician retention (Pathman et al., 1999). This association was mediated by an increased sense of being prepared for small-town living.

Horner et al. analysed the relationship between retention in North Carolina and postgraduate training in the same state or outside the state (Horner et al., 1993). The location of internship and of residency was not significantly associated with physician length of stay in North Carolina, after adjusting for rural location. Pathman and colleagues in yet another study found that graduating from an international medical school was not associated with retention of physicians in USA HPSAs (Pathman et al., 2004), whilst Heng and colleagues' study of two different residency training programs in Northern Ontario (one based from Sudbury and the other based from Thunder Bay) found differences between the program graduates in their retention in northern Ontario or in rural Canada (Heng et al., 2007). However, the extent to which these differences were related to the location of the program, as distinct from factors such as selection into each program and the content of the programs, was not established.

Specialty training (including professional discipline) and certification

Pathman et al.'s seminal study of 1992 showed that aspects of postgraduate training were associated with substantially longer rural retention amongst USA primary care physicians with NHSC obligations. Significant aspects, which approximately halved the risk of leaving at any point of time, included completion of residency, specialty training in family medicine and being board certified. An approximate Australian equivalent for board certification of USA family physicians would be attaining Fellowship of the Royal Australian College of General Practitioners (FRACGP) or Fellowship of the Australian College of Rural and Remote Medicine (FACRRM). Five years later Cullen et al. (Cullen et al., 1997) found that amongst 2,903 NHSC scholarship recipients, retention rates in either the same county or in any rural county were significantly higher for family physicians than for other types of primary care physicians and other types of specialists. Retention rates were lowest for recipients who had not completed postgraduate residencies when they commenced their period of service obligation.

In contrast, Singer et al. found that specialty was not significantly associated with retention of physicians, whether NHSC obligated or not, in univariate analyses (Singer et al., 1998). Crouse and Munson also found that amongst physicians with J-1 visa waiver obligations, primary care specialty was not significantly associated with retention although this analysis was on a small cohort (n=72) and may have been underpowered (Crouse & Munson, 2006). Pathman et al. similarly found that amongst non-NHSC physicians, specialty training in family medicine and completion of residency were not significantly associated with rural retention (Pathman et al., 1992), and the Pathman et al. study of 2004 added further evidence that specialty was not significantly associated with retention amongst non-obligated USA physicians (Pathman et al., 2004). Horner et al.'s study of non-NHSC obligated physicians also found that retention was not significantly different for physicians whose postgraduate training was in family medicine compared with training in other primary care specialties (Horner et al., 1993).

Daniels et al.'s noteworthy study assessed the rural retention of health workers trained in a range of different disciplines (medicine, nursing, pharmacy, physical therapy, occupational therapy, dental hygiene, respiratory therapy, speech pathology, public health, physician assistant, social work and medical laboratory sciences). Unfortunately the analytic design limited the size of the cohort available for analysis, and the authors point out that the study was probably underpowered to detect any significant differences in retention between health workers from different disciplines. Despite a lack of statistical significance, point estimates of the odds of staying in rural practice were lowest for doctors and mid-level practitioners (nurse practitioner, nurse midwife, physician assistant) with an odds ratio of 0.6 (compared to pharmacy odds ratio of 1.0) and highest for therapy practitioners (physical therapy, occupational therapy, speech pathology) with an odds ratio of 1.9. No other study meeting the inclusion criteria for this review compared retention across different disciplines of health workers.

Type of facility

Pathman et al. (Pathman, Konrad, et al., 1994a) found that retention of USA physicians was not significantly related to whether they undertook hospital-based or community-based residency training.

The existing literature therefore reveals a mix of both significant and non-significant associations between educational interventions (at undergraduate and postgraduate level) and actual PHC worker rural retention. However, the studies are few in number, and conducted mostly amongst USA physicians.

3. Regulatory Factors

Restrictions on location of practice for internationally trained PHC workforce

Crouse and Munson (Crouse & Munson, 2006) compared the rural retention of 72 physicians working in Wisconsin under J-1 visa waivers to 58 physicians working without such restrictions on their practice location. J-1 visa waivers are the result of a regulatory intervention which allows IMGs to work in HPSAs for a period of 3 years rather than being required to return to their home country after undertaking postgraduate medical education. This study showed that the rural retention of physicians with J-1 visa waivers was significantly lower than physicians who had been recruited to rural Wisconsin through traditional means. The differences in retention between these two groups weren't immediately apparent, but began to emerge 2 years after commencing employment, which was one year prior to the J-1 visa obligated service finishing. Crouse and Munson did not, however, report the effect size of these differences.

Lapolla and colleagues also reported on the effect of J-1 visa waivers on retention of physicians in rural Oklahoma (Lapolla et al., 2004). Their research revealed that only 30% of recipients of J-1 visa waivers remained in rural Oklahoma after completing service obligations. This proportion was less than half of the rural retention rates for recipients of State-based student scholarship schemes which had similar return-of-service obligations, but which were accepted by the free choice of USA students. However, the retention rate was similar to that of NHSC physicians (24%) completing obligated service in Oklahoma.

D. Social (Family & personal) factors

1. Rural Background

Studies investigating how rural origin is associated with actual retention of rural PHC workers are few in number. Pathman et al.'s seminal work (Pathman et al., 1992), which used longitudinal workforce data from 1981 to 1990 on USA rural physicians, demonstrated that rural background was not a significant predictor of retention for the 93 PHC physicians with service obligations. Nor was rural background a significant predictor of retention in rural practice amongst the 79 non-obligated rural PHC physicians in this study. However, Pathman and colleagues included a variable 'importance of living in a small community' in their modelling, which was found to be a significant predictor of rural retention for both National Health Service Corps (NHSC) and non-NHSC physicians. It is probable that this variable had significant collinearity with the rural background variable, possibly explaining why rural background was not statistically significant in their models. In a later study Pathman et al. found a significant association between a newly trained physician's sense of being prepared for small-town living and their subsequent retention in their initial practice (Pathman et al., 1999). This variable is likely to mediate the effect of rural background on retention (although this was not tested), as well as the effect of rural tertiary educational experiences as demonstrated in the study. Daniels and colleagues found that a strong practitioner preference for working in a smaller community was significantly associated with their subsequent rural retention (Daniels et al., 2007), although admittedly this may not necessarily reflect a rural background.

In 1999 Rabinowitz et al. published a study of 124 medical graduates of Jefferson Medical College, Pennsylvania (Rabinowitz, Diamond, Hojat, et al., 1999). This study found that rural origin was not associated with retention of physicians in a rural county (after 5 to 10 years). A later Rabinowitz et al. study, published in 2001, (Rabinowitz et al., 2001) included a substudy of the retention of 76 Jefferson Medical College graduates in rural practice (this time retention was established after 8 to 13 years of practice in a similar cohort of graduates). Again, rural background was not statistically significant at α=0.05 level in multivariate modelling. However, the estimated odds ratio was 2.8 and the confidence interval (CI) was wide (reflecting small sample size) and only just captured the odds ratio of 1.0 (95% CI 1.0 – 8.4). Additionally participation in PSAP was a significant predictor of retention but selection into this program was based on rural background. Thus collinearity of factors in the modelling may have contributed to the non-significance of rural background as a predictor of rural retention.

2. Proximity to where they grew up or to family or friends

In 2004, Pathman and colleagues found that working in a USA state where they grew up was significantly associated with 31% longer retention of physicians in rural HPSAs (Pathman et al., 2004). This finding persisted after adjusting for the effect of rural background and multiple other variables. Daniels et al., found that retention in rural practice was significantly associated with practitioner ranking of the importance of returning to their hometown amongst graduates of 12 New Mexico health professional programs but not with the level of importance attributed to living in a particular geographical region (Daniels et al., 2007). In this same study, Daniels et al. also found that physician ranking of the importance of proximity to extended family, friends and colleagues was not associated with their rural retention (though proximity to extended family was associated with retention in urban locations).

3. Gender

Consistent evidence from studies of PHC worker actual retention indicates that gender is not a significant predictor of retention (Crouse & Munson, 2006; Heng et al., 2007; Horner et al., 1993; Larson et al., 1999; Pathman et al., 2004; Pathman et al., 1992; Rabinowitz, Diamond, Hojat, et al., 1999; Singer et al., 1998; West et al., 1996). This evidence comprises studies conducted almost exclusively on physicians, and mainly in the United States, with only one study on retention of

Canadian physicians (Heng et al., 2007) and one on the retention of USA Physician Assistants who chose rural practice (Larson et al., 1999). Confirmation is required as to whether gender is associated with the rural retention of PHC workers in other countries, and amongst health professionals other than physicians.

4. Age

The balance of multivariate analyses indicate that PHC worker age is not a significant predictor of the actual retention of rural PHC workers (Heng et al., 2007; Horner et al., 1993; Pathman et al., 2004; Pathman et al., 1992; Rabinowitz, Diamond, Hojat, et al., 1999) However, a number of these studies were specifically of cohorts of recent graduates of various medical schools (Rabinowitz, Diamond, Hojat, et al., 1999) or of graduates of residency training programs (Heng et al., 2007), health professionals first entering a PHC specialty or PHC workers first entering practice in a particular jurisdiction (Horner et al., 1993). Amongst cohorts defined in this way, the variability in age within the cohort is likely to be low. It is not surprising that in cohorts with health workers of similar ages that age is not significantly associated with retention. In support of this supposition is the study by Singer et al. investigating the predictors of retention in rural Community Health Centres amongst 915 physicians with NHSC service obligations and 1,739 physicians without NHSC service obligations. Physicians with service obligations are more likely to be younger, recent graduates. Singer et al.'s multivariate modelling demonstrated that age was not a significant predictor of retention in this group. In contrast, age was a highly significant predictor of retention amongst the physicians who did not have NHSC service obligations. Here, the statistical spread of ages of physicians without service obligations was likely to be greater (although no details on the spread of ages in each group were provided by the authors to confirm this assumption).

Another important point to note is that age can be statistically modelled in different ways, yet authors often do not explicitly state how age has been modelled. It is appropriate to model health worker age at commencement of a position as a fixed constant, or as a time varying covariate, rather than as age at the time of a survey which has collinearity with duration of tenure. Similarly, some studies include not just age, but variables that have significant collinearities with age, for example, the number of years since graduation, in the modelling (Heng et al., 2007). In studies such as this, age may be found to be non-significant whilst the number of years since graduation is found to be significant. Again, number of years since graduation could also be modelled as a fixed constant (number of years since graduation when position was commenced) or as a time varying covariate.

A further problem with the modelling of the age variable is that starting age is frequently hypothesised as having a linear relationship with retention. However, a more feasible hypothesis is that the relationship with retention is not linear over the entire range of age (Pathman et al., 2004).

That is, retention may well be lower amongst the youngest PHC workers (who have fewer family commitments and are therefore more mobile) as well as lower amongst the oldest PHC workers (who are more likely to retire). However, there is a paucity of high quality retention studies that have modelled age as a categorical variable in order to facilitate detection of these associations. This is a research gap that this thesis aims to address.

5. Race, nationality or minority status

Only a small number of studies have assessed whether health worker race is associated with actual rural retention. Two studies of USA Physicians by Pathman and colleagues found that race was not significantly associated with retention (Pathman et al., 2004; Pathman et al., 1992). However, Singer et al. found that whilst race was not significant for Physicians with NHSC service obligations, non-NHSC obligated Asian physicians had longer retention in rural Community Health Centres than non-Asians (Singer et al., 1998). It is possible that other factors not included in the modelling confound this effect. For example, J-1 visa waiver restrictions on location of practice may have been more prevalent amongst Asian physicians and also associated with longer retention. In 2006, Crouse and Munson analysed differences in retention in rural Wisconsin for 72 Physicians with and 58 Physicians without J-1 visa waiver restrictions. They found that after adjusting for the differences in retention due to J-1 visa waivers, nationality did not predict rural retention within the state. The evidence suggests, therefore, that regulatory factors associated with race or nationality may underlie apparent differences in retention associated with race or nationality.

6. Marital status and characteristics of partner

None of the studies included in this review explicitly stated that tests of association between marital status and retention had been undertaken. There is therefore no evidence to support or refute an association between marital status and actual retention of rural health workers.

7. Minor age children

Pathman et al.'s 2004 study of USA Physicians' retention in rural practice found that having children under 18 was associated with longer retention (Pathman et al., 2004). The remaining studies did not include a variable measuring the family structure of health workers.

8. Other personal factors

No existing studies of actual retention behaviour of rural PHC workers included in this review investigated associations of retention with factors such as childhood socio-economic background, community service orientation, resilience and ability to solve problems, and personality factors. Daniels et al., however, found that there were no significant differences in how health workers ranked the importance of serving the health needs of a community between health workers who stayed in rural practice and those who left (Daniels et al., 2007). Kamien's 1998 study, whilst not measuring problem solving ability and statistically modelling its effect on retention, did observe a different pattern in problem solving outcomes amongst Western Australian GPs with dissonant retention intentions and retention behaviours. 'Stayers' – those GPs who had been intending to leave rural practice but had actually stayed in rural practice – had solved most of the problems relating to professional and organisational issues, whilst the majority of 'leavers' – those GPs who had been intending to stay in rural practice but had actually left – had been unable to solve similar problems.

E. External (Location & community) factors

1. Community infrastructure

No studies included in this review analysed the association between PHC worker length of stay and the presence of community infrastructure such as educational institutions, cultural, sporting or other lifestyle related facilities, or commercial infrastructure (which may reflect employment opportunities for family members).

2. Geographical location

Several included studies investigate the association between working in a rural versus an urban location and PHC worker retention. Horner et al. found that rural physicians had significantly lower (28%) retention than urban physicians in multivariate analysis of physicians first registering to work in North Carolina (Horner et al., 1993). Larson et al. found that retention in the first practice after qualification was lower amongst Physician Assistants who initially worked in a rural county compared with those that worked in an urban county (Larson et al., 1999). At the 4^{th} year anniversary since commencement, 49% of urban Physician Assistants were still in their first practice, compared with 40% of rural Physician Assistants. Singer and colleagues found no difference in physician retention in Community Health Centre positions according to rural or urban geographical location of the facility in their multivariate analysis, irrespective of whether the physicians had NHSC obligations or not (Singer et al., 1998). Pathman et al. found that proximity to a metropolitan county was not significantly associated with physician retention in HPSAs, however when they verified their model using a smaller subset of variables (so that the model size wasn't at the limits of the sample size), physicians working in a rural county adjacent to a metropolitan county had a 48% *higher* risk of leaving compared with physicians working in a rural county that was not adjacent to a metropolitan county (p=0.04) (Pathman et al., 2004). This finding may reflect factors other than geographical remoteness, such as the reduced financial viability of practising in counties adjacent to metropolitan counties because of the increased competition for patients due to flows of patients to the nearby metropolitan areas. Whether these findings are applicable to the Australian rural PHC context is arguable, and further clarification of any differences in PHC worker rural retention according to the degree of remoteness is required.

3. Community population size

Several studies analysed the relationship between population size and PHC worker retention. Pathman et al.'s national sample of non-obligated rural PHC physicians found that neither town population size nor county population size were significantly associated with the length of stay of physicians working in HPSAs (Pathman et al., 2004). The Pathman et al. national sample of both NHSC-obligated and non-obligated rural physicians similarly found that town population size did not have a significant linear relationship with the hazard of leaving either their initial practice or leaving rural practice for either obligated or non-obligated physicians (Pathman et al., 1992). In both studies, town population size was modelled as a continuous variable. As with other continuous variables, the association of community population size with retention duration may not be linear over the entire range. Community population size also may have had collinearities with other indicators of geographical location included in the modelling which may have affected the findings. The study by Thommasen of PHC physicians in rural British Columbia, stratified the analysis by different categories of community population size (Thommasen, 2000). Thommasen found differences in PHC physician retention rates according to community population size. However, these differences were not immediately apparent, but took 2-3 years to begin to become apparent. Retention rates were similar for communities with population<3,500 and communities with population<7,000. After the initial 2-3 years, smaller communities with population<7,000 had lower PHC physician retention rates than communities with population≥7,000.

4. Community socio-economic and cultural contexts

In two separate studies Pathman et al. evaluated the association between rural physician retention and the ethnic composition of the county and found no relationship of practical significance within populations of NHSC-obligated and non-obligated physicians (Pathman et al., 2004; Pathman et al., 1992). In these studies Pathman et al. also found that indicators of community impoverishment (county population proportion below the poverty line, county per capita income) were also not significantly associated with physician retention (Pathman et al., 2004; Pathman et al., 1992).

5. Integration into community

A single study by Crouse and Munson reported on the association between the retention of physicians with J-1 visa waivers in health services in rural Wisconsin and their adjustment and integration into the wider community, as assessed by the Chief Executive Officers of the health services (Crouse & Munson, 2006). Multivariate modelling revealed that lower physician integration into the community was associated with reduced retention at 3 and 4 years after commencement.

6. Climate and other physical environmental factors

No studies of acceptable quality were found which evaluated the associations between PHC worker retention and physical environment factors such as extremes of temperature or rainfall, or proximity to the coast or other natural recreational opportunities.

Summarising the evidence and fitting it within the broader retention literature

In the following section the five categories of retention factors identified in the Russell conceptual model (see Figure 3.2) – financial and economic factors, professional and organisational factors, educational and regulatory factors, community and location factors, and personal and family factors – will be used as a framework for organising a summary of the main findings of this literature review.

This section will additionally contextualise the findings of this review within the broader body of rural and remote PHC retention literature. Thus the first paragraph of each retention factor category will summarise the findings from this review, whilst the second and subsequent paragraphs will provide additional evidence from other types of retention studies that did not meet the inclusion criteria for this review. These include studies of health worker cognitions about leaving or staying in rural or remote areas, rather than studies of observed turnover or retention behaviour, studies of reasons given for actual behaviour but where analysis did not take PHC worker length of stay into account, and studies from the grey literature rather than peer-reviewed publications.

Finally, this summary section will provide an overview of the limitations of the available evidence informing the associations between various factors and PHC worker actual length of stay, including, for example, how the majority of current evidence is drawn from studies of doctors providing health care within USA health system.

A. Financial and economic factors

Studies of the NHSC program included in this review revealed consistent patterns in the association between rural service obligations and retention of PHC workers who had received financial support as students in exchange for a period of obligated service. In general, whilst the recipient of financial support was completing obligated service, their rural retention was similar to, or better than, the retention of non-obligated health practitioners. However, once the period of obligation finished, their retention fell, becoming lower than non-obligated physicians. Spikes in the hazard of leaving employment were seen around employment commencement anniversary dates for all health workers, but these spikes were much higher for previously obligated physicians than for PHC workers who had not been obligated. Longer periods of service obligation were associated with higher retention. A further finding of this review was that a State-based scholarship program, targeting PHC students in that state's universities, was more effective than the national NHSC program in retaining physicians in rural practice in that state. Indeed, recipients of State-based scholarship programs appear to have similar retention in rural practice compared to physicians who enter rural practice in that state of their own free choice, which is a different pattern of retention than was found for the NHSC program. Physicians who had previously applied to receive financial support in a return-of-service arrangement (through the NHSC program) had longer retention if patient charges were higher. There was no such association between retention and income indicators amongst physicians who had not sought financial support via an NHSC scholarship (Pathman et al., 1992). This indicates that the retention of scholarship seekers may be more sensitive to other types of financial inducements than non-scholarship seekers.

A rural retention study not included in this review because of its use of a hybrid measure of retention (length of tenure plus intentions to stay) sheds light on the underlying reasons for low retention amongst NHSC physicians after service obligations are complete (Pathman, Konrad, et al., 1994b). The study found that most obligated physicians felt that few of the NHSC positions on offer were acceptable. Further, the majority of obligants were not placed in states where they had previously lived or trained, the placement communities were less likely to meet spousal and family needs and job satisfaction and general satisfaction was lower for NHSC obligants compared to physicians without NHSC obligations. Another retention study, also not included in the review, as it was not specifically rural, found that physicians who had recently fulfilled NHSC obligations were less likely to stay in their initial community but were more likely to be retained in underserved communities (communities designated as HPSAs) (Holmes, 2004).

A further study by Pathman and colleagues found that amongst non-obligated physicians, satisfaction with pay was not statistically significantly associated with retention (p=0.09) (Pathman et al., 1996). A study by Porterfield et al., however, of NHSC alumni found that a higher salary was associated with longer retention in underserved areas (Porterfield et al., 2003). Another study of physician retention in neighbourhood health centres located in underserved areas similarly found that a higher salary was associated with longer retention (Tilson, 1973). However much of this evidence is drawn from underserved areas, rather than specifically from rural areas. The degree to which the factors associated with PHC worker retention are similar in rural and urban underserved areas is not clear, and so the evidence-base informing the association between rural PHC worker salary levels and their subsequent retention is weak.

In summary, existing knowledge of the association between financial and economic factors and rural PHC worker retention is mainly confined to the effects of financial support in return for obligated service, particularly within the context of the USA physician NHSC scholarship program, with a lesser level of evidence available on the effectiveness of State-based scholarship programs. There were no studies in the peer-reviewed literature on the association between rural retention of Australian PHC workers and any Australian policy initiative requiring return-of-service in exchange for financial support. This is despite a wide range of return-of-service initiatives being in operation in Australia (Dunbabin & Levitt, 2003; Dunbabin, McEwin, & Cameron, 2006; Francis & Mills, 2011; Hegney, McCarthy, Rogers-Clark, & Gorman, 2002b).

The policy relevance of improving our understanding of the effect of financial factors on rural health worker retention, however, cannot be overstated. In Australia, a key policy aimed at improving the retention of rural and remote doctors has been the payment of retention incentives linked to length of stay and degree of remoteness of the location in which the doctor provides services (Gibbon & Hales, 2006; Holub & Williams, 1996). Expenditure on these workforce incentives has escalated almost six-fold from $19.9 million over the eight year period between 2004–2005 and 2012–2013 (Gibbon & Hales, 2006; Mason, 2013). This degree of ongoing and escalating spending for one PHC profession alone necessitates that our understanding of the factors associated with PHC worker retention are strengthened and used to inform such policies.

B. Professional and organisational factors

A relatively small number of studies included in this review investigated the association between professional and organisational factors and PHC worker retention. There was a lack of consistency as to which professional or organisational factors were examined, with different studies grouping concepts such as practice ownership and practice settings in different ways. As a result, the body of evidence is piecemeal, but nevertheless suggests that practice ownership and being on-call two or fewer times each week are each associated with longer rural retention of PHC doctors, and that the risk of leaving increases with periodicity at the anniversary of commencement. The evidence from this review about the association between workload (hours worked excluding on-call) and retention is less clear cut, however, with one study finding a significant association and another finding a non-significant association. This review also found that a range of other professional and organisational indicators were not significantly associated with length of stay. These included indicators of jurisdictional workforce shortages, organisational productivity, organisational size, integration into the professional community and previous professional rural experience.

In general, the findings of this review are supported by retention studies from the broader literature. Forti et al., for example, found that sharing on-call with only one other physician was associated with increased intentions of physicians to leave rural practice (Forti, Martin, Jones, & Herman, 1995). Keane et al. found that high clinical demands were associated with intent to leave amongst public (Odds ratio 1.4) and private (Odds ratio 1.6) rural NSW AHPs (Keane et al., 2013). Chauhan et al., too found that a more reasonable workload would influence rural Canadian physicians intending to leave, to stay (Chauhan, Jong, & Buske, 2010), whilst Beggs et al. found that physiotherapist intentions to leave Northern Ontario were associated with length of their professional tenure (Beggs & Noh, 1991). The literature is not entirely consistent about the association between workload and retention. Kim, for example, found that workload was not a significant factor in physician or mid-level health workers' intentions to leave the Navajo Area Indian Health Services (Kim, 2000). The Kim study, however, was set within hospitals based in underserved areas, rather than in a specifically rural or remote area or in a community health setting. Kim also only provided scant quantitative results and did not appear to adjust for any effect related to bonded service. The results, therefore, must be interpreted with caution. The work of Jones et al. demonstrated that other professional factors, including the level of professional support, integration into the professional community and previous professional rural experience are all associated with PHC worker retention (Jones, Humphreys, & Nicholson, 2012). The broader literature also indicates that factors such as continuing professional development opportunities, availability of locums, perceptions about career development opportunities and variety of practice are important for the rural retention of PHC workers across a range of disciplines (Beggs & Noh, 1991; Chauhan et al., 2010; Hanson, Jenkins, & Ryan, 1990; Harding, Whitehead, Aslani, & Chen, 2006; Humphreys et al., 2007; Keane et al., 2013; Mainous, Ramsbottom-Lucier, & Rich, 1994; O'Toole et al., 2008; Silva et al., 2006).

In summary, existing evidence about professional and organisation factors associated with actual rural PHC worker retention indicates that ownership structures, on-call and possibly the level of clinical demands placed on practitioners have important associations with their subsequent retention. However, substantial research gaps are evident including a lack of studies investigating associations between actual rural retention and the level of professional support and networking, continuing professional development opportunities, availability of locums, perceptions about career development opportunities and variety of practice (which includes having opportunities for procedural activity and to provide hospital services).

C. Educational and regulatory factors

Educational

A number of included studies investigated associations between various educational or regulatory factors and health worker retention. These were mainly in the context of USA physicians. One small substudy found that medical student intentions for rural or generalist work were not associated with their subsequent retention as a physician in rural areas (Rabinowitz, Diamond, Hojat, et al., 1999). Rabinowitz, Pathman and Daniels and their colleagues investigated associations between health student rural training exposures and subsequent rural retention as health practitioners (Daniels et al., 2007; Pathman, Konrad, et al., 1994a; Pathman et al., 1999; Rabinowitz, Diamond, Hojat, et al., 1999; Rabinowitz et al., 2001; Rabinowitz et al., 2005). The balance of evidence from these studies indicates that there is no significant association between rural student training exposure and subsequent rural retention as a qualified PHC worker, although several methodologically limited studies by Rabinowitz et al. suggest otherwise (Rabinowitz et al., 2001; Rabinowitz et al., 2005). This review revealed mixed evidence about the association between rural location of postgraduate training and subsequent practitioner rural retention. However, several of the higher quality studies indicate that rural postgraduate training is associated with longer retention in rural practice, perhaps via preparing physicians for small town living (Pathman, Konrad, et al., 1994a; Pathman et al., 1999). This effect was not seen amongst physicians with NHSC service obligations (Pathman, Konrad, et al., 1994a). Studies evaluating the association between retention and physician specialty showed little difference in rural retention across the different USA primary care specialties: family physicians, paediatricians, general internal physicians, and obstetrician and gynaecologists had similar retention patterns. Only a single study included in the review compared retention across disciplines. This study unfortunately had small numbers of health workers in each discipline, and thus unsurprisingly found no significant associations between discipline and retention (Daniels et al., 2007).

Scant evidence of an association between educational exposures and rural retention is found in the broader literature that was outside the scope of this review. Some evidence links student intentions for a generalist (primary care) career and subsequent rural practice (Rabinowitz, Diamond, Hojat, et al., 1999; Rabinowitz et al., 2001). Other evidence links rural exposure as an undergraduate to subsequent rural family practice (Rabinowitz, 1993; Rabinowitz, Diamond, Hojat, et al., 1999; Zink et al., 2010), and there is some uncertainty in the extant literature as to whether length of rural educational exposure is significantly associated with subsequent rural practice location decisions (Pong & Heng, 2005). However, subsequent rural practice is a different concept from retention, and it remains unclear whether educational exposures have an effect on both rural retention and rural recruitment. Surprisingly few retention studies outside the scope of this review specifically investigate the association between retention and postgraduate training location, and the findings from them are mixed. In 2000, Kim found that both residency location and completion of residency were not significantly associated with the intention to leave Navajo area Indian Health Services (Kim, 2000). Stenger et al., however, found that practitioner likelihood of remaining in rural practice was associated with rural residency exposure (Stenger, Cashman, & Savageau, 2008). Again, the evidence of associations between rural residency training and subsequent rural practice (capturing aspects of both recruitment and retention) (Bowman & Penrod, 1998; Horner et al., 1993; Pacheco et al., 2005; Pathman et al., 1999; Rosenthal, McGuigan, & Anderson, 2000; Rosenthal, McGuigan, Osborne, Holden, & Parsons, 1998) is far more convincing than the evidence available for rural retention *per se*.

An examination of the broader retention literature similarly reveals very few studies comparing retention across different health worker disciplines. A recent Australian study by Keane et al. compared the retention intentions of private and publicly employed rural AHPs across 22 disciplines (Keane et al., 2013). In the public sector a larger proportion of radiographers and sonographers intended to stay 10 or more years compared to AHPs from other disciplines. In the private sector higher proportions of chiropractors intended to stay 10 or more years, whilst higher proportions of psychologists and pharmacists were intending to leave within 2 to 5 years. It is likely, therefore, at least within the Australian PHC context, that important differences in rural retention between health worker disciplines exist. These patterns of retention are not well understood, and identifying and measuring differences in retention across disciplines may help identify underlying causes of both optimal and suboptimal retention and lead to improved retention strategies.

In summary, studies informing the associations between retention and each aspect of educational exposure are few in number, and conducted almost entirely amongst USA physicians. Substantial knowledge gaps are evident and remain important to address.

Regulatory

Two studies included in this review investigated the retention of IMG physicians obligated to work in rural areas because of the conditions of their J-1 visa waivers. Both studies found low retention once service obligations had been completed (Crouse & Munson, 2006; Lapolla et al., 2004).

A Canadian study not meeting the strict inclusion criteria for this review, but nevertheless investigating the retention of provisionally licensed IMGs, similarly indicated that IMGs obliged to work in rural or underserved areas because of regulatory restrictions on their licensing, have a low likelihood of being retained in those areas once the restrictions are lifted (Audas, Ryan, & Vardy, 2009). The evidence of rural retention of IMGs available to policymakers, however, remains scant. This is despite the importance of regulatory interventions for directing IMGs to work in rural areas in countries such as Australia, Canada and USA. In 2002, Mueller, reporting on behalf of the Special J-1 Visa Waiver Program Task Force, lamented that more information was needed on where IMGs practice after completing their J-1 visa waiver commitment in order to make recommendations on future policy (Mueller, 2002). However, it is evident that little has changed in the ensuing years, and substantial knowledge gaps remain.

D. Social (Family and personal) factors

Studies included in this review found that rural background is not significantly associated with USA rural PHC physician retention, but that a work location proximate to where a health professional grew up is associated with longer retention. Health worker gender and race/nationality weren't significantly associated with length of stay (after taking obligated service into account), and no studies investigated the effect of rural PHC worker marital status on subsequent retention. A single study included in this review found that having young children is associated with longer rural retention (Pathman et al., 2004). Studies included in this review do not provide a clear picture of the association between retention and health worker age, perhaps related to limitations in many of these studies, including the restricted spread of ages of health workers included in each study and problems related to how the variable is modelled. Finally, this review revealed a lack of evidence of associations between a range of other personal and family factors (for example, personality, health worker psychological and physical wellbeing) and actual retention of rural health workers.

With regards to the association between rural retention and rural background, the findings from retention studies not included in this review have been mixed. Some studies have found that rural background is not a significant predictor of intentions to stay in rural practice (Jones et al., 2012; Kelley, Kuluski, Brownlee, & Snow, 2008) whilst others indicate that rural background is a significant predictor of intentions to stay or leave rural practice (Matsumoto, Okayama, Inoue, & Kajii, 2005; Muus, Stratton, Dunkin, & Juhl, 1993). Evidence from the broader retention literature also indicates that lack of proximity to family is a reason for leaving rural practice whilst close proximity to extended family has been found to be an important reason for staying (Kruger & Tennant, 2005; Mills & Millsteed, 2002; Silva et al., 2006; Solomon, Salvatori, & Berry, 2001; Stagnitti et al., 2005).

A number of studies of rural PHC worker retention intentions either imply or conclude that gender is not associated with retention (Keane et al., 2013; Kim, 2000; Muus et al., 1993). Other studies, however, have found an association between gender and intended retention (Jones et al., 2012; Stenger et al., 2008; Stewart et al., 2011). Wainer et al. found that the length of intended retention in rural general practice was shorter in males compared to females, and the factors associated with contentment and satisfaction also differed according to gender (Wainer, Strasser, & Bryant, 2004). This led Wainer et al. to conclude that systematic gender analysis was important when researching rural doctor satisfaction and subsequent retention (Wainer et al., 2004).

Analyses of rural health worker intentions to stay or leave indicate that age is likely to be significantly associated with retention (Keane et al., 2013; Kelley et al., 2008; Kim, 2000; Pan, Dunkin, Muus, Harris, & Geller, 1995; Stagnitti et al., 2005; Stenger et al., 2008). One of these studies, by Stagnitti et al., highlighted a highly significant non-linear relationship between age and intentions to stay. AHPs younger than 30 or over 60 intended to stay for shorter periods of time. These findings, and the mixed findings from the studies included in this literature review, suggests that further research investigating the association between age and retention is warranted, particularly research which does not model age as a continuous linear variable. Studies outside the scope of this literature review also indicate that spousal contentment, spousal career opportunities and spousal preferences are associated with intentions to stay in rural practice (Alexander, 1998; Beggs & Noh, 1991; Cutchin et al., 1994; Kelley et al., 2008; Manahan, Hardy, & MacLeod, 2009; Solomon et al., 2001). A study by Pathman et al. also concluded that low retention of NHSC physicians was associated with the needs of spouse and children not being well met (Pathman, Konrad, et al., 1994b). In an Australian rural context, the lack of educational opportunities for children has been found to be associated with leaving or intending to leave rural practice (Alexander, 1998; Hays et al., 1997; Kruger & Tennant, 2005). Stewart et al. recently found that not having dependent children or relatives was associated with greater intentions to leave rural and remote nursing practice (Stewart et al., 2011).

A further retention study not meeting the inclusion criteria for this review also found no difference in retention in initial rural practice according to race amongst NHSC obligated USA primary care physicians (Pathman & Konrad, 1996). This was despite minority physicians valuing small town living less than non-minority physicians, and being less satisfied with aspects of both their work and personal lives. Finally, studies outside the scope of this review indicate that a range of other personal and family factors (for example, personality, health worker psychological outlook and physical wellbeing) may have significant associations with PHC worker retention (Eley, Young, & Shrapnel, 2008; Gardiner et al., 2005; Gardiner et al., 2006; Han & Humphreys, 2006; Jones et al., 2012) and also potentially amenable to interventions (Gardiner et al., 2006).

In summary, only a small body of literature exists which explains the associations between personal and family factors and actual health worker retention. The broader literature on PHC worker retention intentions and preferences indicates the presence of substantial research gaps in this domain of inquiry, such that further research is warranted to investigate how different personal and family factors they relate to PHC worker retention in rural and remote areas.

E. External (Location and community) factors

The evidence from studies included in this review about the associations between indicators of community or geographical location and rural retention of PHC workers is limited. A relatively small number of studies model the effects of such indicators. The limited evidence available indicates that, at least in some instances, retention is shorter in rural compared with urban settings. The evidence of association between retention and the degree of remoteness (as measured by proximity to an urban USA county) was not clear cut and warrants further investigation. So too, the association between community population size and PHC worker retention was limited to two national USA studies and one Canadian study of PHC doctors. Both USA studies found that community population size was not significantly associated with rural retention, whilst the results of the British Columbian study were indicative of differences in retention according to population size (Thommasen, 2000). Thommasen's study of PHC physicians in British Columbia, however, did not report on the statistical significance of the findings, or calculate any overall estimate of any effect size. Finally, the findings of a single study examining the association between community integration of internationally trained physicians and their subsequent retention suggest that health worker integration into the wider community is a highly important determinant of retention in this population.

One study not meeting the inclusion criteria for this review which investigated an association between retention and geography was the survival analysis section of the grey literature report by Garnett et al. (Garnett et al., 2008). Garnett et al. found that amongst nurses and midwives employed by NTDH&F, retention varied according to the type of facility and its geographical location. Interestingly, remote health nurses experienced *higher* retention compared with hospital and community or other nurses and midwives, though differences were not quantified nor tested for statistical significance. Approximating median survival, derived from the provided figure (Figure 2.26 in the report) indicate that the differences amount to about six months' longer retention of remote health nurses (median survival about 24 months) compared with hospital nurses (median survival about 18 months). This finding is contrary to what might be expected of retention on the basis of geography alone, however, clearly there are differences in both geography and professional and organisational factors between these groups of workers which haven't been differentiated in the analysis. There was also no attempt by the authors to adjust for the degree of remoteness of the facility in which the nurses and midwives worked, or by population size of the community.

Kelley et al.'s study of Northwestern Ontario physicians revealed that physicians practising in the large city in the region (Thunder Bay, population size 100,000+) were significantly more likely to be intending to stay in practice in five years' time compared with physicians practising in the surrounding smaller rural communities (mostly population size 10,000 or less) (Kelley et al., 2008). In addition, the factor 'Family and community' was significantly associated with retention intentions, and an important component factor was the actual size of the community. This evidence, together with the evidence from the papers included in the literature review, particularly the British Columbian study by Thommasen (Thommasen, 2000), suggests that further research is warranted into the association between rural retention and geographic remoteness and population size.

Studies included in this review did not examine the role of a range of community infrastructure, such as educational opportunities for children, employment opportunities for spouses, and other indicators of rural amenity, on rural retention. This is despite substantial evidence from other types of studies that these factors have important associations with health worker retention or supply (Chauhan et al., 2010; Kelley et al., 2008; McGrail, Humphreys, Joyce, Scott, & Kalb, 2011a; Pathman, Konrad, et al., 1994b; Pathman et al., 1996; Silva et al., 2006). As mentioned above, Kelley found that a latent variable representing family and community factors was significantly and substantially associated with intention of physicians to stay in practice in Northern Ontario (Odds ratio 1.77) (Kelley et al., 2008). Items loading on to this latent variable in factor analysis included, in addition to size of community, availability of cultural events, availability of recreation, quality of education for children and employment opportunities for spouse. Studies included in this review also did not measure practitioner satisfaction with their community, practitioner participation in their community, or the degree to which practitioners were well matched to their community, even though other types of rural retention studies indicate that these are also significantly associated with retention (Keane et al., 2013; Muus et al., 1993; Pan et al., 1995; Pathman, Konrad, et al., 1994b; Pathman et al., 1996). Opportunities remain, therefore, to address these research gaps by investigating associations between various community and location indicators and the actual retention of PHC workers.

Limitations of the literature captured in this review

There are several general observations about the limitations of the literature examining factors associated with rural PHC worker actual retention.

1. *Volume of literature is small, largely from USA, and mainly investigates physician retention*

Given the importance of an adequate and well-functioning PHC workforce to meeting of health system objectives, and the long standing and global nature of the problem of geographical maldistribution of health workers, it is surprising that within such a vast literature on rural workforce supply, recruitment and retention, such a small number of studies investigate the associations between the actual retention of rural PHC workers and a range of financial and economic, professional and organisational, educational and regulatory, community and location, and personal and family factors. As a result of the lack of research specifically investigating actual retention behaviour, substantial gaps in our knowledge and understanding of rural PHC worker retention and the factors associated with it persist. What little evidence is available has mainly been conducted on various populations of USA physicians. Unfortunately the USA health system has quite substantial and significant differences from the Australian health system, something which limits the ability to generalise from these findings. Only scant evidence is available from other countries.

There is also a dearth of evidence relating to the factors associated with the retention of other types of PHC workers. This is despite their numerical significance as providers of PHC in rural areas, and the growth in the importance of team care which has occurred in the context of increasing prevalence of chronic disease and an ageing population. Most included studies, bar one on Physician Assistants (Larson et al., 1999), and one on graduates from 12 different health professions (Daniels et al., 2007), were of physicians. This reflects the state of the broader body of literature investigating health workforce supply, which is dominated by studies of medical practitioners, as earlier identified.

2. Most evidence relates to educational and regulatory factors or financial and economic factors

The evidence from papers included in this literature review indicates that multiple factors are associated with PHC worker retention. These factors are drawn from each of the five categories of retention factors used as a framework for this literature synthesis: financial and economic, professional and organisational, educational and regulatory, community and location, and personal and family factors. This is consistent with evidence from other types of retention studies, including studies of the effectiveness of retention interventions which conclude that a range of multi-facetted and complex factors act in the pathways to health worker retention (Buykx et al., 2010; Lehmann et al., 2008; Viscomi, Larkins, & Gupta, 2013).

However, this review of the literature revealed few studies comprehensively assess factors from each category. The 2004 study by Pathman and colleagues was an exemplary exception (Pathman et al., 2004). Studies more frequently focussed on factors from a single category, particularly educational and regulatory factors or financial and economic factors (Crouse & Munson, 2006; Cullen et al., 1997; Jackson et al., 2003; Pathman et al., 1992; Pathman, Konrad, et al., 1994a; Pathman et al., 1999; Rabinowitz, Diamond, Hojat, et al., 1999; Rabinowitz et al., 2001; Rosenblatt et al., 1996; West et al., 1996). The research focus on the role of educational and financial factors (especially student scholarships with return-of-service obligations) on health worker retention is perhaps not surprising given the immense resources expended on health professional education, the comparative ease with which data can be collected about educational factors and the possibility of using existing datasets required to administer scholarships and financial incentives. However, in order to minimise the risks associated with mis-specifying models, it remains important to include a range of factors across each of the five categories of retention factors, where possible. Evidence from other types of research indicates that professional and organisational factors are likely to have particularly important associations with actual retention (Baernholdt & Mark, 2009; Belcher, Kealey, Jones, & Humphreys, 2005; Chauhan et al., 2010; Humphreys, Jones, et al., 2002; Pathman et al., 1996). Nevertheless, it was a minority of studies which included any professional or organisational measures in the analysis of retention factors.

3. Modelling conventions and procedures require further development

A lack of consistency across studies as to which variables, or factors, are included in modelling was revealed in this review. Whilst there is clearly a need for variables to reflect the local context in which retention occurs, when different studies measure the same concept but use different indicators, the task of synthesising the evidence becomes that much more difficult for end users of the research. This issue is perhaps an unavoidable limitation associated with using administrative datasets as the primary source of data for analyses, as occurred in a number of the studies included in this review (Cullen et al., 1997; Horner et al., 1993; Rabinowitz, Diamond, Hojat, et al., 1999; Rabinowitz, Diamond, Markham, et al., 1999; Singer et al., 1998).

There were also indications that some variables, for example age, may not be consistently modelled in the most appropriate way in the existing literature. Further work is required to investigate associations between age and retention, and to establish conventions to guide future research. These include developing conventions to guide the modelling of complex interactions and the role of mediators and moderators. Whilst the broader literature indicates that complex interactions between factors occur, very few studies included within this literature review modelled interactions between variables (Singer et al., 1998).

There were also few studies which modelled the effects of mediating variables, such as job satisfaction or health worker cognitions about leaving or staying, in the pathways from distally antecedent factors through to actual turnover. The study by Pathman and colleagues (Pathman et al., 1999) modelled the effect of preparedness for small town living as a mediating variable in the pathway from educational factors, such as rural undergraduate and postgraduate exposure, through to subsequent physician retention. The study by Kamien (Kamien, 1998), too, was a rare example of research investigating the links between distally antecedent factors, practitioner intentions and subsequent retention decisions, although associations with distally antecedent factors were not quantified. None of the included studies, therefore, used the statistical techniques of path analysis or structural equation modelling to quantify and further investigate the relative importance of the different factors in determining intentions to leave, and ultimately the time until actual turnover.

4. *There is substantial variability in the study design and analytical approach of included studies*

The studies included in this review reflect a range of different study designs and analytical approaches taken by researchers. Some study designs were cross-sectional, often collecting data using a survey developed specifically for the purposes of the study. Other studies were longitudinal in design (and mostly retrospective), sometimes based on existing health education or workforce databases. As indicated in the inclusion criteria, a range of different retention profiles were also considered acceptable for inclusion in this review, so in many cases the outcomes of interest were not strictly comparable across studies.

Only about half of the included studies used multivariate analysis techniques, allowing assessment of the association between one variable and retention, whilst keeping other variables constant. A number of studies used logistic regression methods. However, many of these didn't predict turnover after a fixed period of employment (for example, first 2 years of employment). Instead, these studies predicted turnover at a particular point in calendar time, having established that the PHC worker was employed in a rural location at an earlier point of calendar time (Rabinowitz et al., 2001). The cohorts of PHC workers captured by these analyses have a range of different lengths of rural PHC service, and these types of analyses fail to take this into account. As survival analyses show, the risk of turnover (slope of the survival curve) varies according to the time since employee commencement – and is generally highest amongst recently commenced employees (seen as a steep curve initially) and thereafter tends to reduce (the curve flattens out). Whilst Pathman and colleagues introduced the concept of an 'inception cohort' to partially adjust for this effect (Pathman et al., 1992), not all studies adopted the use of an 'inception cohort' to reduce variability in length of PHC worker stay when analysing data.

Further, there was a noticeable lack of high quality studies evaluating the effectiveness of retention interventions on actual retention of PHC workers. That is, there were few studies that were designed and analysed in such a way as to allow strong conclusions to be drawn about the links between a policy response or responses targeting one or more retention factors and subsequent health worker actual retention. The USA NHSC program analysis by Pathman and colleagues was exemplary in this regard, as was the study by Crouse and Munson of the effectiveness of the J-1 visa waiver policy (Crouse & Munson, 2006; Pathman et al., 1992). Each of these studies used a cohort design with controls to compare retention of obligated and non-obligated physicians. Whilst a number of studies included in the literature review used a similar design (see Table 3.2 column 2), few studies had cases and controls selected on the basis of exposure to a specific retention intervention, and subsequent analysis of retention outcomes according to exposure status.

This variability in study design, retention profiles and analytical approaches each act to limit the ability to make valid comparisons between studies and result in caveats being placed around the findings of some of the included studies (summarised and highlighted in Table 3.2 column 5, study critique).

3.2.3 Which retention factors are most important for rural PHC worker retention?

The literature captured by this review, whilst identifying a range of factors associated with rural PHC worker retention, struggles to highlight which factors are of most importance for different groups of rural and remote PHC workers. This is a problem that has also been identified in the broader rural and remote workforce literature (Lagarde & Blaauw, 2009). Individual studies mostly identify specific factors significantly associated with PHC worker retention, and the direction and magnitude of their effect. Horner et al., for example, found that the strongest predictors of length of stay (as determined by statistical significance and having the largest effect size) were professional or organisational factors, whilst educational factors were of moderate strength, and demographic factors, such as age, gender and race were generally weakly associated or not significantly associated with physician retention (Horner et al., 1993).

A further illustrative example is provided by Pathman and colleagues, who concluded that obligated physicians have approximately twice the risk of leaving their initial rural practice compared with non-obligated physicians (Pathman et al., 1992) (Hazard Ratio 1.98). Their work also showed that physician training in internal medicine was associated with an increased risk of leaving (Hazard Ratio 1.43), whilst physicians placing high importance on small community living (Hazard Ratio 0.79) was associated with a reduced risk of leaving an initial rural practice. However, the strength of a predictor, as measured by statistical significance and its reported effect size, is not the same as the degree of importance of each factor.

In the Pathman et al. example above, obligated service is the strongest predictor, as it is associated with the largest effect size (Hazard Ratio 1.98 is larger than for other variables). However, it may not be of much overall importance to rural PHC retention if there are very few physicians with obligations in the population of interest (though it is clearly of importance to the few physicians who are obligated). If this were the case, only a small proportion of any variance in retention would be attributable to physician obligations. It is therefore of note that the studies meeting the inclusion criteria for the literature review were either unable to measure the proportion of variance in retention that the overall models explained, or did not report such findings. This lack of information on the relative ability of different factors to explain variation in retention is a substantial gap in our knowledge of the factors associated with actual rural retention of PHC workers.

Other types of retention studies, including those that are based on intentions or preferences rather than actual behaviour of rural PHC workers do, however, provide some insight into the relative importance (from a PHC worker perspective) of different retention factors in the Australian rural or remote PHC context. Humphreys et al., using paired comparison techniques, found that Australian rural and remote PHC physicians ranked the importance of six factors related to retention differently according to their degree of geographical remoteness, gender, age, family status and length of time in practice (Humphreys, Jones, et al., 2002). Despite differences amongst different groups of doctors in the importance of various factors for rural retention, some clear patterns were evident. Professional and organisational factors were dominant, especially the frequency of on-call. The level of importance of on-call also increased in magnitude as the degree of geographical remoteness increased. Professional support and the variety of rural practice were also consistently ranked as highly important for PHC physician retention. Humphreys et al. found that external factors, including the local availability of services (infrastructure) and geographical attractiveness were less important than aforementioned factors, and the degree of geographical remoteness (proximity to the city) had the least important association (of the six factors studied) with retention (Humphreys, Jones, et al., 2002).

Kamien's (1998) longitudinal study of rural Western Australian GPs found that dissatisfaction with the professional or organisational factors were the most frequent factors associated with turnover amongst GPs who had earlier indicated an intention to remain in rural practice. Important professional and organisational factors related to their workload (excessive regular hours and on-call hours), scope of practice (dissatisfaction with forced de-skilling) and inter-professional relationships. Kamien found that for GPs who had 10 years earlier been intending to leave rural practice, having a sense of doing a special job and personal attributes, especially resilience, were associated with having solved these professional dissatisfactions and ultimately with long term retention in rural practice.

High quality Australian retention studies, therefore, highlight important associations between professional and organisational factors and rural PHC worker retention. The findings of these studies are consistent with Dolea et al.'s review of the international retention literature which concluded that non-financial factors were gaining increasing importance, as health workers increasingly sought work-life balance (Dolea et al., 2009).

It is pertinent, of course, to note that retention factors found to be most important from a rural PHC worker's perspective, may not necessarily have the same level of importance from a policy-making perspective. Policymakers must additionally consider the degree to which a variable can be readily modified by policy interventions, and the costs associated with improved retention. A range of other political imperatives also come into play (see also Chapter 4). Unfortunately, however, no studies captured by this review examined the relative cost-effectiveness of different retention policy interventions, or the full range of information on retention interventions likely to be required by policymakers. It remains largely unknown therefore, what retention factors are most important from different policymakers' perspectives.

In summary, this chapter has presented a conceptual model to underpin the rural and remote PHC worker retention research of this thesis. Five categories of factors associated with the actual retention of rural and remote PHC workers were identified: financial and economic, professional and organisational, educational and regulatory, social (family and personal) and external (location and community). These categories were used to organise a comprehensive review and synthesis of the international literature investigating specific factors associated with PHC worker actual retention in rural or remote areas. Whilst the existing literature was noted to have a number of important limitations (see Sub-section 3.2.1), nevertheless, 22 studies of sufficient quality were identified and the evidence from these studies was reviewed and synthesised.

The review revealed that the majority of studies investigated the rural retention of USA PHC physicians, with the USA national NHSC program being the most widely evaluated financial and economic initiative. Consistent evidence was found indicating that longer periods of NHSC service obligation were associated with longer retention after obligations were completed. Nevertheless, medium to long term rural retention in the initial practice was low, after falling markedly once NHSC obligations were completed. Several studies indicated, however, that good retention outcomes were possible for State-based student scholarship programs targeting locally trained students and requiring return-of-service in rural areas of that State. Limited evidence confirmed that practice ownership and on-call frequency were important professional and organisational factors related to retention. Educational factors investigated included student rural rotations, which on balance were not associated with subsequent rural retention as a qualified practitioner, and postgraduate rural rotations, which were, however, associated with longer retention of non-obligated physicians. A lack of evidence about any differences in retention according to PHC worker profession was also evident. The J-1 visa waiver regulatory intervention was associated with low retention of IMGs once service obligations were complete. Only a very small body of literature investigated associations between personal and family factors and actual PHC worker retention, with a lack of quality evidence about many factors, including PHC worker age, opportunities for spouses and needs of children. Working in a location that was proximate to where the PHC professional grew up was, however, found to be significantly associated with longer retention. Finally, there was limited and mixed evidence about the associations between rural PHC worker retention and geographical remoteness and population size.

In light of the noted limitations, and the many evidence gaps exposed within the existing literature, there is a clear need to quantitatively investigate the factors associated with the actual retention of rural and remote Australian PHC workers. Of particular interest are differences in retention according to PHC worker profession, as no research to date has adequately investigated this association. Also of high interest to the Australian rural and remote workforce policy-making context are differences in retention according to geographical remoteness and population size. As shall be seen from the next chapter, these differences are of critical and current interest to policymakers, because of the implications related to the distribution of retention incentives to PHC professionals. The next chapter will therefore provide a chronology of Australian Commonwealth government policy context within which the research of this thesis can be understood.

Chapter 4: Australian rural workforce policy context

Chapter 2 revealed how long standing and serious rural PHC workforce shortages have characterised medical workforce supply in Australia. These are largely a result of market forces which attract and retain health workers in large cities, and market imperfections in the healthcare labour market which are unable to correct for this imbalance. This phenomenon was also shown to characterise the pattern of workforce distribution for almost all countries in the world.

The delivery of health care services, however, is considered a 'merit good'. That is, society judges that access to PHC services is a fundamental human right which everyone should have access to. This is in line with the declaration of Alma-Ata in 1978:

> *'…health…is a fundamental human right… the attainment of the highest possible level of health is a most important world-wide social goal… Governments have a responsibility for the health of their people which can be fulfilled only by the provision of adequate health and social measures. A main social target … should be the attainment by all peoples of the world … of a level of health that will permit them to lead a socially and economically productive life. Primary health care is the key to attaining this target as part of development in the spirit of social justice'. (World Health Organization, 1978, p. 1)*

In situations of 'market failure' where the good being supplied is considered a 'merit good', as is the case for the delivery of PHC services, it is necessary for governments to intervene to ensure that supply of those services is sufficient to meet population need. Therefore, given the evidence of substantial rural and remote PHC worker shortages in Australia, particularly for doctors and AHPs, but also for nurses in very remote areas, effective policies designed to improve the recruitment and retention of PHC workers in rural and remote areas have been considered essential forms of 'public' policy intervention.

As Dolea and colleagues recently articulated, whether or not PHC workers actually stay or leave rural and remote regions depends on how well health system policies and interventions target the factors known to be associated with retention or acting as 'triggers to leave' (Dolea et al., 2010). To this end, policymakers have long sought rigorous evidence to inform the policy-making process. In Australia this has been evident in the numerous inquiries, reports and other publications which have been produced since the 1970's reporting on the factors associated with Australian PHC worker turnover and retention.

The aim of this chapter is to document the most sentinel events, organisations, reports and publications that have shaped government policy development in relation to rural health workforce retention. The intention is not to provide an exhaustive account of the many different organisations and stakeholders that have an interest in influencing policy development around rural and remote workforce turnover and retention. Nor is it intended to provide a comprehensive historical review of rural and remote health workforce policy, as this is a substantial undertaking in its own right, as illustrated by Pensabene's documentation of historical issues relating to the Victorian medical workforce (Pensabene, 1980). By necessity, this chapter also does not deal with international workforce policies, nor with the different approaches and processes involved in developing policy responses, as this is also beyond the scope of this thesis.

Nonetheless, the overview that follows demonstrates the importance of understanding the historical context of policy-making aimed at improving Australian rural and remote PHC worker turnover and retention. The perspective taken and emphases placed on events and policy development by the author are only one of many possible understandings of these historical events. Different versions, or interpretations, of the historical events and policy responses detailed in this chapter are to be expected, since variation in the interpretation of historical events is widely recognised.

It is deemed important to give an overview in this thesis of the historical policy context in which Commonwealth government rural PHC workforce initiatives have developed. This enables the reader to gain insight into the complexities of developing interventions to target identified problems when policy-making is frequently constrained by a broad range of factors, not the least of which is the amount of time and evidence available to policymakers. Whilst in ideal circumstances policy-making would be evidence-based, it must be acknowledged that many other influences on policy-making, including political, economic, legislative and socio-cultural effects, are also important. The role of these considerations is perhaps best illustrated by the unfolding of the NSW rural doctors' dispute in 1987. During the dispute a great deal of political pressure was applied to policymakers by rural communities, and the media, in response to the resignation of rural NSW doctors from local hospitals. At the time, Sir Nicholas Shehadie, who chaired the inquiry into services provided by medical practitioners to country public hospitals, was required to gather the evidence, within a 6 week timeframe, to inform policy interventions by the NSW government (Shehadie, 1987). In this example, a multitude of factors, but especially political and economic factors, influenced the timing and content of policy interventions.

The chapter now goes on to provide a chronological overview of key events, organisations and sentinel publications and their recommendations relevant to PHC worker – especially GP – supply and distribution in rural and remote Australia, and their relevance to rural workforce retention. The focus of this chapter predominantly on the PHC medical workforce is to some degree unavoidable, given the Commonwealth government's own focus on medical workforce supply and distribution, and the necessity to confine the scope of the thesis according to the resources available. This chapter nevertheless provides a useful outline of Australian Commonwealth Government policy responses to rural and remote Australian PHC workforce issues, and how they have changed over time. A tabulated summary of the events, organisations, publications and policy responses described in this chapter is also provided in Appendix 1.

4.1 Chronological overview

4.1.1 Early days

Prior to and during the 1970's national health workforce data were intermittently collected, analysed and reported. The main source of national health workforce data at this time was the Census of the Commonwealth of Australia, undertaken every 5 years since 1961. Consequently, there was little information to assist policymakers to understand and develop health workforce policy, and what information did exist tended to be about GPs rather than nurses, AHWs and AHPs. Scotton's analysis, in 1967, of Australian GP supply and distribution concluded that Australia had an adequate supply of doctors, but that rural and remote areas, particularly in Queensland, Western Australia and Tasmania, were undersupplied (Scotton, 1967). Scotton indicated that at this time in Australia's history, it was the State governments, rather than the Australian Commonwealth government, which took responsibility for addressing rural doctor shortages, mainly through provision of public medical services in remote areas.

4.1.2 The seventies

In 1973, Karmel's review of medical education in Australia found that the main medical workforce problem was the distribution of the workforce rather than the overall supply, but nevertheless recommended that the medical workforce be expanded by one third in order to avoid future shortages (Karmel, 1973). This recommendation was accepted at the time, and the Australian Commonwealth Government committed to establishing new medical schools and expanding the number of university medical places, with numbers of medical graduates increasing by 50% in the decade between 1970 and 1980. This expansionary phase, to increase the overall supply of doctors, hoping for a flow-on effect on doctor supply in rural and remote areas, continued into the early 1980's. This approach shows how workforce policymakers recognised the link between having an overall adequate medical workforce supply (especially through education and training of domestic graduates) and the recruitment and retention of doctors in rural and remote Australia.

Three years later, in 1976, the Hospital and Health Services Commission reported on the inequitable access to health care services for rural and remote populations, especially in small towns with population size less than 3,000 (Hospital and Health Services Commission, 1976). Importantly, this report identified staff shortages affecting not just doctors, but all professions of health workers, as the most serious problem for rural areas, and concluded that the problem was worsening rather than improving. Recommendations were made to develop nurse practitioner roles, to better prepare new graduate health professionals for rural practice by increasing rural exposure during their training, and to involve Aboriginal Australians in the delivery of health care. The Hospital and Health Services Commission also reported that policy responses to rural workforce shortages were mainly at the State and Territory and rural community levels of governance, and included the offering of direct financial incentives to health workers, especially doctors, to help with recruitment. The report concluded that research was desperately needed to determine what types and how much recruitment incentives were effective for recruiting different types of rural health workers. Unfortunately the political and economic context at this time was not conducive to a favourable Australian Commonwealth Government policy response, as the government grappled with double digit inflation, rising unemployment and a large budget deficit.

In 1978, a national rural health conference "*Country Towns, Country Doctors*" was organised under the auspices of the Royal Australian College of General Practitioners (RACGP). The conference was organised in response to rising and widespread concerns amongst rural and remote health workers about the need to improve health and health care services in rural and remote Australia. The conference was addressed by the Australian Commonwealth Government Minister for Health, who shared concerns relating to the shortage of doctors in rural areas but indicated increasing government consternation about the costs of oversupply in metropolitan areas, and the inability of the market to adequately correct for this maldistribution (Walpole, 1979). Additionally, at this time, in the Ministers' view, responsibility for PHC was seen to rest with the State and Territory governments. Australian Commonwealth Government policy responses were restricted to funding the Community Health and Family Medicine Programs, which relied on the hope that rural exposure during vocational training might translate to improved rural recruitment and retention of doctors. Consequently, whilst the conference highlighted many important rural workforce issues at the time, there was little interest from the Australian Commonwealth Government to act upon the recommendations.

At about the same time, a number of analyses of the estimated production and requirements for medical manpower emerged. According to Ganderton (Ganderton, 1983), these included the unpublished Commonwealth Department of Health's "*Revised Estimates of Production and Requirements for Medical Manpower"* in 1977 (Commonwealth Department of Health, 1977), and two reports by Sax which each indicated that doctor oversupply was imminent or already evident (Sax, 1979, 1980). In an environment of increasing concern about rapidly escalating health care costs attributed to growth in doctor numbers, the previous expansionary phase for growth in Australian medical graduates began to shift to a phase of containment and eventual contraction. Thus, up to the 1980's Australian Commonwealth Government concerns about the health workforce focussed on overall supply rather than distributional issues, and focussed on doctors rather than on all types of PHC workers, even in the face of evidence of significant workforce shortages in rural and remote Australia.

4.1.3 The eighties

During the eighties there was growing disaffection amongst rural GPs occurring as a result of deteriorating professional and financial situations. In 1987, the Australian Commonwealth Government attempted to reduce rising health care costs due to the pronounced growth of corporate 24 hour clinics in cities, by bringing in a number of changes to Medicare payments, including payments for after-hours services. These Medicare Benefits Schedule (MBS) changes, passed on by the NSW State government, and disproportionately affecting rural and remote GPs providing Visiting Medical Officer (VMO) services in NSW public hospitals, triggered the NSW rural doctors' dispute. At the time nearly all rural NSW GPs resigned from VMO appointments at rural hospitals (McEwin & Cameron, 2007).

Prior to this dispute, whilst major problems with PHC worker shortages in rural and remote Australia had been documented (Hospital and Health Services Commission, 1976; Scotton, 1967) and had garnered the attention of members of health professional organisations (Walpole, 1979), the issues had gained little traction with state and federal policymakers. However, the NSW rural doctors' dispute of 1987 brought these issues to the attention of the community and the media, and at this time there became some urgency for governments to take notice and intervene (McEwin & Cameron, 2007). A committee was quickly established to inquire into, and report within 6 weeks to the NSW Minister of Health, on the methods and levels of payment for country GPs providing VMO services in rural NSW public hospitals (Shehadie, 1987). The NSW rural doctors' dispute concluded with the Rural Doctors' Association Settlement Package (RDASP) and formation of NSW Rural Doctors Resource Network. At the time, the RDASP represented substantial improvement in remuneration for after-hours care provided by GPs at the 127 smaller rural NSW hospitals, and anecdotally contributed to subsequent enhanced retention of these GPs in their rural communities.

In 1987, at the same time as the NSW rural doctors' dispute was unfolding, widespread concerns about doctor shortages in many parts of rural Western Australia were emerging. A Ministerial Inquiry, chaired by Kamien, was commissioned to examine the issues and recommend solutions (Kamien, 1987). The recruitment and retention of doctors in rural areas was recognised as a complex problem, with many factors contributing to it, including:

- A lack of rural students in medical courses;
- Inadequate training pathways for rural GPs, and discouragement of rural general practice during undergraduate training;
- Financial disincentives to rural work, including grievances about changes to Medicare payments for after-hours work;
- Professional isolation;
- Heavy workload including long hours of work and on-call;
- Difficulties in getting locum cover; and
- Limited access to continuing professional development (Kamien, 1987).

Kamien noted that improving rural GP recruitment and retention required co-ordinated and systematic action from multiple stakeholders at different levels of governance to address each of the multiple contributing factors. Recommendations included funding programs to assist with locum relief, increasing financial incentives for rural work through revision of Medicare rebates especially for after-hours care (in line with RDASP in NSW), creating bonded scholarships for rural students, taking affirmative action for selecting rural students into medical degrees, increasing rural GP exposure for medical students, providing specific vocational training for would-be rural GPs, and up-skilling opportunities for existing rural GPs in teaching and other government hospitals, and establishing an organisation resourced to specifically address rural health workforce shortages.

Soon after Kamien's sentinel investigation of recruitment and retention issues for Western Australian rural GPs, Doherty conducted a review of Australian medical education and future medical workforce needs (Doherty, 1988). This review assessed the overall supply of doctors as adequate, and whilst acknowledging geographical maldistribution of doctors, perceived the issue as largely a problem of metropolitan oversupply. Doherty therefore supported Commonwealth government action to reduce medical student intakes and recommended tighter regulatory control over entry of immigrant doctors to the Australian PHC workforce. Doherty also called for greater integration between the delivery and financing of health services, and health provider education, training and workforce supply and distribution efforts. Other recommendations included improving workforce data collection, strengthening research into the effectiveness of policies to correct the geographical maldistribution of health providers, increasing clinical training of health professionals in settings outside of hospitals, and closer consideration in future of the impact on doctor distribution when implementing changes to MBS items, such as after-hours remuneration for VMOs.

4.1.4 The nineties

During the 1990's, a change of approach to rural health workforce distribution policy formulation became evident. Distinguishing features of this approach can be summarised and synthesised as follows:

First, **rural health began to be seen as a more important issue in its own right.** That is, the health disadvantage of dispersed rural Australian populations became increasingly apparent (Australian Institute of Health and Welfare, 1994, 1998; Stephenson, 1991) and the increasing inequities in access to quality PHC services came to the fore. As a result, there was increased recognition that more targeted action was required to address rural and remote health issues. This led to the development of specific strategies guiding government attempts to address rural and remote health needs. An important component of each of the strategies was their attention to health workforce distribution, through recruitment and retention initiatives.

An early strategy was "*A Fair Go for Rural Health. Draft National Rural Health Strategy",* which was drafted in preparation for the inaugural National Rural Health Conference of 1991 (Agenda Forming Committee of the National Rural Health Conference, 1991). This strategy specifically addressed economic, professional, educational and family/social/cultural disincentives for rural practice for health professionals, and proposed solutions. The development of this draft strategy, in the context of the coming together of hundreds of rural health stakeholders, substantially increased pressure on the Commonwealth government to prioritise rural and remote health care and develop a specific plan to meet the health care needs of rural and remote populations (Australian National Audit Office, 1998). Consequently, in the years to come, three further rural health strategy documents were developed in conjunction with the Commonwealth government. These were the *"National Rural Health Strategy"* in 1994 (Australian Health Ministers' Conference, 1994), the *"National Rural Health Strategy Update"* in 1996 (Australian Health Ministers' Conference, 1996) and *"Healthy Horizons: A Framework for Improving the Health of Rural, Regional and Remote Australians"* (National Rural Health Alliance, 1999). The aim of the first National Rural Health Strategy was to provide a framework to:

- Guide the provision of appropriate and accessible health services in rural and remote areas
- Prioritise rural health interventions
- Enable flexibility of service delivery
- Monitor changes in key rural health indicators (Australian National Audit Office, 1998)

Subsequent rural health strategies progressively introduced a broader PHC approach (as envisaged by the Declaration of Alma-Ata (World Health Organization, 1978)) and a population health approach to health services delivery (Humphreys, Hegney, Lipscombe, Gregory, & Chater, 2002). As a result, the intense focus on medical and GP workforce supply in the seventies and medical workforce distribution in the eighties gradually expanded to include other professions.

Second, during the nineties an **increasing range of national rural and remote stakeholder organisations** emerged with a vested and specific interest in improving access of rural and remote populations to PHC services and reducing rural workforce shortages. Already, the Council of Remote Area Nurses of Australia had begun operations in 1982, supporting and advocating for workforce issues faced by Remote Area Nurses. So too, the NSW Rural Doctors' Resource Network had recently commenced (1988), as the first Australian educational and support organisation with a primary role of managing recruitment and retention programs for rural GPs. The Rural Doctors' Resource Network was later to become the NSW Rural Doctors Network as the Commonwealth government moved in 1998 to fund RWAs in the States and Territories. Subsequently formed rural health stakeholder groups included the Rural Doctors Association of Australia (1991), National Rural Health Alliance (1993), Health Consumers of Rural and Remote Australia (1994), Divisions of General Practice (1994), the Australian College of Rural and Remote Medicine (ACRRM) (1996), and Services for Australian Rural and Remote Allied Health (1997).

Third, there was **recognition that the provision of PHC services in remote and Indigenous health contexts differed from rural health contexts, which in turn differed from metropolitan contexts**. This meant that models of PHC service provision that worked well in metropolitan areas, for example reliance on privately provided GP services and a public/private mix of allied health services, did not necessarily work well in rural or remote areas. The late eighties and nineties saw the establishment of early precursors to the current ACCHSs and Aboriginal Medical Services throughout Australia. The model of care provided by ACCHSs specifically supported capacity for self-determination, whilst simultaneously providing culturally appropriate community services, including PHC, for Indigenous Australians. This period also saw the commencement of the rural Multi-purpose Service model of service delivery, enabling small rural communities to take a more flexible and integrated approach to the delivery of PHC services.

Fourth, a greater understanding of the **importance of having high quality health workforce data collections, analyses and reporting, and the necessity to undertake specific workforce planning** was seen through the nineties. This was evident in the setting up of the Medical Workforce Committee, from 1989, which became AMWAC in 1995. AMWAC provided advice to the Australian Health Ministers' Advisory Council (AHMAC) which was itself a committee of the newly established Council of Australian Governments (COAG). AMWAC produced a series of health workforce reports, many of them about various specialties. The *"Australian Medical Workforce Benchmarks"* report (Australian Medical Workforce Advisory Committee & Australian Institute of Health and Welfare, 1996) was especially significant to rural and remote GP workforce policy development, because it reported a considerable oversupply of 2,900 FTE GPs in capital cities and other major urban areas of Australia (and a far smaller undersupply in rural areas of 445 FTE GPs) based on an estimated PPR benchmark of 205 FTE practising clinicians per 100,000 population. This finding supported ongoing reductions in undergraduate training numbers by the Commonwealth government, even though workforce projections were based on the (false) assumption of uniform distribution of medical workforce supply relative to need. The subsequent report, *"The Medical Workforce in Rural and Remote Australia"* (Australian Medical Workforce Advisory Committee, 1996) projected future workforce needs based on increments to the aforementioned benchmark PPRs over time. There was also increased recognition of the need for research, so that rural workforce planning decisions could be based on a better understanding of the issues, and so that the policy responses to the workforce problems might be more effective.

Fifth, a **greater flow of information between stakeholders about rural and remote health workforce issues was made possible** through regular conferences with a rural focus (National Rural Health conferences), the inception of a specific Australian rural health journal (Australian Journal of Rural Health) in 1992, through increased media interest, and through further development of the internet and information technology in general. Support for academic research into various aspects of the rural health workforce was also more evident during the nineties, as seen through the commencement of the first university academic rural health research unit at Monash University in 1992 (Clough, 2012).

Sixth, **rural issues in general became established as a real political 'thorn'** that threatened governments. With rising popularity of the One Nation party in the late 1990's, there emerged a political imperative to address the needs of rural Australians. In response, the Deputy Prime Minister, John Anderson, convened the Regional Australia Summit. From this came a renewed emphasis on the critical importance of improving access to health care for rural and remote populations, and having a professionally skilled health workforce to deliver appropriate health services. This was followed up in 2000 by, what was at the time, the largest ever Commonwealth Government budget response to rural and remote health workforce recruitment and retention issues with the $562 million Regional Health Strategy *"More Doctors, Better Services".*

Seventh, from the 1990's **increasingly well developed, comprehensive rural health training programs that were often embedded within universities** were funded for doctors. The Western Australian Centre for Rural and Remote Medicine, which commenced in 1990, was an early example of a comprehensive rural training program. It was partly funded by the Commonwealth, and was established with the specific aim of supporting the recruitment and retention of rural GPs. Subsequently the Rural Undergraduate Support and Coordination (RUSC) program was established in 1993, which was intended to promote rural general practice career pathways through increasing rural undergraduate placements, and developing rural health clubs at universities and rural health undergraduate medical curricula. In 1994, the RUSC program implemented a 25% quota of rural students entering medical courses and mandated minimum lengths of rural placements, as rural recruitment initiatives. Between 1989 and 1996, several multidisciplinary rural health training units were also funded to provide education and training to rural health professionals. These functions were eventually transferred to six University Departments of Rural Health (UDRHs) which were funded from 1996-7. UDRHs aimed to support the rural recruitment and retention of a broader range of health professionals (doctors, nurses and AHPs), by providing rural training opportunities for students. UDRHs were also tasked with supporting the retention of existing rural health professionals. Towards the end of the nineties, the Rural Clinical Schools (RCS) program also received initial funding so that medical students could receive large parts of their clinical training in rural and regional areas.

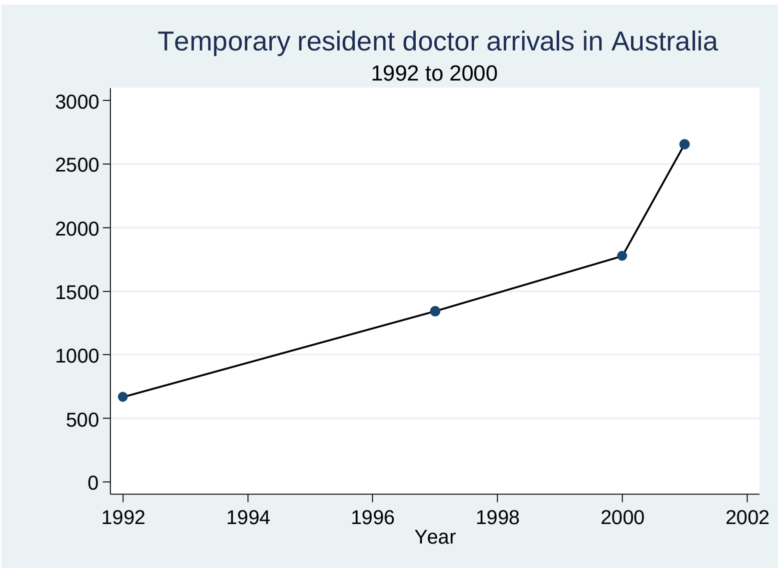
Postgraduate training for rural general practice also underwent significant changes during the nineties. In 1992 the RACGP established a rural vocational training stream to better prepare GPs for rural or remote practice. In 1997 the Commonwealth government introduced regulations to link vocational registration with access to Medicare provider numbers, thereby incentivising new medical graduates to undertake comprehensive training for PHC.

Educational initiatives for nurses, AHPs and AHWs, however, did not keep pace during the nineties with those for training doctors. According to Bennett's analysis of a 1994 review of nursing education (Reid, 1994), recommendations were made that AHMAC fund centres for rural and remote area nursing, and provide infrastructure and financial support for rural background nursing students and Indigenous nursing students (Bennett, 1995). Little action on these recommendations was taken during the nineties, however.

Eighth, Australia increasingly assumed a **greater international role in responding to rural workforce issues.** This is evident in Australian policymaker and researcher participation in international forums, including the International Health Workforce Collaborative conferences from 1996 onwards. Increasingly, Australians also held international health workforce leadership roles. For example, an Australian medical workforce academic and clinician was Chair of the Working Party on Rural Practice of WONCA, the World Organization of Family Doctors, for 12 years between 1992 and 2004.

Ninth, the nineties saw **changes in the approach to management of inflows to Australia's PHC workforce from overseas health professionals**. In the early nineties, workforce planning was largely concerned about managing oversupply in the GP workforce evident in major cities and large urban centres. These concerns led to quotas on Australian Medical Council (AMC) examination applications and point penalties for medical practitioners applying to migrate to Australia. However by the mid-nineties the focus on controlling overall supply shifted to consideration of how to improve health workforce distribution (Gavel, 2003). The nineties was a period of rapidly increasing numbers of IMGs on temporary resident visas entering Australia, with numbers almost tripling from 667 in 1993 to 1777 in 2000 (see Figure 4.1).

Figure 4.1 Temporary resident doctor arrivals, Australia, 1992-2002



Source: Used and adapted with permission from (Gavel, 2003). Data from AMWAC and Department of Immigration and Multicultural and Indigenous Affairs

By the mid-nineties, policymakers sought to direct these health care workers to work in underserved areas, where they were needed most. In 1997 restrictions were introduced on IMG practice, known as the *'10 Year Moratorium'*. This policy restricted the access of IMGS who first registered in Australia after 1/1/1997 to bill Medicare for 10 years from when they registered unless they worked in a DWS (Hawthorne & Birrell, 2002). In 1999, the policy intervention was further refined with the introduction of the *'5 Year Overseas Trained Doctor Scheme'* which allowed for scaled reductions in the 10 Year moratorium according to the remoteness of the geographical location of IMG practice. These policies were effective in directing permanent resident and temporary IMGs to practise in geographical locations where they were most needed (Rural Health Workforce Australia, 2008). They relied on coercive mechanisms to primarily increase *recruitment* of health workers to rural and remote Australia. Retention of IMGs in rural and remote Australia received relatively little attention at this time.

Tenth, the Commonwealth government began to **better target recruitment and retention initiatives, both directly and indirectly**, to existing rural and remote PHC providers. An important initiative targeting financial and economic retention factors was the General Practice Rural Incentives Program (GPRIP) for GPs which commenced in 1993. In its early phases it provided relocation grants for GPs moving to areas that have difficulty recruiting GPs, training grants, funding for continuing professional development and for locum relief, and remote area grants to support GP recruitment and retention in 50 remote communities (Clark, 1995). GPRIP became the Rural and Remote General Practice Program (RRGPP) in 1998. The RRGPP reforms were a government response to the recommendations of the 1998 *General Practice Strategy Review* and were designed to provide direct financial recruitment and retention incentives to GPs which were scaled according to practitioner length of stay, factoring in remoteness of the geographical location and professional isolation using the General Practitioner Accessibility and Remoteness Index of Australia (GPARIA) classification tool (Gibbon & Hales, 2006). In 1998, a further financial incentive to support the recruitment and retention of rural GPs was the introduction of rural loadings as part of the Practice Incentives Program. The Rural Health Support Education and Training (RHSET) Program, a grants program established in 1990, also targeted both educational and professional support for rural and remote PHC providers through a wide range of discipline-based projects (Harvey, Webb-Pullman, & Strasser, 1999). The Rural Locum Relief Program also began in the late nineties, as an initiative to support the retention of rural and remote GPs by enhancing their ability to access *locum tenens* and take recreational and professional leave.

Table 4.1 Summary of the Commonwealth government rural workforce policy context in the nineties

The nineties	
1.	Rural health began to be seen as a more important issue in its own right
2.	An increasing range of national rural and remote stakeholder organisations
3.	Recognition that the provision of PHC services in remote and Indigenous health contexts differed from rural health contexts, which in turn differed from metropolitan contexts
4.	Importance of having high quality health workforce data collections, analyses and reporting, and the necessity to undertake specific workforce planning recognised
5.	A greater flow of information between stakeholders about rural and remote health workforce issues was made possible
6.	Rural issues in general became established as a real political 'thorn'
7.	Increasingly well developed, comprehensive rural health training programs that were often embedded within universities were funded, especially for doctors
8.	Australia increasingly assumed a greater international role in responding to rural workforce issues
9.	Changes occurred in the approach to management of inflows to Australia's PHC workforce from overseas health professionals
10.	Better targeted Commonwealth recruitment and retention initiatives to existing rural and remote PHC providers

Thus it can be seen that during the nineties, rural health workforce shortages were very much evident, and rural health in general attracted a great deal more stakeholder and policymaker interest than it had done in preceding decades. In some regards, however, the heightened interest in rural health issues during the nineties absorbed policy-making attention that had previously been more tightly focussed on rural workforce issues. Instead, workforce issues became framed within the broader PHC and population health contexts outlined in the successive National Rural Health Strategies. Nevertheless, the nineties saw the first specific Australian Commonwealth Government policy interventions at a national scale specifically and overtly targeting rural and remote PHC worker recruitment and retention.

4.1.5 The 21st Century

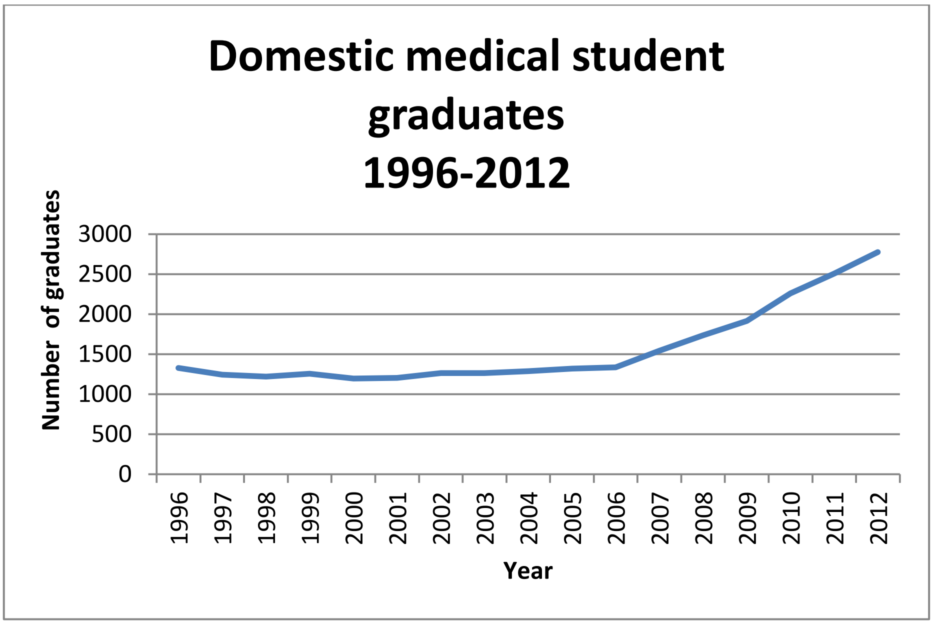
The Commonwealth government rural health workforce policy context continued to change during the 21st Century, as policymakers grappled with what was by now a widely accepted problem of critical rural workforce shortages related to the geographical maldistribution of health workers. Characteristics of the changing policy context are detailed in the following:

First, the 21st Century saw a continuation of previous health workforce analysis and planning which **focused on the numbers and distribution of specific cadres of health professionals, especially doctors**. The perception from the nineties that overall Australia was oversupplied with GPs was progressively challenged during the noughties, for example by the Access Economics report in 2002 "*Primary Health Care for all Australians: An Analysis of the Widening Gap between Community Need and the Availability of GP Services. Report to the Australian Medical Association",* and in 2005 by the Productivity Commission report "*Australia's Health Workforce*" and again in 2008 by the Department of Health and Ageing's (DOHA's) "*Report on the Audit of Health Workforce in Rural and Regional Australia*" (Access Economics, 2002; Australian Government Department of Health and Ageing, 2008; Productivity Commission, 2005). Each of these reports confirmed evidence from the nineties that the supply of health workers in rural and remote Australia was very poor. However, these reports also provided evidence that overall health worker shortages were now extending to affect provincial cities and outer urban areas (Access Economics, 2002) and also across a number of professions (Productivity Commission, 2005).

Second, at the same time as Commonwealth government perceptions of the adequacy of the overall Australian supply of health workers were shifting, **the health workforce market was becoming increasingly globalised.** In 2006, the WHO identified shortages of PHC workers in rural areas as a critical issue in many developing countries (World Health Organization, 2006). WHO Member States were subsequently urged to rapidly increase production of their own health workforce, in order to reduce reliance on immigration of health workers from developing countries. Eventually, in 2010, a code of practice for international recruitment of health personnel was adopted by all WHO Member States (Buchan et al., 2013; World Health Organization, 2010b). As a result it became less ethically acceptable for Australia to continue with its heavy reliance on internationally trained health professionals from low income countries.

Third, in response to these issues and the political imperative at the time, the early 21st Century saw the Commonwealth government shift from a phase of containment of the number of domestic medical school graduates to a **substantial expansionary phase in an attempt to increase overall supply of doctors**. This phase had begun with the 2000-01 Commonwealth budget's funding of extra medical places for domestic students, and is revealed in the large increases in numbers of domestic medical graduates six years later. Between 2006 and 2012 the numbers of medical student graduates more than doubled and continued on an upward trajectory (see Figure 4.2).

Figure 4.2 Domestic medical student graduates 1996-2012



Source: (Medical Deans Australia and New Zealand, 2013)

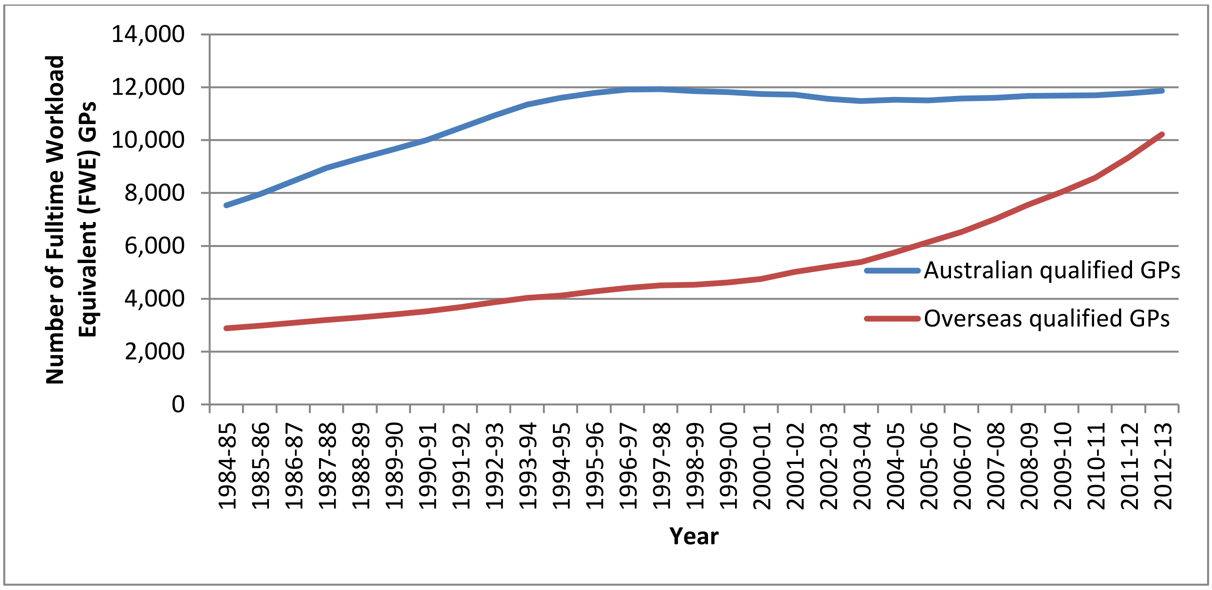
Increased graduate numbers were a result of Australian Commonwealth Government policies to increase overall medical school intake quotas as well as to double the number of new medical schools from 2000 (Joyce, Stoelwinder, McNeil, & Piterman, 2007).

The Australian Commonwealth Government also acted to expand the medical PHC workforce by increasing the number of available vocational training places for GPs. The 2000-01 Commonwealth budget funded an additional 75 places, the 2002-03 budget an additional 225 places, and further increases in 2004 saw the number of GP vocational training places increase to 600. In 2008 COAG committed to further increase GP vocational training by another 212 places. However, as can be seen in Figure 4.3, despite substantial growth in the number of domestic medical graduates between 2007 and 2012, the overall number of Australian qualified FWE GPs has been static for almost 20 years.

The noughties was also a period of rapid growth in the number of domestic nursing graduates, with a 43% increase from 5,084 in 2001 to 7,266 in 2009 (Hawthorne, 2011) occurring in response to increased Commonwealth government funding of university places for nursing students.

Also in the late 1990’s and early 2000’s, in further expansionary efforts, the Australian government introduced regulations facilitating foreign graduates from Australian medical schools (FGAMS) (and from other Australian university courses) to remain in Australia and apply for permanent residency as General Skilled Migrants immediately upon graduation. As the Australian Commonwealth Government does not regulate the numbers of international full fee paying students, the number of

Figure 4.3 Australian GP workforce growth 1984 to 2009



Source: Department of Health General Practice Workforce Statistics 1984-5 to 2012-3 (Department of Health, 2014)

FGAMS have increased enormously during the 21st Century (Deloitte Access Economics, 2011). The opening of this study-migration path resulted in unprecedented inflows of former international students as skilled migrants, especially as doctors and nurses (Hawthorne, 2011; Hawthorne & Hamilton, 2010).

At the same time, the numbers of overseas trained doctors in the Australian GP workforce began increasing more rapidly than seen in previous decades, as seen in Figure 4.3. Already the 10 Year Moratorium and 5 Year Overseas Trained Doctor schemes were in place, directing newly arrived IMGs to work in rural and remote areas of Australia. Several Commonwealth government policies were introduced during the noughties to facilitate the recruitment of IMGs to rural and remote areas. The International Recruitment Strategy (IRS) commenced in 2004 to recruit and place IMGs in undersupplied areas (as defined by DWS status). By 2006 COAG announced that nationally consistent assessment processes for IMGs would be developed, and in 2007, the *'Competent Authority Pathway'* for IMGs was introduced. The *'Competent Authority Pathway'* fast-tracked recruitment of IMGs trained in the UK and Ireland, amongst others, resulting in a further surge of UK/Ireland qualified IMGs (Hawthorne, 2011). These initiatives targeting IMGs were particularly successful for increasing the recruitment of GPs to rural and remote Australia. In 2008-09 compared with 2000-01 there were an additional 1,452 GPs in rural and remote Australia. 82% (1,196) of these were IMGs (Rural Health Workforce Australia, 2011).

Fourth, the 21st Century also saw **increased use of Commonwealth government funded *financial incentives* offered for health students to take up on a voluntary basis. These were aimed at**

improving the geographical distribution of health workers in the medium term. Student scholarships were frequently targeted at, or gave priority to, rural origin students or students from other disadvantaged minorities. Current examples include the Aged Care Nursing Scholarship Scheme, the undergraduate scholarship stream of the Nursing and Allied Health Scholarship and Support Scheme, the Rural Australia Medical Undergraduate Scholarship (RAMUS), the Rural Pharmacy Scholarship Scheme, and the Puggy Hunter Memorial Scholarship Scheme. Other types of student financial incentives were bonded, requiring return-of-service in rural or remote areas. One such program was the voluntary Medical Rural Bonded Scholarship (MRBS) scheme, initially funded in 2000, which provides financial support to medical students in exchange for service in rural or remote areas once qualified. Breach of MRBS contract is strongly discouraged by the requirement to repay the scholarship together with loss of access to a Medicare provider number for up to 12 years. Yet other types of financial incentives sought to increase and support rural exposure during student training. One such program, the John Flynn Placement Program, had 150 places when initially funded in 1997, but underwent substantial expansion in the early 21st Century with 1200 places funded by 2008. Another program is the Rural and Remote Placement Allowance Scheme for pharmacy students. Despite the proliferation of student scholarship schemes, a recent review of government workforce programs concluded that there remains insufficient evidence to conclude that providing financial incentives to students is an effective way to achieve desired workforce outcomes (Mason, 2013).

Fifth, **Commonwealth government funded *financial incentives* for recruitment and retention of existing health professionals**, which had been in place for the medical profession since the nineties, in general **became less well targeted to where they were needed most.** The annual Australian Commonwealth Government spend on financial incentives also increased markedly. The mechanism for allocating relocation and retention incentives to GPs (Rural Retention Program) and GP Registrars (General Practice Registrars Rural Incentive Payment Scheme GPRRIPS) was based on GPARIA until 2010. This meant that the professional isolation (and, indirectly, town population size) was taken into account up until 2010. An evaluation of the Rural Retention Program undertaken in 2006 reported that the incentive scheme was particularly crucial for retaining GPs in the most remote and isolated areas, GPARIA categories D and E (Gibbon & Hales, 2006). However, in 2010 the allocation mechanism changed and the ASGC-RA classification scheme began to be used to differentiate levels of payments to doctors. This change had the unintended consequence that specific rural workforce relocation and retention incentives were less well targeted to where they were needed, because professional isolation related to community population size was no longer specifically taken into account. Evidence that the financial incentives were poorly targeted was seen in the major growth of

GPRIP payments in inner regional areas, as well as in the increasing access of specialists to these payments which were intended for PHC providers (Mason, 2013). This was despite increasing evidence becoming available at the time of the importance of population size as an indicator of the different types and level of activity undertaken by PHC providers, especially GPs (Best, 2000; McGrail, Humphreys, Joyce, Scott, & Kalb, 2011b). These problems have since been identified by a recent review of Australian Government health workforce programs, which recommended substantial adaptations to the ASGC-RA system when used by health workforce programs to distribute financial incentives (Mason, 2013).

Additionally, other recently introduced financial incentives for health professionals have similarly failed to carefully target recruitment and retention in locations where workforce shortages are the most acute. One such example is the Higher Education Contribution Scheme (HECS) Reimbursement Scheme, for doctors, which was funded in 2000. This program also uses the ASGC-RA classification scheme for scaling purposes, and therefore is similarly limited in its ability to target smaller communities. A further example is the Medicare Plus for Other Medical Practitioners Program (MOMPs) incentive program for medical practitioners which started in 2004. MOMPs offers higher Medicare rebates for pre-1996 non-vocationally registered doctors who work in DWSs. The higher rebates are available whilst they were working in DWS and on a permanent basis after 5 years of service provision in a DWS. However, determination of DWS is a simple binary measure (see Table 2.3, Chapter 2), essentially benchmarking the adequacy of GP supply in a SLA against the national average. Reliance of workforce programs on DWS as the distributive mechanism limits their ability to effectively channel the PHC workforce to where the shortages are most acute, as the DWS measure lacks precision. Recent research has revealed DWS provides an inadequate basis for distributing rural recruitment and retention incentives (McGrail, Humphreys, et al., 2011a). The limitations related to the use of DWS status (as an indicator of workforce shortage areas) in workforce programs such as MOMPs was also recognised and flagged for modification in the recent review of Australian government health workforce programs (Mason, 2013).

Another Commonwealth funded financial incentive for existing GPs, introduced in 2000 and increased in 2006, was the PIP procedural GP payment. This initiative provided tiered financial incentives of up to $17,000 per year for GPs in rural and remote areas (RRMA 3-7) to continue providing obstetric, anaesthetic and surgical procedures. Because program eligibility relates directly to specific activities undertaken by PHC providers with an extended generalist scope of practice, it is likely that this program, in contrast to other GP incentive programs, is reasonably well targeted to retain highly skilled GPs where they are needed most.

Sixth, during the 21st Century, specific **rural workforce distribution policies increasingly relied on *coercion and regulations* which forced health workers to work in rural or underserved areas**. Coercive policies had already been introduced for directing IMGs to work in underserved areas of Australia during the nineties. Additional coercive policies, directed at graduates of Australian universities, were brought in from 2000. In the 2000-01 Commonwealth budget the government announced funding for over 200 new Bonded Medical Places (BMPs) at universities for medical students. BMPs began in 2004 and subsequently the number of BMPs substantially expanded to 25% of all commencing domestic medical student places (around 535 places in 2007 and 700 places in 2013). Whilst acceptance of BMPs is 'voluntary', the uncertainty and frequent lack of transparency in allocation of university medical places effectively coerces students to accept BMPs for fear of missing out on a university medical place entirely. Students accepting these places are then obliged to work in a DWS for a length of time equivalent to the length of their medical degree, less any time reductions gained by scaling based on the ASGC-RA classification of the location. The return-of-service obligation commences after attaining fellowship of a specialist college (for example, FRACGP). Alternatively BMP students can elect to opt out of the scheme and repay 75% of the cost of their medical schooling (with no restrictions on subsequent access to Medicare). The BMP policy therefore enforces recruitment to underserved areas and retention in those areas for a period of time equivalent to the length of medical schooling. BMPs may therefore effectively recruit and retain doctors in underserved and rural areas in the short to medium term. However, penalties for escaping from obligations must be a sufficient disincentive for the policy to be effective in the short term (Mason, 2013). Additionally, evidence indicates that it is important that graduates complying with return-of-service obligations are provided with sufficient choice of practice location and support within that location, for medium and longer term retention to be supported (Pathman, Konrad, et al., 1994b). The literature also indicates that rural retention is likely to be poor once return-of-service obligations are complete. At this stage the effectiveness is still not known, due to the long lead time of the program

Other Commonwealth government initiatives have also been introduced which act via coercive regulatory mechanisms forcing health workers to work in underserved areas. In 2002, regulations requiring mandatory vocational training in (underserved) outer metropolitan areas for GP Registrars were introduced. This regulatory intervention was linked to 1996 changes to the Health Insurance Act 1973, which mandated that medical practitioners had to be working towards, or have achieved, vocational recognition in order to be able to access Medicare provider numbers and bill Medicare. Similarly the Rural Locum Relief Program, which commenced in 1998 and still operates, acts by coercing doctors who would otherwise be unable to access the MBS, to be able to access Medicare on a temporary basis if they are providing locum services in approved places in rural or remote areas.

Seventh, the 21st Century saw an **ongoing and major expansion in the role of the Commonwealth in funding rural *educational initiatives*** at all stages of the 'rural pipeline', but especially at the undergraduate/graduate stage at Australian universities. The RCS program was established in 2000 and rapidly grew to its current 17 rural clinical schools across Australia. A key requirement for RCS programs is to fill a quota of 25% of Commonwealth supported medical students spending at least a year of their clinical training in a rural setting. The RUSC program, an ongoing initiative from the nineties, continued to target rural background students and require mandatory rural placements for all Commonwealth supported medical students (Australian Government Department of Health and Ageing, 2013). Training programs were also developed to address gaps in the rural PHC training pathway continuum in the 3 years following medical graduation. The Rural and Remote Area Placement Program (which became the Prevocational General Practice Placements Program in 2004) was developed to expose junior doctors to PHC practice in settings that were traditionally medically underserved (rural, regional and outer metropolitan). Specific rural and remote vocational pathways for GPs were also largely developed in the 21st Century. In 2001, the vocational training function of the RACGP was subsumed by the new entity, General Practice Education and Training (GPET). GPET developed the Australian General Practice Training Program with a specific rural vocational training pathway and was required to deliver a minimum of half of GP vocational training places in regional, rural and remote areas (Department of Health and Ageing, 2012). The Remote Vocational Training Scheme also commenced in 2000 as a small scale program (22 GP Registrars p.a. from 2011) providing vocational training in-situ for doctors in remote and isolated Australian communities and in Indigenous communities. In 2007 ACRRM gained accreditation from the AMC to provide training and professional development for rural GPs working towards their FACRRM qualification as a rural generalist.

As well as having an expanded role in funding rural undergraduate medical education initiatives, the Australian Commonwealth Government also increasingly funded rural undergraduate education initiatives for nursing and allied health students. This was evident in the 2003-04 budget announcement of increased funding to provide additional nursing training places in regional areas and to support clinical training of nurses. In 2008-09 the Commonwealth budget announced a further 50,000 additional health vocational training places targeting areas of chronic skill shortages, including dentistry, nursing and Indigenous health.

Eighth, unfortunately there were **no equivalent systematic and comprehensive Commonwealth rural *educational initiatives* for internationally trained health professionals** during the 21st Century. This was despite the huge influx of overseas trained professionals and coercive Commonwealth government policies which increasingly required them to work in isolated rural and remote settings. The access to bridging programs for this group of rural health professionals is considered to be critical, however, to date, educational support programs have been poorly co-ordinated, under-resourced, ad-hoc, and mostly funded regionally or jurisdictionally rather than through the Commonwealth budget (Hawthorne, 2011; House of Representatives Standing Committee on Health and Ageing, 2012). Limited specific training support for IMGs coming to Australia, and other non-vocationally registered doctors who were permanent residents is funded through the Additional Assistance Scheme. This educational initiative provides case management support and funding for eligible rural candidates studying for FRACGP or FACRRM. The Overseas Trained Doctor National Education and Training program for temporary and permanent IMG doctors working in a GP environment also prioritises training support for eligible doctors practising in rural and remote ASGC-RA 2-5 locations, however this program is over-subscribed. As a result, educational support initiatives are not available to many temporary resident IMGs (Rural Health Workforce Australia, 2011).

Ninth, the Australian Commonwealth Government **funded a broad range of *professional and organisational* initiatives** to support the recruitment and retention of rural and remote GPs. The Divisions of General Practice, for example, funded initially in 1992, continued to provide support with mentoring, network development, and continuing professional development of all GPs, especially those newly arrived to a region. Unfortunately in recent times, this function is threatened as Divisions of General Practice underwent rapid transitioning to Medicare Locals which had a far broader PHC remit, and then towards Primary Health Networks. Part of the remit of RWAs, too, was to provide important recruitment and other professional support for rural and remote GPs.

In 2001, the Practice Incentives Program began providing incentives for GPs to employ Practice Nurses or AHWs, thus creating opportunities for rural and remote GPs to manage some of their heavy workload by delegating tasks. During the 21st Century, the Commonwealth government also began to broaden the scope of activities which Practice Nurses could be remunerated for, by opening up access to MBS items for nurses providing services under the direction of a GP. Whilst these initiatives were not specifically targeted at the rural health workforce, it is likely that given the heavy workloads of many rural and remote GPs, the Practice Nurse and AHW initiatives provided a mechanism by which the rural GP workload could be more flexibly managed without creating significant financial disincentives. Unfortunately, at the same time, there was a lack of effective Australian Commonwealth Government initiatives to substantially address the effect of frequent on-call and after hours work on discouraging rural recruitment and triggering the turnover of existing rural and remote GPs. This is an important gap, as on-call has previously been identified by rural GPs as overwhelmingly the most important factor contributing to retention in rural practice (Humphreys, Jones, et al., 2002).

Another Australian Commonwealth Government funded professional and organisational initiative was the National Rural and Remote Health Infrastructure Program (NRRHIP). This was a competitive grants program to support primary care infrastructure in rural and remote Australia. It enabled rural and remote GPs to improve the professional premises from which they provided PHC services.

So, too, programs that provided subsidies and support for rural and remote PHC practitioners to access *locum* tenens were increasingly provided during the noughties. These programs enabled rural and remote PHC practitioners to take adequate recreational and professional leave. Initiatives which commenced under the National Rural Locum Program (for doctors) included the Rural General Practitioner Locum Program (administered by RWAs), the Specialist Obstetrician Locum Scheme, which started in 2006 and for which GP obstetricians were eligible, and the General Practitioner Anaesthetist Locum Scheme, which started in 2009.

However, once again, some of the potentially most important programs were poorly targeted or had inadequate coverage. A review of the National Rural Locum Program in 2011, for example, found that it had poor reach and did not adequately target GPs with the highest need for professional support of this type (Communio, 2011). Instead, many locum placements were in ASGC-RA2 (inner regional) locations. The Specialist Obstetrician Locum Scheme and the General Practitioner Anaesthetist Locum Scheme were subsequently merged and rebadged as the Rural Obstetric and Anaesthetic Locum Service. Recently, a national rural GP locum register has also been set up to help facilitate RWAs support rural and remote GPs to find locums. The Rural Locum Education Assistance Program, commencing from 2004, was also designed to up-skill metropolitan GPs so that the pool of metropolitan GPs providing rural and remote GP locum services was expanded. Since the 2010-11 Commonwealth budget, funding to support access to locums has been extended to rural nurses and AHPs through the Nursing and Allied Health Rural Locum Scheme (NAHRLS).

The Rural Health Continuing Education Program (Stream 2) was funded from the 2009-10 Commonwealth budget as an initiative to enhance access to continuing professional development for rural and remote GPs, nurses, AHPs and AHWs. Recent evaluations of this program, too, indicate a need to better target the program to more remote areas (for example, ASGC-RA 3-5) and to increase its reach by doubling the amount of funding available (Dade Smith, Wolfe, & James, 2013; Mason, 2013).

Other professional and organisational support initiatives targeting rural PHC workers during the 21st Century included the development and support for rural generalist career pathways (supporting GPs to up-skill and gain advanced procedural skills, for example through the Rural Procedural Grants Program since 2004), increased support for rural PHC infrastructure development (for example, through NRRHIP) and increased professional support available through facilitating GP, nurse and AHW access to MBS funding of telehealth patient consultations with specialists.

Tenth, with respect to recruitment and retention initiatives targeting *personal and family or community and location* factors, there was **little Australian Commonwealth Government targeted investment in initiatives that could flexibly support rural and remote PHC practitioners' access to adequate, appropriate and affordable housing, childcare, and schooling for their families**. 21st Century Australian Commonwealth Government initiatives included:

- the Rural Medical Family Network, administered by RWAs to provide information and support, including employment support and training for spouses as well as networking opportunities for spouses, and
- the Bush Crisis Line, which from the late nineties provided counselling services to remotely located PHC practitioners and their families to support their health and wellbeing.

Eleventh, **health workforce data collections, analysis and reporting advanced** during the 21st Century. Rural Health Workforce Agencies got into the full swing of establishing databases to collect longitudinal workforce data on rural and remote GPs. National reporting of rural GP workforce data was simultaneously facilitated by the Australian Rural and Remote Workforce Agencies Group (ARRWAG), established in 2000 and later to become RHWA, and the mandatory requirement for reporting on a National Minimum Data Set. So, too, the Australian Government DOHA funded the Medical Schools Outcomes Database from 2004, enabling tracking of medical students through medical school and into the workforce. In 2007 COAG announced a national registration and accreditation scheme for nursing and midwifery, medicine, pharmacy, physiotherapy, psychology, dental care, optometry, osteopathy and chiropractors, thereby creating and enhancing opportunities for national longitudinal workforce studies on these groups of health professionals. These new sources of workforce data complemented existing Medicare, AIHW and ABS workforce data collections and reporting and represented important advances in the ability to provide a necessary evidence-base for workforce planning purposes. Nevertheless, substantial gaps remain, particularly the lack of a comprehensive national allied health workforce longitudinal database and a lack of systematic and comprehensive collection of data on the critically important flows of internationally trained health professionals. So, too, quantitative analytical methods to provide much needed information to policymakers became increasingly refined during the 21st Century. More frequent statistical modelling of future health care workforce needs, especially the medical workforce, was undertaken and made publicly available (Access Economics, 2002; Australian Medical Workforce Advisory Committee, 2000; Deloitte Access Economics, 2011; Health Workforce Australia, 2012a, 2012b, 2012c; Joyce, McNeil, & Stoelwinder, 2006). In spite of these advances, however, it is still rare for statistical modelling to specifically take geographical location into account when forecasting and planning future health workforce requirements.

Table 4.2 Summary of the Commonwealth government rural workforce policy context in the 21st Century

The 21st Century	
1.	Continuation of previous health workforce analysis and planning which focused on the numbers and distribution of specific cadres of health professionals, especially doctors
2.	The health workforce market becomes increasingly globalised
3.	The Australian Commonwealth Government shifted to a substantial expansionary phase in an attempt to increase overall supply of doctors
4.	Increased use of Australian Commonwealth Government funded financial incentives for health students aimed at improving the geographical distribution of health workers
5.	Australian Commonwealth Government funded financial incentives for existing health professionals became less well targeted to where they were needed most
6.	Rural workforce distribution policies increasingly relied on coercion and regulations forcing health workers to work in rural or underserved areas
7.	Ongoing and major expansion in the role of the Australian Commonwealth Government in funding rural educational initiatives
8.	No equivalent systematic and comprehensive Australian Commonwealth Government rural educational initiatives for internationally trained health professionals
9.	Funding of a broader range of professional and organisational initiatives to support the recruitment and retention of rural and remote GPs
10.	Little Australian Commonwealth Government targeted investment in initiatives that could flexibly support rural and remote PHC practitioners' access to adequate, appropriate and affordable housing, childcare, and schooling for their families
11.	Health workforce data collections, analysis and reporting advanced

Summary of rural workforce policy context in 21st Century

In summary, the 21st Century was characterised by the progressive introduction and incremental adaptation of a vast range of complex Australian Commonwealth Government initiatives aimed at improving the availability of PHC workers to rural and remote Australian populations. The initiatives have required, and continue to require substantial investments by the Australian Commonwealth Government. In many respects the policy interventions continued to predominantly target the medical profession, to the detriment of an improved geographical distribution of AHPs in particular.

Some of the most effective policy interventions (at least for rural recruitment) targeted the *educational and regulatory* group of factors, and involved coercion of IMGS via the 10 year Moratorium and 5 year Overseas Trained Doctors Program. On the other hand, after more than 20 years of funding, there is little evidence that a key Australian Commonwealth Government funded retention policy intervention, GPRIP, effectively enhances rural retention in those areas where retention is most critical. Furthermore, important gaps are also evident in the range and reach of initiatives funded by the Australian Commonwealth Government. Of particular importance for the retention of rural and remote PHC providers was the lack of adequate programs to sufficiently address workload issues, particularly the often onerous on-call and after-hours workload borne by rural and remote PHC workers. So, too, it seems likely that existing locum relief programs provide insufficient support to those that need it the most, as do existing continuing professional development support programs.

These observations are supported by the recent Senate Community Affairs Reference Committee inquiry report (The Senate Community Affairs References Committee, 2012) which found a significant ongoing impact of a range of factors on the current recruitment and retention of rural and remote GPs. Factors still significantly adversely impacting on the ability to recruit and retain GPs include inadequate training and professional development opportunities, a lack of clear career pathways, heavy workload and on-call hours, limited opportunities for spouses and children, poor availability of peer and professional support, inadequate accessibility to locum services, insufficient financial and economic incentives, and inadequate community infrastructure including housing. Many of these identified factors were the same factors identified by Kamien more than 25 years earlier! Most relate to *professional and organisational* factors which, as Figure 3.1 indicates, are likely to be moderately modifiable by policy interventions. The literature also indicates that professional and organisational factors are additionally the most important group of factors associated with PHC worker *retention* in the Australian rural and remote context. (Alexander, 1998; Humphreys, Jones, et al., 2002; Kamien, 1998). Professional and organisational factors, as has been shown, are not well targeted by current Australian Commonwealth Government rural workforce initiatives.

4.2 Summary and way forward

Up to this point, this thesis has described long standing geographical maldistribution of the PHC workforce that contributes to poorer health outcomes for rural and remote populations. Chapter 2 reviewed what is already known about patterns and levels of turnover and retention of PHC workers in rural and remote Australia. A dearth of quantitative reporting of actual turnover and retention of rural and remote PHC workers in Australia was revealed. Additionally, only limited data indicative of variations in patterns of actual turnover and retention according to a range of different determinants (including geographical location, population size, and health worker profession) were found. These were identified as important evidence-gaps which limit the ability of Australian health workforce planners and policymakers to make well-informed workforce retention policy decisions.

Chapter 3 provided a comprehensive literature review of international quantitative studies investigating the determinants of actual retention of rural and remote PHC workers. The existing literature was found to be relatively small in volume and to focus mainly on retention of PHC physicians within the USA rural context. It also was largely focussed on quantifying associations between rural retention and certain financial and economic factors, particularly bonded student scholarships and bonded physician payments, or between rural retention and educational or regulatory factors, such as undergraduate, prevocational and vocational rural training exposures, or J-1 visa waivers. Substantial gaps were revealed in the existing evidence-base of associations between the actual retention of PHC workers and a range of factors, including practice ownership, PHC profession, PHC worker age, geographical location and population size.

Chapter 4 outlined a chronology of increasingly complex and expensive Australian Commonwealth Government rural and remote PHC workforce distribution initiatives which provide an Australian policy context for the findings of Chapters 2 and 3 and also for interpreting the research findings of this thesis. It was found that despite significant investment by the Australian Commonwealth Government in initiatives aimed at improving the availability of PHC workers to rural and remote Australian populations, the effectiveness of a number of programs remains in doubt, and much remains to be done to better address rural and remote PHC worker recruitment and retention. In the light of these observations, and taking Australia's current economic and demographic situation into account, it is perhaps more crucial now more than ever that the factors associated with ongoing rural and remote PHC workforce shortages are investigated and better understood by policymakers, so that cost-effective policies can be developed and implemented.

The remainder of this thesis therefore investigates the patterns, determinants and measurement of rural and remote PHC workforce turnover and retention. The next chapter, Chapter 5, describes the methods developed and used in this thesis to appropriately measure turnover and retention outcomes, whilst Chapters 6 and 7 present the empirical evidence obtained by applying the methods developed in Chapter 5 to a range of rural and remote PHC workforce datasets.

Chapter 5: Research design and methodology

The rationale for, and importance of, research into the patterns and determinants of rural and remote PHC worker turnover and retention has been outlined in earlier chapters. This chapter provides background to, and details of, the overall methodology underpinning this research. Specific details of methods are elaborated more in each of the publications incorporated in Chapters 6 and 7.

5.1 Background to methodological approach

A review of the literature reveals an abundance of qualitative studies related to workforce turnover and retention and the reasons for leaving or staying in rural or remote PHC practice. Qualitative research has been especially useful for identifying the numerous factors that are associated with PHC worker retention, and for providing an understanding of how the many different factors may be interrelated. Qualitative research has therefore been critical in informing the theoretical framework upon which this thesis is based.

The value of these qualitative studies notwithstanding, the needs of policymakers and workforce planners extend beyond what can be provided by qualitative methods alone. A recent perspective article in the Medical Journal of Australia highlighted the need for health decision makers to be able to access better information – that is, information that is of higher quality, timely and locally relevant, so that decisions can be better informed and not made 'blind' (Redman & Wells, 2013). Diallo and colleagues concur, providing an international perspective which emphasises the vital importance for health workforce planners to have access to high quality and timely quantitative information to enable effective planning and management (Diallo, Zurn, Gupta, & Dal Poz, 2003).

With respect to rural and remote PHC worker turnover and retention research, the quality and type of quantitative statistics used to underpin the existing literature vary enormously. Some of this variation is related to the specific quantitative methods chosen for the analysis. Statistical methods may be either descriptive or inferential. Descriptive analyses produce quantitative statistics which usefully summarise observed turnover or retention behaviour of a population of PHC workers in a clear, simple and concise form. Counts of PHC workers (for example, number of PHC workers that have left rural PHC service) and simple ratios (for example, annual turnover rates and stability rates) are examples of simple descriptive statistics. For certain rural and remote PHC workforce planning purposes – when the results do not need to be generalised to other populations of rural or remote PHC workers – descriptive statistics of this type may be all that is required.

However, in many other instances, workforce planners need to know whether observed differences in turnover or retention behaviour amongst samples of rural or remote PHC workers are likely to be occurring due to chance or not. Descriptive data do not provide the answers to questions of this type. Instead, basic inferential statistics are required to test for the statistical significance of differences between groups. For example, a rural health service manager may be influenced to change a decision relating to a retention strategy if appropriate data are available which indicate that the retention of PHC workers at the facility that they manage is statistically significantly worse than the state average.

Frequently, rural and remote PHC workforce planners require greater insights, over and above what is provided by descriptive or basic inferential statistics. For example, they may have questions about how large the observed differences in turnover or retention are, and whether the differences in retention are accounted for by additional factors such as the rurality of the health service or the age profile of the PHC workers at the service, as well as what predictions about future PHC worker turnover and retention can be made. Ultimately, a key goal of workforce planners is to understand what contribution particular factors make to patterns of workforce retention, and the extent to which retention can be modified through leveraging these factors, for example through the provision of financial or other incentives. As the level of detail required by policymakers and workforce planners increases, so too, the level of sophistication of the methodological approach must increase.

In Australia, for example, there has recently been an increasing policymaker interest and need for specific information about how rural and remote PHC worker retention is associated with geographical location (distance from metropolitan centres) and community size, as detailed in Chapter 4 (Mason, 2013). Addressing questions such as these demands the ability to quantify differences in rural PHC worker retention between groups, whilst taking multiple other factors associated with retention into account. This requires advanced estimation methods, and these form the cornerstone of the research in this thesis.

Nevertheless, as shall become evident in the peer-reviewed publication included in this chapter, a range of metrics are recommended for the evaluation of rural and remote PHC worker turnover and retention, some of which only require calculation of simple descriptive statistics, whilst others require more advanced multiple regression methods of analysis. The selection by a policymaker or workforce planner of a metric or suite of metrics as indicators of turnover and retention will vary according to the type of retention information required, the availability of suitable data, and the availability of skilled personnel to undertake the analysis.

The next section of this chapter, Section 5.2, addresses research question 1: What PHC workforce turnover and retention metrics are best suited for use in rural and remote Australian contexts? Because a key aspect of this research is specifically how we *measure* the concept of retention, five workforce turnover and retention metrics will be identified and critically appraised to determine their suitability for use by Australian rural health workforce planners. A detailed description of the strengths and weaknesses of each of these metrics is provided in the publication entitled *'How Best to Measure Health Workforce Turnover and Retention: Five Key Metrics'*. This publication also provides examples of the use of the key metrics using data obtained from rural and remote health services.

Section 5.3 of this chapter provides an overview of broad methodological challenges associated with rural and remote PHC worker turnover and retention research in general. Challenges include the limitations imposed by the nature of the PHC workforce data available, the need to adequately take time into account when measuring PHC worker retention, the need to maximise the use of available information, even when it may only be partial information, and the need to be able to make valid comparisons and predictions of PHC worker retention. This section facilitates an understanding of how sophisticated quantitative methods, and in particular survival analysis and the survival analysis regression analogue, the Cox proportional hazards model, are particularly well suited for analysis of rural and remote PHC worker turnover and retention.

Section 5.4 of this chapter provides a rationale for using the sophisticated quantitative methods chosen for the research undertaken in this thesis. For specific details of the methods used in each paper, the reader is referred to the body of the individual published manuscripts. To minimise duplication these details will not be re-stated in this section of the thesis. Sub-section 5.4.1 then goes on to give an overview of the basics of survival analysis, and how survival analysis is applied to the specific context of turnover and retention of rural and remote PHC workers.

5.2 Review and evaluation of how to measure PHC worker turnover and retention: five key metrics

As shown in earlier chapters, there is an urgent need to address existing deficiencies in the current evidence-base informing policymakers about both patterns of PHC workforce turnover and retention in rural areas, and what rural PHC worker retention policies work well. Moreover, these deficiencies in the rural PHC workforce evidence-base are of both national and international significance (Australian Government Department of Health and Ageing, 2010; World Health Organization, 2010a). In order to address current deficiencies in our knowledge of the effectiveness of retention strategies, it is important to seek out the underlying reasons for this knowledge gap. One of the reasons that has been pinpointed as an important contributing factor has been a lack of agreement and understanding on how best to measure supply of "human resources for health", or the "health workforce", as it is more commonly termed in Australia (Dal Poz et al., 2009; Dal Poz et al., 2007).

A lack of understanding and agreement on how to best measure rural PHC workforce recruitment, turnover and retention, manifests as an inability to adequately monitor workforce baseline patterns of these supply components. This compromises evaluations of the effectiveness of workforce interventions that target recruitment, turnover or retention of health workers. Recently, substantial work has been undertaken to identify core indicators for measurement of health worker stocks and their distribution (Dal Poz et al., 2009; Diallo et al., 2003; World Health Organization and University of Technology Sydney, 2008). Diallo et al., for example, recognised the critical importance of identifying a small and essential number of health workforce indicators for monitoring and evaluating workforce supply, distribution and efficiency, whilst acknowledging that a more extensive range of indicators is required to fully describe and monitor these aspects of the health workforce (Diallo et al., 2003). However, not one of the 23 metrics included in their 'basket of indicators' related to health worker turnover or retention (Diallo et al., 2003). Amongst the sixteen key health workforce indicators identified by Dal Poz et al. only a single metric related to health worker turnover (workforce loss ratio) and none related specifically to retention (Dal Poz et al., 2009).

This lack of a core set of indicators which adequately measure rural and remote PHC worker turnover and retention is still apparent, despite the acknowledged geographical maldistribution of health workers being repeatedly identified as a critical and major challenge facing health systems (Chen, 2010; Chopra, Munro, Lavis, Vist, & Bennett, 2008; Joint Learning Initiative, 2004; Mason, 2013). Addressing this gap, through identifying and appraising different measures of workforce stability, has recently been highlighted as having significant potential benefits for policymakers (Buchan, 2010).

Measurement tools have an instrumental role to play in improving our understanding of geographical maldistribution, through the accrual of new knowledge about rural and remote PHC worker turnover and retention. In particular, valid and reliable measures are essential in order to enable valid comparisons to be made across different jurisdictions and over time in order to monitor how such patterns change in response to policy interventions. Because of the substantial knowledge gaps in our understanding of the patterns and determinants of Australian rural and remote workforce turnover and retention, it is of critical importance to identify a set of sentinel turnover and retention indicators, which can then be consistently applied to rural and remote PHC workforce datasets.

5.2.1 How are rural and remote PHC worker turnover and retention measured?

As indicated earlier, the rural PHC worker turnover or retention profile of interest to researchers or policymakers can, and does, vary (see Sub-section 2.2.2, Chapter 2). Two retention profiles explored within this thesis are retention in a rural or remote community (within 15 km), and retention in a rural or remote health service. However, many other rural retention profiles are also of relevance to the research in this thesis. This section examines the specific metrics that can be used to measure rural retention, no matter which retention profile is specified.

A critical finding from the literature review (Chapter 3) was that rural retention is often not well distinguished from other PHC workforce supply components, and so some of the existing ‘evidence’ about ‘retention’ is actually about a mix of recruitment and retention. As defined in Chapter 2, retention is broadly defined as the length of time between recruitment and turnover. Measurement of rural or remote retention therefore requires measurement of both when the PHC worker was recruited and when they exited.

A further feature of the extant literature is that a great number of different metrics have been used to measure health worker turnover and retention. This is well illustrated by the findings of Dolea et al.’s recent literature review of studies evaluating strategies to increase retention of health workers in remote and rural areas (Dolea et al., 2010). Amongst the ten included retention intervention studies, Dolea et al. reported 5 different measures of health worker turnover or retention, and concluded that the magnitude of effect of any intervention was difficult to ascertain because of inconsistencies in reporting retention outcomes across studies. The five metrics Dolea et al. identified in the extant retention literature were: average (mean) length of stay (of current workers); retention rates after different periods of elapsed time (for example, after 1 year, after 5 years); survival probabilities (including median survival); annual turnover rates; and settlement rates (Matsumoto, Inoue, & Kajii, 2008b) [Note: settlement was defined as working in a home prefecture at all of three different time points, spread over 6 years, after having completed obligated service in that prefecture]. However, these are not the only turnover and retention metrics found in the rural and remote PHC worker literature. There are many additional metrics, including (but not limited to): proportions of current workers retained for a specified length of stay (for example, more than 2 years); conditional probability of leaving at any point of time (Hazard Ratio); unconditional probability of leaving after a specified length of service (Odds Ratio); unconditional probability of leaving at a specified point of calendar time (Odds Ratio); and attrition rate, which is distinct from turnover rate. For those wishing to find out further information about retention metrics, the work of Humphreys et al. provides useful definitions of some of these and other retention metrics (Humphreys et al., 2009).

Each of these metrics measures slightly different aspects of turnover or retention, and therefore each measure has the potential to incrementally add to our knowledge of turnover and retention amongst rural PHC workers. However, the use of a wide array of metrics leads to difficulties in making valid comparisons when each study reports a different metric and none (or few) are consistently reported. Even when the same metric is used, frequently the indicators derived from the metric may not be easily comparable across studies. For example, it is difficult to draw conclusions about similarities and differences if one study reports the retention rate after 1 year whilst another reports the retention rate after 5 years (even though the underlying metric is the same – in this example, retention rates). Just as Diallo et al. (2003) recognised a critical need to reduce the vast number of measures of workforce supply, distribution and efficiency to a small core set of essential metrics in a 'basket of indicators', this thesis recognises the need to identify key turnover and retention metrics, and to assess the strengths and weaknesses of included measures. This need is addressed through the following published paper, which critically analyses five measures of turnover and retention and recommends their use as a suite of turnover and retention metrics best suited for use in rural and remote Australian health workforce context.

Monash University

Declaration by candidate regarding publication 1

Russell DJ, Humphreys JS, Wakerman J. How best to measure health workforce turnover and retention: five key metrics. *Australian Health Review* 2012; **36:** 290-295

In the case of Publication 1, appearing in Chapter 5, the nature and extent of my contribution to the work was the following:

Nature of contribution	Extent of contribution (%)
Substantial contribution to conception and design of the paper, drafting and re-drafting and final approval of the version to be published	80

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Emeritus Professor John Humphreys	Substantial contribution to conception and design of the publication, and critical revision of drafts	n/a
Professor John Wakerman	Critical revision of drafts	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature	[redacted]	**Date** 21/2/2014
Main Supervisor's Signature	[redacted]	**Date** 21/2/2014

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Feature

How best to measure health workforce turnover and retention: five key metrics

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Abstract

Objective. This article identifies, critically appraises and illustrates the use of five key workforce turnover and retention metrics that are well suited for use by Australian rural health workforce planners. These are crude turnover (separation) rates, stability rates, survival probabilities, median survival and Cox proportional hazard ratios. Examples of their calculation are presented using actual data obtained from payroll records in Australian rural and remote health services.

Conclusion. The use of this small number of metrics as a 'workforce measurement package' can help overcome many of the limitations evident when a single measure is reported in isolation, by providing a more comprehensive picture of turnover and retention patterns. We suggest that health services themselves can calculate the simplest measures, whereas regional and centralised health authorities with higher levels of expertise undertake survival analysis and comparisons of compiled data.

Implications. These key metrics can be used routinely to measure baseline levels of health worker turnover and retention, to quantify important determinants of turnover and retention, and importantly, to make valid comparisons. This enables areas for improvement to be better targeted using appropriate retention strategies, and changes resulting from retention interventions to be evaluated effectively.

What is known about the topic? A vast array of turnover and retention metrics has been described in the literature. However, which of these are likely to be most useful for measuring Australian rural and remote health workforce turnover and retention is not well understood.
What does this paper add? In recognition of the shortcomings of using single measures in isolation, this article identifies, critically appraises and illustrates the use of five key workforce turnover and retention metrics, recommending their use as a 'package'.
What are the implications for practitioners? Regular use of the identified metrics can enable health workforce planners to recognise which areas to target for improvement, devise appropriate retention strategies and evaluate changes occurring as a result of retention incentives or interventions.

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Background

Health workforce shortages are a major problem nationally and globally and encompass a broad range of health professions.[1–3] In areas experiencing health workforce shortages, increased importance is placed on optimising the retention of key health workers. This is particularly true in rural and remote regions, because of the added difficulties of recruiting health workers to these areas and the increased acuity of workforce shortages as distance from capital cities increases.[4] There is also an added imperative to deliver high quality healthcare to rural and remote populations to counter their relative disadvantage in terms of increased healthcare needs and poorer health outcomes.[5]

It is vital that rural and remote workforce planners have a sound understanding of the patterns and determinants of workforce turnover and retention to ensure adequate staffing (an essential prerequisite for the delivery of high quality care) and minimise the need for recruitment of staff, which is increasingly costly as remoteness increases.[6–8] Despite the constant collection of considerable health worker employment data, such as through health service payroll records and by health workforce agencies, inevitably these data are underutilised. A key reason for this is the lack of any consensus and understanding as to which of the many possible measures are likely to be most useful for measuring Australian rural and remote health workforce turnover and retention.

Until now, quantitative analysis of Australian health workforce employment patterns has mostly been characterised by reporting measures of distribution, such as numbers of health professionals per 10 000 population, rather than measures of health service, region or profession turnover or retention. Where these have been reported, single measures of either turnover or retention, such as crude annual turnover (separation) rates or average (mean) length of stay in current position, have often been used in isolation, despite the significant shortcomings of any single measure and the attendant risk of failing to capture critically important aspects of health labour market behaviour. Importantly, we contend that the measurement and reporting of health workforce turnover and retention can be strengthened by using a small number of sentinel measures which would together identify key aspects of workforce turnover and retention.

The aim of this paper is to identify and critically appraise the strengths and weaknesses of five sentinel measures of health workforce turnover and retention (Table 1), and to make recommendations for their use based on organisational size and capacity for data collection and analysis. The use of each metric is illustrated using actual payroll data collected from different health services in rural and remote settings within Australia.[7]

Key workforce turnover and retention metrics

Crude turnover (separation) rate

Crude turnover (separation) rates are simple ratios which measure the proportion of employees moving out of an organisation or profession during a period of time, usually annually. Historically, turnover rates have been widely used in many sectors of the economy and are generally well understood, although variations in how the denominator (average number of employees) has been defined means that there remains a need to standardise the definition carefully and state explicitly which definition has been adopted.[9] Likewise, it is important that the definition of the numerator is also standardised – in the interests of simplicity we recommend that all leavers are included in the calculations, though in some instances, distinguishing between voluntary and involuntary separations may also be appropriate.

Turnover rates are important because they link with both costs of staff replacement and the ability to provide an ongoing adequate level of service.[10] They relate workforce performance to calendar time, which is useful when implementation of retention strategies relates to calendar time. The calculation of annual turnover rates is illustrated using data from a remote health service (Table 2).

Calculation requires the longitudinal collection of numbers of employees exiting, so turnover rates do not identify precisely which employees have exited. Clearly, the implications for health service provision differ according to precisely which individual has left. Although separation into subgroups, for example based on profession, might be useful for large health services, the small size of many rural and remote health services makes sub-grouping undesirable due to instability of rates when small numbers are being considered.[11] Furthermore, crude turnover rates provide no information about employees who remain. These are crucial shortcomings, because to provide effective, high quality health services, workforce planners must have precise information, both about employees who have left, but also about those employees continuing to provide health services. Hence, crude turnover rates need to be supplemented by additional measures.

Stability rate

Stability rates measure the proportion of an original workforce cohort that remains employed by the organisation for the entire duration of an interval of time, and are moderately easy to calculate and understand. Calculation requires longitudinal collection of specific commencement and exit dates for individual employees and the formation of a cohort of employees based on calendar time, for example, all those in employment on 1 January 2003 (Table 3, first and second rows).

Once established, it is straightforward to track a cohort, calculating the proportions that remain at differing calendar times (for example, as at 1 January 2004, 1 January 2005 etc.) as seen by following the first and second rows across Table 3. Multiple cohorts are established to more fully utilise the data enabling comparisons to be made and patterns to be recognised (for example, stability rates after 2 years in successive cohorts are shown in bold in Table 3) and linked to calendar time.

Stability rates do not take into account the length of time that employees have been with the organisation. As length of employment is an important predictor of future retention, this limits the inferences that can be drawn. Subdivision of cohorts based on length of employment with the organisation can partly address this shortcoming. However, as indicated earlier, this has limited usefulness in rural and remote health services, due mostly to their smaller size.

There remains, therefore, a need within smaller organisations for additional turnover and retention metrics that intrinsically adjust for employee length of employment and maximise use of data.

Measures derived from survival analysis

Survival probabilities

The probability of employees remaining in employment with an organisation can be calculated using Kaplan–Meier (product limit) methods of survival analysis. Survival analysis requires longitudinally collected individual-level commencement and exit data. Crucially, survival analysis calculations are based on the time from commencement of employment until an employee leaves an organisation, and therefore intrinsically take into account length of employment with an organisation. Additionally, whereas stability rate calculations necessitate the establishment of multiple cohorts based on calendar time to fully utilise available data (Table 3), survival analysis has the capacity to use data on all employees in a single analysis, which is particularly useful for smaller organisations. Survival analysis handles incomplete data for employees who have not yet been observed to exit

Table 1. Appraisal of sentinel turnover and retention measures

Measurement	Formula	What it measures	Strengths	Weaknesses
1. Crude turnover (separation) rate (%)	$\frac{\text{Total number of leavers during a time interval}}{\text{Average number of employees in that interval}} \times \frac{100}{1}$	The proportion of the workforce who have left an organisation during an interval of time	• Easy to calculate and understand • Number of leavers (numerator) is important because of its association with costs of recruitment • Data collection requirements are straightforward, though longitudinal data are required	• There is a lack of precision as to which employees have left • No conclusions can be drawn about remaining employees nor about leaver's length of service • Definitions of the denominator and numerator are not standardised
2. Stability rate (%)	$\frac{\text{Number of employees at the start of an interval who remain employed at the end of the interval}}{\text{Number of employees at the start of the interval}} \times \frac{100}{1}$	The proportion of the original workforce that remains with an organisation for the entire duration of an interval of time	• Moderately easy to calculate and understand • Once a cohort is established it is easy to maintain • Provides a 'running record' of workforce losses related to calendar time • Precision about remaining employees	• Successive cohorts required to trace changes in stability over time • Longitudinal data comprising commencement and exit dates for individual employees are required • Gives little indication of absolute numbers or proportion of workforce leaving
Metrics calculated using survival analysis (Kaplan–Meier product-limit) methods:				
3. Survival probabilities (%)	Event of interest = employee exits employment Time variable = time from commencement of employment until study end or employee exits employment Censored = employee remains in employment at study end $\frac{\text{Number remaining employed beyond a specified time}}{\text{Number at risk of exiting at the specified time}}$	The survival function models the probability that employees remain in employment at specified points in time (relative to when they commenced), given that they have remained employed up to the specified time	• Survival analysis facilitates comparisons between subgroups • Plotting survival probabilities versus time (survival curves) gives a simple, immediate visual impression of patterns • Appropriate account is taken of incomplete observation, for example of the interval until an employee leaves (i.e. those employees yet to exit) • Can be easily read off a survival curve • Confidence intervals can be calculated	• Higher level of complexity, requiring a statistical package and training in its use • Requires complete longitudinal data for individual employees • Makes assumptions, for example, employee exits are independent • A sufficient number of exits are required • Does not intrinsically relate employment patterns to calendar time • Conceptually more challenging to understand than simple ratios
4. Median survival (years)	Median survival is the time from commencement at which the probability of being retained equals the probability of having exited (and is equal to 0.5)	Median survival is the time from commencement (for example, of employment, in a profession etc.) until only half remain	• An appropriate measure of central tendency for skewed, censored data • Can be easily read off a survival curve • Confidence intervals can be calculated	• Cannot always be estimated: extensive data, with most employees exiting, are required • Unreliable if survival curve is fairly flat in region of 50% probability
5. Cox proportional hazard ratio	$\frac{\text{Observed number exiting group A} / \text{Expected number exiting group A}}{\text{Observed number exiting group B} / \text{Expected number exiting group B}}$ where the *expected* number exiting is calculated assuming no differences exist between groups A and B	Cox proportional hazard ratios estimate the ratio of hazard (for example, of leaving employment) for one group of employees compared to another group of employees	• Cox proportional hazard (regression) models can isolate and quantify single predictors of risk of leaving after adjusting for other variables • Predictor variables can be categorical, continuous or change with time • Appropriate account can be taken of sampling procedures	• Further assumptions are made, for example, the risk of leaving for one group of employees is a constant multiple of the risk for another group • Power to detect differences between groups is impaired if this is not the case • Strength of conclusions limited by the extent to which assumptions are correct

Table 2. Crude annual turnover (separation) rate at a remote health service

	2003	2004	2005	2006	2007	2008
Number of exits	5	5	6	7	10	13
Average number employed	35.0	42.5	46.0	53.5	60.5	57.0
Crude annual turnover (%)	14.3	11.8	13.0	13.1	16.5	22.8

(those still employed at study end), coding these observations as censored.

Survival curves present survival probabilities in an easy to understand graphical format, making patterns of turnover and retention readily apparent. Another key feature of survival analysis is the ease of making comparisons. Differences in the risk of leaving employment can be calculated according to employee characteristics, such as profession, or according to health service characteristics, such as the location of employment. An example of a survival curve depicting differences in employment survival according to health service location can be seen in Fig. 1, and the corresponding survival probabilities and median survival are presented in Table 4.

In this example, survival curves for employees at rural compared to remotely located health services overlap for the first 6 months of employment, diverge between 6 and 18 months and thereafter, run approximately parallel. Survival analysis is also useful for evaluating retention interventions. The few rigorous evaluations of retention incentives for health workers in developed economies reported in the international literature have used survival analytical methods to compare retention of recipients of incentives to non-recipients.[12–15]

Median survival

Median survival, the time from commencement until only half the individuals remain, is also derived using survival analysis. Median survival is particularly useful to workforce planners because it is the midpoint estimate of the length of service that might be expected from commencing employees or members of a profession.

Median survival, however, cannot always be estimated. Having an extensive dataset (such as payroll records), with most employees exiting (as is more likely to occur in remote settings), increases the likelihood of being able to estimate median survival. A further limitation of median survival is that estimates of median survival are unreliable (have a wide confidence interval) if the survival curve is fairly flat in the region of 0.5 probability. Despite these shortcomings, knowing how long, on average, a newly commencing health professional might be expected to remain in employment assists health services with their workforce planning considerably.

Cox proportional hazard ratios

Cox proportional hazard ratios give an estimate of the magnitude, direction and statistical significance of the risk of leaving for one group compared to another. They are derived using a regression analogue of survival analysis (Cox proportional hazards model) and are especially useful because they quantify differences in the hazard (risk) of leaving employment (or profession) for different groups.[16] Applied to the data from Fig. 1, employees of health services located in remote locations, on average, had 1.32 (95% CI 0.85, 2.06) times, or 32% greater, risk of leaving employment compared to employees of health services located in small rural towns (population <10 000). Importantly, adjustments can be made for several different factors all at once. This makes it possible to adjust for potential confounders, for example employee age, which could be linked with both the risk of leaving employment and the location of employment. Thus, regression analogues of survival analysis are particularly suited to helping identify and quantify important determinants of health worker turnover and retention. This is fundamental information for workforce planners, more so because of the current unprecedented changes occurring in the determinants of Australian health workforce supply and demand.[17]

The main drawback with using survival analysis methods (including measurement of survival probabilities, median survival and Cox proportional hazard ratios) is the requirement for expertise in the use of suitable statistical software packages. This potential shortcoming can be addressed through the collection of data locally, but with the analysis and subsequent reporting being

Table 3. Stability rates calculated using actual commencement and exit data from a remote health service

		1 January 2003	1 January 2004	1 January 2005	1 January 2006	1 January 2007	1 January 2008	1 January 2009
1 January 2003 Cohort	Number employed	50	41	36	28	26	26	22
	Stability rate (%)	100.0	82.0	**72.0**	56.0	52.0	52.0	44.0
1 January 2004 Cohort	Number employed		59	54	37	35	32	27
	Stability rate (%)		100.0	91.5	**62.7**	59.3	54.2	45.8
1 January 2005 Cohort	Number employed			59	39	36	32	27
	Stability rate (%)			100.0	66.1	**61.0**	54.2	45.8
1 January 2006 Cohort	Number employed				55	45	36	29
	Stability rate (%)				100.0	81.8	**65.5**	52.7
1 January 2007 Cohort	Number employed					60	45	35
	Stability rate (%)					100.0	75.0	**58.3**
1 January 2008 Cohort	Number employed						60	48
	Stability rate (%)						100.0	80.0

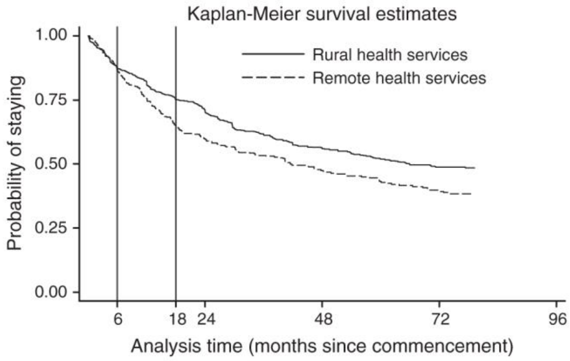

Fig. 1. Kaplan–Meier survival curve with subgroups defined according to location of health service.

Table 4. Survival probabilities and median survival according to location of health service

Metric	Small rural town	Remote locations
Survival probability after 6 months	87.2%	86.7%
Survival probability after first year	80.8%	75.5%
Survival probability after second year	70.2%	59.4%
Survival probability after third year	61.3%	53.3%
Median Survival	66 months	41 months

undertaken at a more centralised level, where appropriately skilled analysts and the necessary software packages can be located. A second important shortcoming of data modelling is the necessity to make certain assumptions. For example, Cox proportional hazards models are based on the assumption that the risk of one group of employees leaving is a constant multiple of the risk of another group of employees leaving – and as we can see from Fig. 1, this is not always an appropriate assumption. Analysts can, however, test whether, or in what circumstances, such assumptions are reasonable, although the strength of conclusions that can be drawn will be limited by the extent to which assumptions are appropriate.

Despite these shortcomings, survival analysis (and its regression analogue, Cox proportional hazards modelling) has great, and largely unrealised, potential to strengthen the existing evidence base informing rural and remote health workforce turnover and retention.

Discussion

The fragmented and incomplete nature of evidence informing Australian rural and remote health workforce retention hampers workforce planning and the delivery of efficient, effective and equitable healthcare to rural and remote Australians. Health services and health authorities could use existing data better, for example, data from payroll records, to calculate and report on five key turnover and retention metrics: crude turnover (separation) rates, stability rates, survival probabilities, median survival and Cox proportional hazard ratios. Our review of these key turnover and retention metrics has identified significant shortcomings with use of any single measure in isolation. The use of all five measures together as a package, however, can overcome many of these limitations and help build a more comprehensive picture of baseline turnover and retention patterns, because each of the measures informs a different, yet important, aspect of workforce planning. Focussing on a small number of essential metrics (such as those proposed), all of which can be readily calculated using standard data sources (such as existing routinely collected payroll records), is highly desirable.[18]

By identifying the respective strengths and weaknesses of each measure, health workforce planners are better positioned to determine how they might assess different aspects of health worker turnover or retention, subject to limitations imposed by particular circumstances (including availability of data, size of dataset and expertise available). Those measures identified as being easy to calculate (crude turnover rates and stability rates) can be calculated regularly, plotted on control charts and reported within each health service, providing health service managers with ready access to the information as needed. More complex analyses, specifically those based on survival analysis, can be undertaken wherever the necessary statistical expertise is located (whether it be at health service, Local Hospital Network, regional or central health authority level), so long as processes ensuring timely, regular feedback to workforce planners and policy-makers can be put in place. A second important role to be undertaken at the different levels of regional health authorities is to collate data from multiple health services. Collation of data, with disaggregation by factors such as health service type, health service location and employee profession enables important comparisons to be made (for example, of workforce patterns in similar health services, health regions or jurisdictions), and lays the foundations for establishing explicit evidence-based benchmarks and health workforce turnover and retention targets.

Although the use of each measure has been illustrated and explained using health workforce data collected at the health service level (from payroll records), this package of metrics can be similarly informative if applied at other levels, including regional, state and national levels, so long as the requisite data are collected and coded appropriately. For example, instead of coding individual employee commencement and exit data from a specific health service using payroll data, a national workforce planner could code entry and exit from each profession using routine administrative records from our newly established national health professional registration body. In this instance, applying the identified five key metrics to national profession-based data has the potential to generate additional new or improved information relevant to the planning and monitoring of entry to and attrition from the profession, for example, by identifying and quantifying important determinants of health worker turnover and retention within each profession. Workforce analysis requires the ongoing, systematic and judicious collection of high quality data. Existing information systems may require strengthening, with improvements in data linkages so that further exploration of key determinants can occur.

Health workforce researchers, too, can benefit from this critical appraisal. Dolea *et al.* recently identified the inconsistencies and great variability in reported outcomes observed across health worker retention evaluation studies in the existing literature.[19] A better understanding of how best to measure workforce outcomes could remedy these problems, and ultimately lead to the development, implementation and evaluation of more effective retention strategies, with obvious benefits to patients and providers alike.

Conclusion

A crucial step to tackling the rural health disadvantage occurring as a result of an inadequate rural health workforce is providing health service managers and policy makers with the best health workforce information and tools at their disposal, enabling decisions to be based on sound evidence. By using the identified tools to measure health worker turnover and retention regularly, health workforce planners can recognise areas to target for improvement, devise appropriate retention strategies and evaluate changes occurring as a result of retention incentives or interventions.

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The paper "*How Best to Measure Health Workforce Turnover and Retention: Five Key Metrics*" identifies five key workforce turnover and retention metrics which differ in the complexity of their calculation and the level of data required. Each metric, however, provides different, though complementary, information to help inform workforce planning. The five metrics recommended for measurement of rural and remote PHC workforce turnover and retention are:

1. Crude Turnover (separation) rates
2. Stability rates
3. Survival probabilities
4. Median survival
5. Cox proportional hazard ratios

Each metric has individual strengths and limitations, as detailed and summarised in Table 1 of the paper. The use of the metrics as a 'package' was identified as having the advantage of providing a more complete description of observed patterns of health worker turnover and retention. Calculation of each of these metrics requires the collection of longitudinal data, although the level of detail required is least for crude turnover, more for stability rate calculation and most for the three calculations based on survival analysis.

The first two metrics use simple ratios to identify the proportion of the workforce leaving (crude turnover rate) and the proportion of an original cohort who stay (stability rate) during an interval of time. The methodology is straightforward, and no further description will be provided from that provided in the paper.

The latter three metrics, by contrast, are each derived from survival analysis or the survival analysis regression analogue. As such, they are advanced estimation methods, and methodological issues associated with their use require further discussion. For a full discussion of these issues, together with an overview of the basics of survival analysis, see Sections 5.3 and 5.4.

The paper (Russell, Humphreys, & Wakerman, 2012) makes a significant contribution by providing policymakers with a clear statement and evaluation of five key metrics for measuring retention in a rural or remote PHC setting. This information enables policymakers and workforce planners to select valid and reliable measures that are 'fit for purpose' and able to assist them to understand existing patterns of PHC worker turnover and retention, and to model future workforce scenarios.

5.3 Methodological challenges to rural and remote PHC turnover and retention research

Quantitative research into the patterns and determinants of rural and remote PHC worker turnover and retention faces a number of challenges. These are repeatedly evident throughout the extant literature. The challenges encountered are multiple and interrelated, but shall be considered in the following four broad categories:

1. Limitations imposed by the nature of the PHC workforce data available;
2. The need to appropriately take time into account;
3. The need to maximise the use of partial information on PHC worker retention ;
4. The need to make valid comparisons and predictions of PHC worker retention.

5.3.1 Limitations imposed by the nature of the PHC workforce data

i) Optimising study size

Optimising study size is especially important for rural and remote PHC workforce analysis, since the numbers of workers that could potentially be included in the analysis is often small. For example, many rural health services have fewer employees overall, in comparison to metropolitan health services, and are perhaps serviced mainly by nurses, with only a few GPs and a small number of visiting AHPs providing PHC services at any one time.

The problem of optimising study size was evident within the studies included in the literature review undertaken in Chapter 3 of this thesis (Crouse & Munson, 2006; Jackson et al., 2003; Kamien, 1998; Rabinowitz, Diamond, Markham, et al., 1999; Rabinowitz et al., 2001; Rabinowitz et al., 2005). Methods which result in reduced study size compromise the statistical power of the study to detect significant changes in retention. It is therefore important to choose a study design and analytical method which tends to include as many health workers as is appropriate in the analysis to maximise the use of available data.

A cohort study design, which collects longitudinal rather than cross-sectional data, for example, generally results in an increase in the number of health workers available for analysis, because it captures additional data on health workers who had previously provided PHC services to clients, but who have since left the health service, or who join the service during the period of the study.

Specific methodological approaches, too, can also optimise study size. For example, a study which analyses data only on those PHC workers who commence employment after the study starts or who have only recently commenced (for example, as defined by Pathman et al.'s inception cohorts), can result in a far smaller study size because existing or long standing PHC workers are excluded from analysis (Pathman et al., 1992). Issues associated with optimising study size are closely interrelated with other methodological challenges, and will be identified throughout the following discussion. The underlying principle is the same in each instance however: in analyses of rural and remote PHC workforce, methods which optimise the number of PHC workers included in the analysis and which maximise as much available and relevant information about their tenure as possible often offer substantial advantages.

ii) Requirement for longitudinal and individual level data

Calculation of each of the five key metrics identified in the paper requires collection of longitudinal data. The systematic collection of longitudinal data requires well-maintained health workforce databases with appropriate quality control built in. The measures based on survival analysis also require individual level data – that is, commencement and exit dates for individual PHC workers. These data requirements are more likely to be met in high-income countries compared with low-income countries, in part because of the increased likelihood of sufficient funding being available for infrastructure support for rural and remote PHC services in high-income countries. However, even within high-income countries, well-maintained electronic human resources databases on the PHC workforce cannot be assumed, perhaps especially in rural and remote locations where workforce instability and difficulty recruiting appropriately skilled support staff to PHC facilities may be the norm, and may limit the quality of the data available.

An additional requirement for calculations of each metric is for longitudinal data to be available for a suitable length of time. How long is suitable will depend on the turnover and retention characteristics of the PHC workers being studied, however as a rule of thumb for survival analysis calculations, a period of study time that is long enough for at least half the workforce to leave is preferred. The length of time for which longitudinal data are available is also relevant to the tracking of changes in annual turnover (separation) rates over time, and identification of trends in the data. So too, retention cohorts can only be tracked for as long as the length of time that the longitudinal data is for.

iii) Challenges associated with identifiable data

Individual-level data are more likely to be identifiable in smaller rural and remote PHC services and communities. This is related to the small numbers of PHC workers delivering PHC services in rural and remote PHC facilities and communities. Some communities may only have a single PHC worker providing care at any one time. In these circumstances it may well be unavoidable that employment data on individual PHC workers are identifiable to the researcher.

The probability of data being identifiable also increases when policymakers are interested in understanding the extent to which a range of other factors are associated with length of health worker retention, such as health worker profession, demographics, or educational and regulatory exposures. In these instances it is critical that data are judiciously collected on important explanatory variables, and that these are appropriately coded, stored, and made available for analysis (perhaps requiring data linkage). As more variables are included in the analysis, the likelihood that individual PHC workers are identifiable to the researcher increases, and this can be the case even when much larger rural or remote datasets are analysed.

The potentially identifiable nature of data required for rural and remote PHC workforce analysis using survival analysis can present a challenge to gaining access to data for researchers undertaking research in this area, but who work externally to the organisations that collect and maintain the data. Similarly it can present a challenge to organisations and their policymakers who are wishing to increase their understanding of PHC worker turnover and retention, but lack the internal capacity to undertake the necessary analyses and are limited by privacy requirements in their ability to make potentially identifiable data available to external analysts.

iv) Defining which rural and remote PHC workers are of interest

As indicated in Chapter 2, frequently researchers of rural and remote PHC worker turnover and retention face challenges related to inconsistent definitions of cadres of health workers. Inconsistencies may occur from one organisation to the next, one jurisdiction to the next, across nations, or at any level of the health system. For example, PHC workers may have the same title, but there may be different qualification requirements and, most importantly, different scopes of practice in different jurisdictions. Some cadres of PHC workers may exist in some countries, but not others, and as indicated in the literature review in Chapter 3, some workers may be considered PHC workers in one country (for example, obstetrician and gynaecologists are PHC providers in the US), but not in another (obstetrician and gynaecologists are specialists, requiring a referral from a PHC provider, in Australia). Because of the potential for considerable confusion, and the dangers associated with making inappropriate comparisons, it is important that care is taken with definitions of PHC workers, for example by using standardised categorisation of PHC workers, and thus ensuring that only appropriate and valid comparisons are made.

v) Taking appropriate account of how lengths of stay data are distributed

It cannot be assumed that the spread of times until employees exit has a normal distribution. The risk of turnover varies according to the length of time that a PHC worker has been working in a role, and may exhibit distinct peaks and troughs (Rosenblatt et al., 1996; Singer et al., 1998; Somers, 1996).

In general, the longer the period of time that a health worker has been in the role, the lower the risk of them subsequently leaving – that is, the distribution of exit times is most likely to be positively skewed (many health workers leave after a relatively short period in a role, whilst relatively few stay in a role for extended periods of time). This is evident in the concave (rather than convex) shape of many survival curves tracking employment from rural PHC worker commencement until exit. However, as shown in the literature review in Chapter 3, other patterns, including a bimodal distribution of exit times (related to obligated service or contract design and length), are also possible. Analyses of health worker turnover and retention must therefore make appropriate assumptions about the distribution of rural and remote PHC worker exit times. A non-parametric distribution of exit times is appropriate with no assumptions required about the distributions of PHC worker exit times. The Kaplan-Meier method of survival analysis is non-parametric, and the challenge of taking appropriate account of how lengths of stay data are distribution is therefore adequately handled.

5.3.2 The need to appropriately take time into account

i) Determining the risk of leaving at *any* point of time

Many studies of health worker turnover described in the extant literature take a stock sample of employees at study commencement and then examine whether or not turnover occurred at study end. Studies of this type frequently use logistic regression to model the binary outcome of exit at study end versus continuing employment. Study lengths vary, seemingly arbitrarily, so whilst one study may report on the factors associated with PHC worker turnover after 12 months' study observation, another may report on factors associated with PHC worker turnover after 36 months' study observation. In studies of this type the extent to which the findings can be extrapolated to different lengths of study time remains unclear: a factor observed to be significantly associated with turnover at 12 months may not be significantly associated with turnover at other times. Studies analysed in this way do not provide summary measures of the risk of turnover at all points in time, but only of the risk of turnover at one, possibly arbitrary point of time.

Policymakers and workforce planners, however, may need to be able to predict not just *whether* or not turnover is likely to occur at one particular point in time, but *when* turnover is likely to occur along the spectrum of all possible points in time. Survival analysis is a method which intrinsically takes time until an event into account. The outcome variable captures both whether or not an event (employment exit) has occurred, but also the time at which the event occurred. Survival analysis, therefore, is especially suited to providing information about the risk of rural and remote PHC workers leaving at any point in time, given that they have remained in employment up until that time. This information is of particular interest to rural and remote PHC workforce planners and policymakers.

ii) Taking time since commencement into account

An additional methodological challenge for research of rural and remote PHC worker turnover and retention is for the time when turnover occurs to be linked to the time since employment commenced for each health worker. This is critical, because, as has been discussed above, the risk that an individual leaves employment is not uniform over their entire tenure. Many studies in the extant rural PHC worker turnover and retention literature, however, fail to adequately take time since commencement of employment into account. Frequently, analysis of the risk of exiting employment by the study end does not adjust for length of time since commencement (Cullen et al., 1997; Daniels et al., 2007; Fryer et al., 1994; Jackson et al., 2003; Kamien, 1998; Larson et al., 1999; Rabinowitz, Diamond, Markham, et al., 1999; Rabinowitz et al., 2001). As discussed above, the risk of health workers leaving an employment role generally varies according to how long they have been in that role.

It is therefore important that the research method that is used to investigate health worker turnover and retention makes some form of adjustment for the length of tenure of health workers at study commencement.

One frequently used method that does this is the aforementioned use of an ‘inception cohort’. This method was used by Pathman and colleagues in their seminal 1992 paper (Pathman et al., 1992). In the context of turnover and retention research, an inception cohort generally limits membership of a cohort to those health workers who have recently commenced in a role. Pathman et al. limited their inception cohort to physicians who had commenced in their rural positions between 1979 and 1981, thus excluding from analysis physicians who had been in their positions prior to 1979. In the following year, Adikhari et al.’s analysis of Australian GP retention defined a series of inception cohorts based on the year of practitioner initial entry to general practice in each of three different financial years (Adikhari et al., 1993). The use of inception cohorts greatly reduces variability in the length of tenure of PHC workers at study commencement.

Whilst some studies have defined rural PHC worker inception cohorts based on employment commencement date (Horner et al., 1993; Pathman et al., 2004; Pathman et al., 1992; Pathman et al., 1999; Singer et al., 1998), others – particularly those investigating the association between retention and educational interventions – have defined cohorts based on a restricted date of student graduation (Rosenblatt et al., 1996).

However, there are limitations associated with the use of inception cohorts in the context of analysis of the retention of rural and remote PHC workers. The limitations relate to how the inception cohort is defined. Firstly, even within the small number of studies cited above which use inception cohorts, there is a lack of consistency in the period of time chosen for the definition. Adikhari et al. (1993) define an inception cohort based on entry to practice in a single financial year, whilst other inception cohorts are based on entry over 2 or 3 years (Pathman et al., 1992; Rosenblatt et al., 1996). This feature limits comparability of studies.

Secondly, for some populations of rural and remote PHC workers, the risk of leaving may vary markedly, even over time frames as short as 1 or 2 years. This was shown to be the case amongst Northern Territory nurses and midwives in the research report by Garnett et al., where survival curves were steepest in the first 10 months of employment (highest risk), but subsequently flattened off (lesser risk) at around 15 months (Garnett et al., 2008). In this instance, for example, were an inception cohort of nurses and midwives to be defined based on commencement within the past 2 years, there would be insufficient adjustment in the analysis for the substantial variation in the risk of those nurses and midwives leaving. Some prior knowledge of variations in the risk of turnover according to length of employment is therefore desirable when determining the period over which an inception cohort is to be defined. This knowledge is not always available *apriori*, however.

Thirdly, there are substantial trade-offs to be made when defining inception cohorts, as mentioned in Sub-section 5.3.1 under 'Optimising study size'. These trade-offs are between the sample size available for analysis and the variability in length of tenure of health workers at study commencement. As the period of time over which an inception cohort is defined gets less, the variability in the risk of cohort members leaving (due to different lengths of tenure) gets less. However, the size of the cohort also gets smaller, and, as already discussed it is important within the context of rural and remote PHC workforce research to optimise study size.

Thus whilst the use of inception cohorts has the advantage of making adjustments for differences in the lengths of health worker employment at study commencement, the trade-offs associated with this approach can be problematic. Methods, such as survival analysis (time to event analysis), which intrinsically can take into account health worker length of stay since commencement are advantageous in this respect. Survival analysis does not require exclusions from the cohort based on how long a PHC worker was working in a position prior to study commencement. Instead, survival analysis methods intrinsically take this into account. Further, specific cohort effects can readily be looked for, if these are of policy-making interest.

5.3.3 The need to maximise the use of partial information on PHC worker retention

i) Taking appropriate account of censored data

Longitudinal studies of health worker retention typically capture a mix of both censored and uncensored data. Right censored data are quite typical of turnover and retention studies.

In the context of turnover and retention studies, right censoring of data occurs when, at study end, some of the health workers under study remain in their positions. For these workers, the endpoint of interest (exiting their position) has not been observed, and therefore their total length of stay is not known. However, partial data are available for this group of workers, since it is known that they remained in their positions from their commencement date until the date when the study ended.

Right censoring can also occur when the records for a defined group of PHC workers are available for some, but not all, of the study time, and the PHC worker has not exited a position at the time the records no longer are available. This may occur because of the “close-down” of an organisation as part of overall service rationalisation. It might also occur if the criteria by which PHC workers were included in the longitudinal dataset were to change, such that data on some of the PHC workers is no longer available after a certain time point (prior to study end). An example of right censored data of this type was seen in the longitudinal database of rural and remote GPs managed by the NSW Rural Doctors Network, when changes in the remoteness classification from RRMA to ASGC-RA meant that after the changeover date there were some GPs located in a rural RRMA, whose retention had previously been tracked by NSW Rural Doctors Network, but who were no longer tracked because their locations were reclassified as ASGC-RA 1 (major cities). GPs located in Hastings Point, for example, were tracked in the database prior to changeover (RRMA 5), but not after changeover (ASGC-RA 1). If it was desired to retain the data on these GPs in the analysis, their records would need to be right censored at the time of remoteness classification changeover.

Right censoring may also occur when a study analyses a particular type of turnover, for example, turnover occurring as a result of voluntary departure of employees. Data on health workers who have left for other reasons (involuntary turnover, death etc.) that compete with the outcome of interest are also ideally included in the analysis. This requires that the data be coded as (right) censored for health workers that leave due to competing reasons.

In these instances of censored data, a method is required which can optimise the use of all available data, rather than discarding the records of health workers who, importantly, are in continuing employment, or who have left employment for alternative reasons. The requirement to be able to handle censored PHC worker length of stay data may render some analysis methods inappropriate. Survival analysis, however, is ideally suited to the simultaneous analysis of length of stay of current and past employees.

ii) Taking appropriate account of truncated data

Longitudinal studies of health worker retention typically also capture data that are left truncated. Left truncation occurs when data are captured on all PHC workers providing rural PHC services during a pre-specified period of time, including data on PHC workers who were already employed prior to the start of the study observation period.

For example, one of the peer-reviewed published papers included in this thesis captures data on all GPs who worked in rural NSW at any time between January 1st 2003 and December 31st 2012 (Russell, Humphreys, McGrail, Cameron, & Williams, 2013). Some of these GPs will have already been working in rural NSW at the start of the study observation period. It is not appropriate to include in the analysis data on these workers from the period of time when they were not under observation, that is, prior to January 1st 2003. This is because their inclusion in this data set is conditional upon them still working in rural NSW on January 1st 2003. Truncation is defined as:

> *'a period over which the subject was not observed but is, a posteriori, known not to have failed'.* (Cleves, Gould, Gutierrez, & Marchenko, 2008, p. 34)

A further example of the utility of being able to appropriately handle left truncated data was seen in the study of the retention of Victorian AHPs (Chisholm, Russell, & Humphreys, 2011). In this study there were difficulties associated with the continuity of health records. One health service had instituted a new Information Technology and Human Resources database system during the study period. This meant that complete data on all AHPs at that service were only available from the time at which the new system was brought in. In this instance, survival analysis methods were used to tailor the coding of left truncated data, so that the different study period for the AHPs at this service was handled appropriately. This meant that it was still possible to include these data in the overall analysis, and it wasn't necessary to shorten the overall study period.

Survival analysis is able to maximise the use of data on PHC workers already in employment at the start of the study observation period, whilst still taking into account that their risk of leaving will vary according to how long they have already been in employment. It is also flexible enough to be able to appropriately handle variations in the study observation period.

iii) Taking account of multiple episodes of rural PHC tenure

Rural and remote PHC workers may have a number of career moves during their career span, moving between rural and metropolitan locations, as they seek positions that match changes in their personal and family needs, educational and training needs, regulatory constraints to their practice, and financial and professional needs. Most methods of retention analysis evident in the literature have been constrained by analysis of a single episode of rural or remote employment. Frequently, researchers have analysed retention in an 'index' or initial rural practice, community, or non-metropolitan county (Horner et al., 1993; Pathman et al., 1992; Pathman et al., 1999). If PHC workers were to move away from their index practice, community or non-metropolitan county, any data on subsequent moves, even if returning to these locations, would not be included in the analysis.

Infrequently, researchers calculate each PHC worker's total tenure by adding the lengths of stay in initial and subsequent practices together, and thus examine factors associated not with an initial or subsequent length of stay, but with overall length of stay (for example, in a non-metropolitan county) (Pathman, Konrad, et al., 1994a). Whilst this method retains data on the number of person-years of PHC service provided, the act of combining different stints into the one measure results in loss of information. For example, the factors associated with retention in the initial location may differ from the factors associated with retention in subsequent locations. A method which optimises use of this information – repeated measures survival analysis – can have significant advantages for health workforce retention analysis, especially in the context of rural and remote locations where health worker turnover may be higher, and where 'orbiting' staff may make important contributions to the workforce (Wakerman, Curry, & McEldowney, 2012). Repeated measures survival analysis is demonstrated in the paper included in Chapter 6 of this thesis titled "*The Value of Survival Analyses for Evidence-based Medical Workforce Planning*" (Russell, Humphreys, McGrail, et al., 2013).

5.3.4 The need to make valid comparisons and predictions of PHC worker retention

i. Examining differences in retention between groups

A substantial proportion of the retention studies identified in the literature review (Chapter 3) were limited in the comparisons they made of retention between different groups of rural PHC workers (Fryer et al., 1994; Heng et al., 2007; Jackson et al., 2003; Kamien, 1998; Lapolla et al., 2004; Larson et al., 1999; Rabinowitz et al., 2005; Rosenblatt et al., 1996; West et al., 1996). Some studies reported descriptive statistics, describing and summarising the data, revealing apparent differences between groups, but not testing for any significance of these differences in retention. Other studies used methods based on inferential statistics but either didn't test for statistical significance or didn't report the statistical significance of differences in retention between groups. Some studies that did report tests of significance did not adjust for other factors – that is the models were not multivariate.

Data analysis which is undertaken using multivariate regression techniques is able to address these shortcomings. Regression analysis readily provides information about the statistical significance of associations between various factors and health worker turnover or retention. It also provides information on the relative magnitude (or strength) and direction of any associations. Multivariate regression methods can also isolate the effect of a single independent factor on retention, whilst simultaneously adjusting for other factors. In survival analysis, factors can be continuous variables, categorical variables or they can vary with time. This provides a highly flexible method which helps preserve information available for analysis.

Finally, the results of multivariate regression models can be used to forecast what might happen in the future. Logistic regression models are frequently used to model the unconditional probability that a health worker will leave. In contrast, survival analysis regression analogues, for example Cox Proportional Hazards models, can predict not just whether a health worker will leave or not but, importantly, when this will occur.

In health worker retention research, these predictions can be used to propose tentative benchmarks about expected average tenure based on the translation of Hazard Ratios into estimates of median lengths of tenure (median survival). In summary, the features of multivariate regression analysis methods mentioned here render them eminently suitable for providing high quality information that is of great interest for rural and remote workforce planners and policymakers.

5.4 Methodological approach taken in this thesis

What this overview of methodological challenges highlights is the enormous advantage and benefits offered by using survival analysis, in conjunction with a survival analysis regression analogue, to provide an evidence-base to inform rural and remote PHC workforce policy-making.

For these reasons, survival analysis methods are widely used in this thesis. However, survival analysis requires longitudinal data on PHC workers, and these are not always available or accessible. This was the case for the research reported in the paper titled "*What Factors Contribute Most to the Retention of General Practitioners in Rural and Remote Areas?*" in Chapter 6. For this study, cross-sectional data were available at an individual level for rural and remote Australian GPs. The data provided were from two sources: the Australian State and Territory Rural Health Workforce Agencies

National Minimum Data Set, a federally mandated data set which provides ‘snapshots’ of rural and remote GP workforce each November; and wave 1 of Australian rural and remote GPs responding to the MABEL survey.

Whilst the cross-sectional nature of these data meant that none of the five key metrics could be calculated, it was nevertheless important to optimise the information that could be provided to policymakers and workforce planners from these data. Analyses were therefore based on an alternative metric: length of stay in current position. This is not an ideal metric because all data are censored (we do not know how long each health worker is going to actually stay in that position, only how long they have been there up until the time of the study). However, currently in Australia there is limited accessibility to national level longitudinal PHC worker datasets for research purposes, and limited knowledge of the factors associated with retention of PHC workers. Therefore the paper *titled “What Factors Contribute Most to the Retention of General Practitioners in Rural and Remote Areas?”* was analysed using multiple (linear) regression methods (with logarithmic transformation of the outcome measure).

Given the wide use of survival analysis methods in this thesis, Section 5.4.1 is provided to give an overview of the basics of survival analysis, and how survival analysis is applied to the specific context of turnover and retention of rural and remote PHC workers.

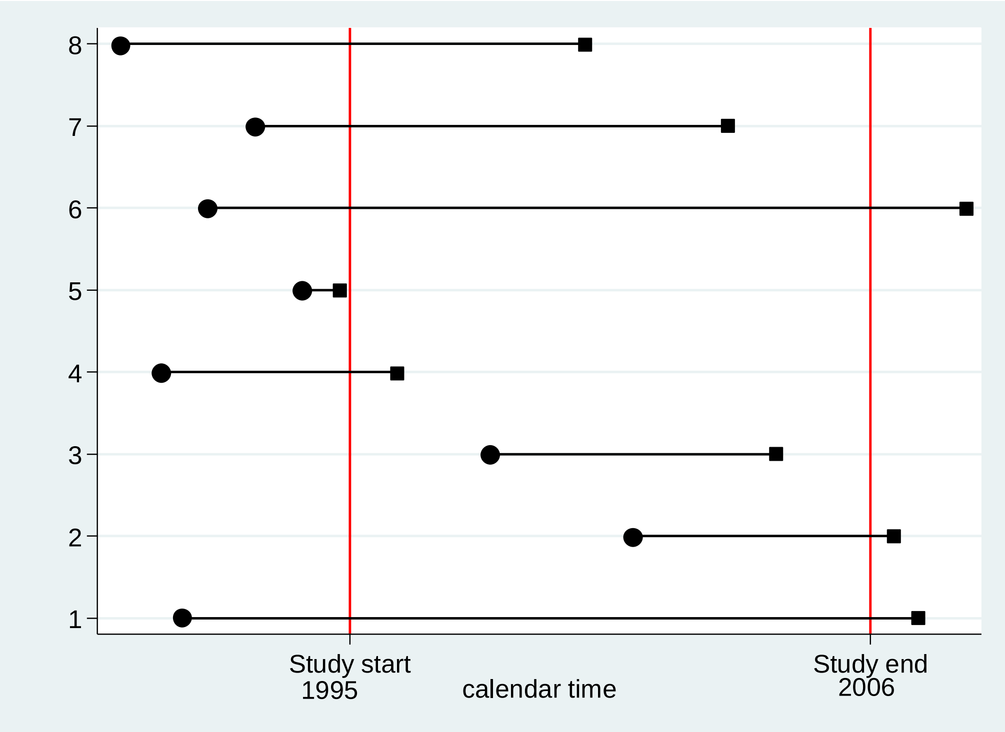
5.4.1 The basics of survival analysis

Survival analysis is also known as ‘time to event’ analysis. In survival analysis studies of PHC worker retention in rural or remote contexts, the ‘event’ of interest is the PHC worker leaving a rural or remote setting, whilst the time is the time from commencement of work in that setting. Therefore, the outcome variable of interest (health worker length of stay in a rural or remote location, also known as ‘survival time’) is usually the length of time from commencement of employment until exit from employment.

The precise definition of ‘commencement of employment’ and ‘exit from employment’ may differ from one study to the next, depending on the retention profile of interest (refer to Chapter 2). For example, if the profile of interest is retention in a rural health service, ‘commencement of employment’ will be defined as the date that the PHC worker commenced at a rural health service, and ‘exit of employment’ will be defined as the date that the PHC worker exited that rural health service.

An example of an analysis of the length of employment of eight PHC workers is provided to illustrate how survival data are handled and the survivor function calculated. These data are represented graphically in Figure 5.1.

Figure 5.1 Example lengths of employment for 8 PHC workers

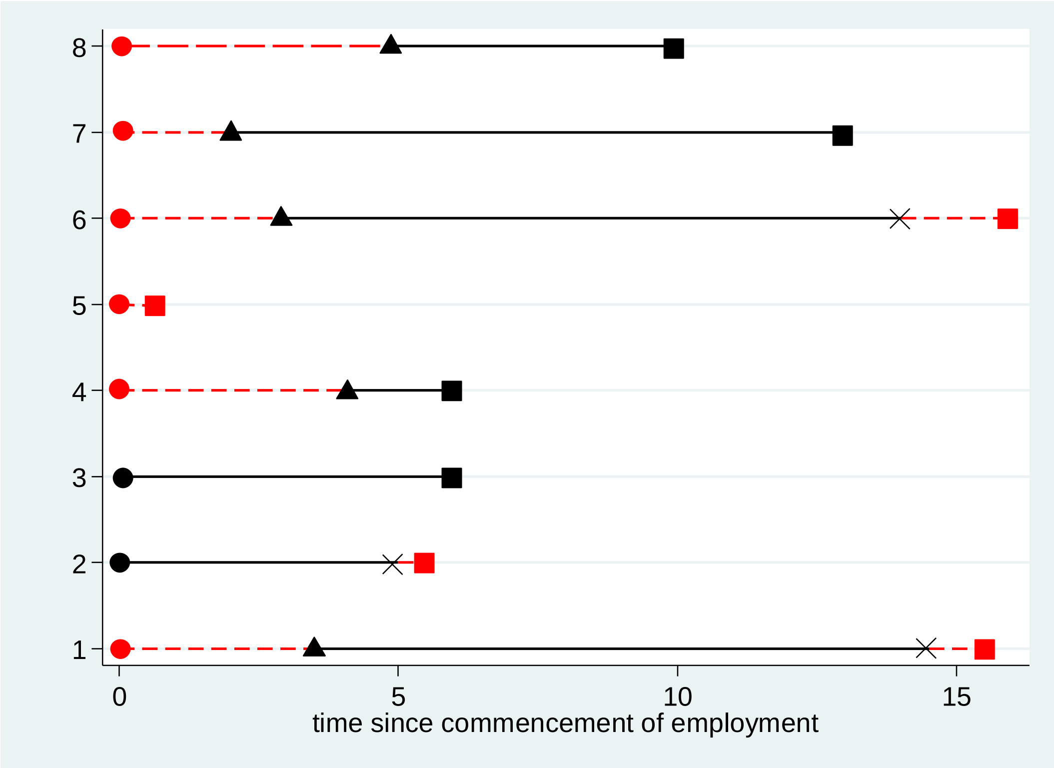


In Figure 5.1 a solid circle represents employment commencement for each of eight PHC workers, whilst a solid square represents each worker's employment ceasing. The health worker survival times are represented by the lengths of each line. In this example, the study period is the time between the two vertical (red) reference lines, which represent the study start and the study end.

Thus in the example represented in Figure 5.1, five PHC workers were already providing clinical services at the start of the study (individuals 1, 4, 6, 7 and 8), three PHC workers were providing clinical services at the end of the study (individuals 1, 2 and 6) and four PHC workers exited during the study period (individuals 3, 4, 7 and 8). One PHC worker shown in Figure 5.1 (individual 5) was not included in the analysis for this study, as this individual exited the health service before the study commenced. In this example only one PHC worker (individual 3) commenced and exited employment within the study period.

In Figure 5.2 the portion of each of the health workers' employment data that can be used in survival analysis is shown by a black solid line bounded by black symbols. Data that are represented by a red dashed line and red symbols are not used in the analysis. Time is measured relative to the time since each worker commenced employment. Solid circles represent commencement dates, with black circles indicating PHC worker commencement within the study period, and red circles indicating commencement prior to the study period. Similarly, solid squares represent exit dates, with black squares indicating exit within the study period and red squares indicating exit after the study period. Solid triangles represent the point at which data were left truncated (employment commenced prior

Figure 5.2 Translation of Figure 5.1 data using time since employment commenced on the x-axis



to study commencement), and crosses represent right censoring of data (employment exit occurred after the study end). The graphical representation of employment data shown in Figure 5.2 is represented numerically in Table 5.1.

Table 5.1 Numerical representation of the data from Figure 5.12

PHC worker number	Time from employment commencement when PHC worker came into the study	Time from employment commencement when PHC worker exited the study	Exited employment or still employed (censored) at study end	
1	3.5	14.5	Censored	0
2	0.0	5.0	Censored	0
3	0.0	6.0	Exited	1
4	4.0	5.0	Exited	1
5	.	.	.	.
6	3.0	14.0	Censored	0
7	2.0	10.0	Exited	1
8	4.8	9.8	Exited	1

The Kaplan-Meier method of survival analysis can then be used to calculate estimates of the survivor function, that is the probability that each worker remains employed as a function of the time since they commenced employment (Pagano & Gauvreau, 2000).

Estimates of the survivor function, at various times *t,* take on values from 1 to 0, continually decreasing as time increases, and are obtained from the equation $S(t) = \Pr(T > t)$

where *T* is a non-negative random variable representing the time from commencement until each PHC worker leaves.

Ordering these data by time of exit allows the probability of survival at time *t* to be calculated, given survival up to time *t* (see Table 5.2).

Table 5.2 Ordered data from example shown in Figure 5.1, showing calculations of survivor function

Time from commencement	Beginning total	Failures	Net lost	Survival probability calculations	Survival probability
2.0	2	0	-1	$= 1.0000 \times \left(1 - \frac{0}{2}\right)$	1.0000
3.0	3	0	-1	$= 1.0000 \times \left(1 - \frac{0}{3}\right)$	1.0000
3.5	4	0	-1	$= 1.0000 \times \left(1 - \frac{0}{4}\right)$	1.0000
4.0	5	0	-1	$= 1.0000 \times \left(1 - \frac{0}{5}\right)$	1.0000
4.8	6	0	-1	$= 1.0000 \times \left(1 - \frac{0}{6}\right)$	1.0000
5.0	7	1	1	$= 1.0000 \times \left(1 - \frac{1}{7}\right)$	0.8571
6.0	5	1	0	$= 0.8571 \times \left(1 - \frac{1}{5}\right)$	0.6857
9.8	4	1	0	$= 0.6857 \times \left(1 - \frac{1}{4}\right)$	0.5143
10.0	3	1	0	$= 0.5143 \times \left(1 - \frac{1}{3}\right)$	0.3429
14.0	2	0	1	$= 0.3429 \times \left(1 - \frac{0}{2}\right)$	0.3429
14.5	1	0	1	$= 0.3429 \times \left(1 - \frac{0}{1}\right)$	0.3429

Survival curves can then be used to produce graphs of the probability of PHC workers remaining employed (survival probability) on the y axis, and all points of time since the commencement of employment on the x axis as shown in Figure 5.3. Note that in this instance, the time at which the three PHC workers who are still employed at the end of the study period are censored are marked on the survival curve with a ‘1’. This graph also shows the numbers of PHC workers ‘at risk’ of leaving marked at various time points as shown beneath the x axis. These figures are needed to calculate the survivor function. Note also that the large ‘steps’ seen in this example survival curve occur because of the small number of health workers in the example. As the number of observations increases, the survival curve appears progressively smoother (see, for example, Figure 5.4).

Survivor functions can be calculated separately for PHC workers with different characteristics and then compared. To illustrate, in Figure 5.4 the probability of NSW GPs (either with or without VMO rights) staying in a rural or remote community is graphed against the time since they commenced working in a particular community. Survival curves are particularly good at revealing patterns of retention and how they differ between groups – Figure 5.4 demonstrates, for example, that differences in length of stay between VMOs and non-VMOs occur within about 6 months after commencement and are maintained throughout the period of employment.

Figure 5.3 Survival curve for sample data shown in Figure 5.1

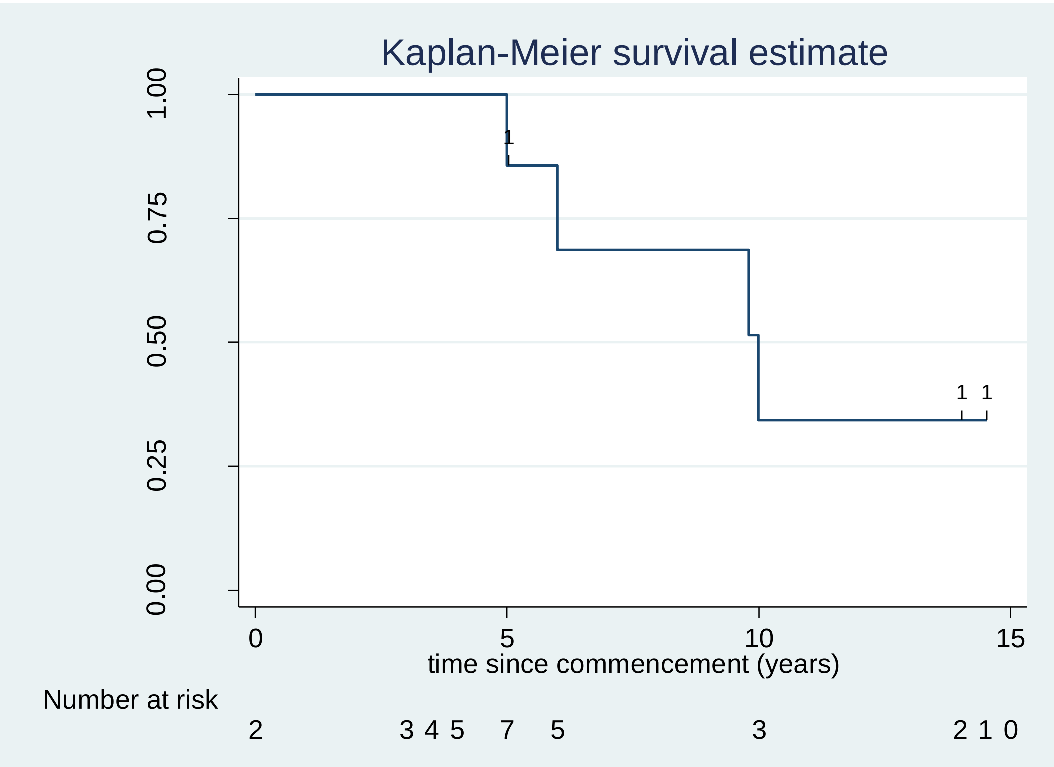
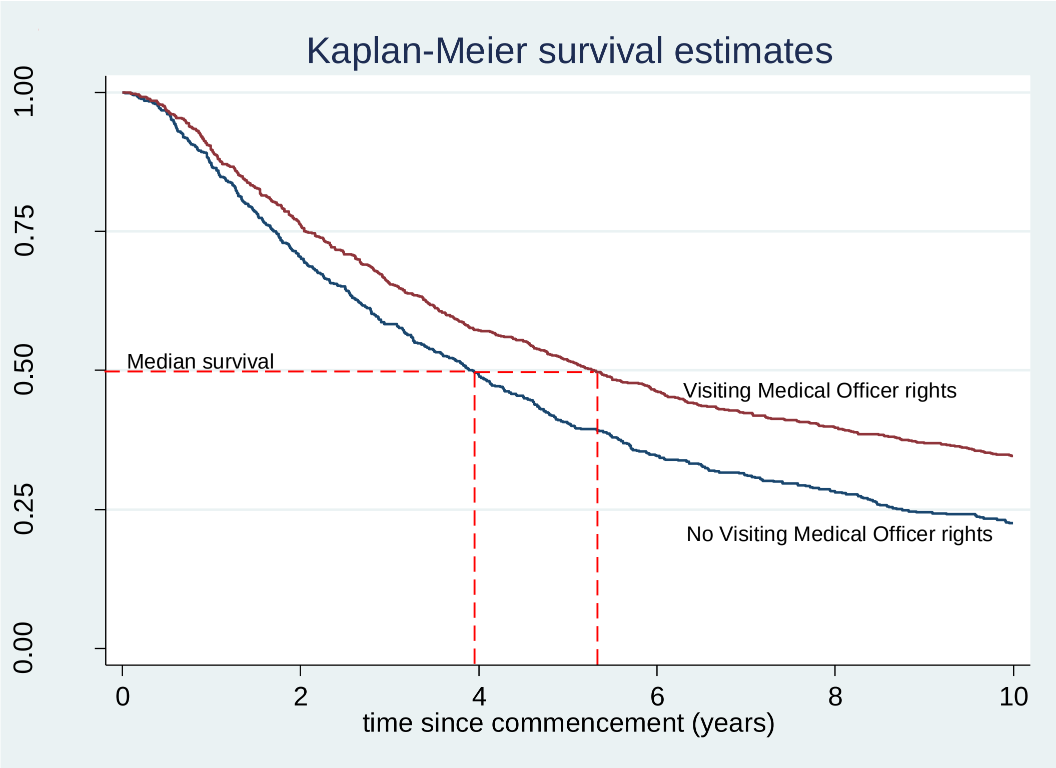


Figure 5.4 Survival curve for NSW GPs with and without Visiting Medical Officer rights



However, to quantify these differences, test their significance, relate the length of employment to various characteristics present at commencement of employment, and to make predictions of length of employment based on these characteristics, additional techniques are required. Cox proportional hazards modelling is a survival analysis regression analogue based on modelling the hazard function – the risk or hazard of leaving employment at time *t*, given that the individual PHC worker has remained employed up until that time (Collett, 2003). It is particularly useful because the hazard functions for individuals in different groups, for example VMOs and non-VMOs can be compared, and a ratio of the hazard functions calculated.

$$Hazard\ Ratio = \frac{h_{non-VMO}(t)}{h_{VMO}(t)}$$

where

$h_{non-VMO}(t)$ is the hazard of leaving a rural community for GPs without VMO rights at time t

$h_{VMO}(t)$ is the hazard of leaving a rural or remote community for GPs with VMO rights at time t

In the example shown in Figure 5.4, a Cox proportional hazards model with a single explanatory variable can quantify any difference in hazard between groups and test for statistical significance of the differences. In this example the hazard ratio for GPs without VMO status leaving at any point of time compared with GPs with VMO status is 1.41 (95% CI 1.26, 1.58).

The modelling can be extended to include multiple explanatory variables, and thus have the added capacity of adjusting for multiple characteristics at once. The semi-parametric Cox proportional hazards model with multiple explanatory variables can be written as:

$h_i(t)=h_0(t)exp(\beta_1 x_{i1}+ \beta 2x_{i2}+ \dots + \beta_p x_{ip})$

where

$h_i(t)$ is the hazard function for PHC worker i

$h_0(t)$ is the baseline hazard function (hypothetical PHC worker with all explanatory variables = 0)

p is the number of explanatory variables

$x_{i1}, x_{i2}, \dots x_{ip}$ are the values of the explanatory variables for the ith PHC worker (Collett, 2003).

Using the data from NSW rural and remote GPs again for illustrative purposes, we can see in Table 5.3 that after adjusting for a number of other variables, including GP age, location of employment and proceduralism, the effect of VMO status on the hazard of leaving is slightly increased with a Hazard Ratio of 1.49 (95% CI 1.30, 1.71). (This example is drawn from Table 3 in the published paper titled '*The Value of Survival Analyses for Evidence-based Rural Medical Workforce Planning'* in Chapter 6) (Russell, Humphreys, McGrail, et al., 2013).

Whilst Cox Proportional Hazards regression does not rely on assumptions about the shape of the baseline hazard function, analysis is underpinned by other assumptions. One key assumption of survival analysis in general is that for censored data, censoring is non-informative (Collett, 2003). That is, the actual length of employment of PHC workers is independent of the arbitrary choice of study end dates (and therefore censoring). For the analyses described in this thesis, this assumption is reasonable and appropriate.

A second assumption that applies to the Cox Proportional Hazards modelling is that the hazard functions are proportional over time (Collett, 2003). This means that the hazard for one group remains a constant multiple of the hazard for another group over time (in situations where the predictor variables are not time varying). As a result, the reporting of the relative hazards of one group compared to another is as a constant, the 'Hazard Ratio'. For many variables included in this study, for example VMO status as graphed in Figure 5.4, the survival curves indicate that the assumption of proportional hazards is likely to be reasonable.

Table 5.3 Cox proportional hazards model example using rural and remote NSW GP data

Variable	Baseline	Comparators	Hazard Ratio	Lower Limit 95% CI	Upper Limit 95% CI
Population size & remoteness classification	<5000 & inner regional	<5000 & outer regional	1.33	1.12	1.57
		<5000 & remote/very remote	2.65	2.03	3.46
Country of primary medical degree	Australia	Other (non UK etc.)	1.45	1.26	1.68
Proceduralist	Yes	No	1.42	1.21	1.68
Registration	Conditional	Full	1.49	1.24	1.79
Visiting Medical Officer rights	Yes	No	1.49	1.30	1.71
Birth year	1945-1970	Pre 1940	1.45	1.13	1.85
		1940-1945	1.36	1.03	1.79
		1970-1975	1.45	1.21	1.75
		After 1975	1.54	1.18	1.99
Coastal location	Yes	No	1.22	1.08	1.39

Source: (Russell, Humphreys, McGrail, et al., 2013)

These are the key assumptions of survival analysis and Cox proportional hazards regression modelling. One further important assumption is held in common with other forms of regression modelling. This is the assumption that data on key relevant factors are captured and modelled. It is important that an appropriate set of explanatory variables – that is factors that are known or hypothesised to be important predictors of turnover or retention – are included in the model (Collett, 2003). This study drew on the findings of the literature review from Chapter 3, as well as the broader literature on the factors associated with rural and remote PHC worker turnover and retention, to minimise the risk of inappropriate model specification.

5.5 Summary

In summary, this chapter has recommended a suite of key metrics for measuring rural and remote PHC worker turnover and retention, acknowledging that the choice of one or more of these metrics will depend on a variety of factors including policy-making needs, data availability and analytical capability. The substantial advantages associated with using sophisticated survival analysis methodology for measurement of PHC worker retention in rural and remote areas have been outlined. The use of the three metrics derived from survival analysis, in conjunction with the simpler turnover and stability rate metrics, increases the comprehensiveness and usefulness of previously proposed 'baskets of indicators' for informing current rural and remote PHC workforce planning and policy-making.

Chapters 6 and 7 present four papers which measure and report on rural and remote PHC workforce turnover and retention. Most of these papers demonstrate the use of some or all of the five key metrics identified in the research paper presented in this chapter. The workforce datasets used in each of the papers varies. Chapter 6 presents the results of analyses of retention of Australian and NSW GPs, using data from the RWAs and from the MABEL study. Chapter 7 extends analyses to include cadres of PHC workers other than doctors, presenting the results of analyses of retention of Australian AHPs, nurses, AHWs, doctors and health service managers, and of Victorian AHPs. These data were collected from rural and remote Australian and Victorian health services, respectively.

Chapter 6: Patterns of retention amongst rural and remote GPs

Currently, in Australia, despite the many medical workforce studies, relatively little quantitative empirical investigation has taken place into what the patterns of retention of rural GPs are like and what factors are associated with the length of their stay. The two papers in this chapter use quantitative methods to address the evidence gaps identified in Chapter 3 regarding the factors associated with the retention of rural and remote PHC workers. Specifically, both papers measure the magnitude, statistical significance and relative importance of factors associated with PHC worker retention. The papers therefore addresses research question 3 of this thesis: What is the magnitude, direction of association and relative importance of factors associated with rural and remote primary health care workforce turnover and retention?

Both papers in this chapter are specific for the PHC medical profession: they investigate variations in patterns of Australian rural and remote GP turnover and retention. The significance of examining factors associated with the retention of GPs relates to their central role as providers of PHC and as 'gateways' to the rest of the Australian health system: GPs are the first point of entry into the health system, and co-ordinate care and control referrals to other parts of the health system (Commonwealth of Australia, 1998). GPs are therefore critical to the efficient and equitable functioning of the health system as a whole. However, GPs are particularly crucial for the functioning of rural and remote health services, which are heavily dependent on the PHC services provided by GPs (Standing Council on Health, 2012). For these reasons, it is important to have a sound understanding of the factors associated with rural and remote GP retention.

Both papers in this chapter also examine how retention varies according to geographical location. The papers therefore also address research question 2 of this thesis: What does use of these metrics reveal about patterns of turnover and retention amongst the rural and remote Australian primary health care workforce, including any variation according to profession and geographic location? The significance of the focus of these papers on geographical location as a determinant of turnover and retention, relates to long standing issues with GP geographical maldistribution, as detailed in Chapter 2. However, it is important to understand that the activities of rural and remote GPs differ from those of metropolitan GPs (Britt, Miller, & Valenti, 2001). This is especially apparent when practice patterns of GPs working in small rural and remote locations are compared to practice patterns of metropolitan GPs.

6.1 Background to Russell et al. 2012 paper

The first published paper in this chapter, titled "*What Factors Contribute Most to the Retention of General Practitioners in Rural and Remote Areas?"* (Russell, McGrail, Humphreys, & Wakerman, 2012) reports on the relative strength, significance and contribution of factors associated with the retention of Australian rural and remote GPs. This research comprised parallel analyses of two distinct but related cross-sectional national datasets on GPs. The first dataset, with data provided by the RWAs, included data on almost the entire population of rural and remote GPs – the only data that were not provided were for South Australian GPs. However, multiple linear regression modelling used listwise deletion to handle missing values for data items, and not all GPs provided responses to all items that were modelled. Therefore a reduced sample of GPs was included in the analysis. The second dataset, with data provided by the 2008 wave of the MABEL study, included data on a comparable, but different, sample of rural and remote Australian GPs. Analysing these two datasets in parallel, therefore, enables cross-validation of results.

Given the cross-sectional nature of the available data, an alternative retention metric, length of stay in current position, was used for this analysis, and an alternative method of analysis was similarly required. For this study, multiple linear regression models were separately developed for the RWA and MABEL data, using variables in each dataset that were the same or similar. This allowed a direct comparison of estimated effect sizes to be made. More comprehensive models were also developed that utilised the full suite of predictor variables available within each dataset.

As with other modelling reported in this thesis, the selection of predictor variables was guided by the rural and remote PHC workforce turnover and retention literature. Predictor variables were drawn from each of the five categories of factors identified in the literature review in Chapter 3: financial and economic, professional and organisational, educational and regulatory, personal and family, and community and location. Specific predictor variables included in the modelling were geographical remoteness and town size (as measured by RRMA classification), gender, GP Registrar status, income source, business structure, annual leave, age, hospital work, availability for on-call, procedural skills, restrictions on practice location, proximity to the coast, proximity to private schools, country of primary medical degree and practice size.

Monash University

Declaration by candidate regarding publication 2

Russell, D.J., McGrail, M.R., Humphreys, J.S., and Wakerman, J., *What factors contribute most to the retention of general practitioners in rural and remote areas?* Australian Journal of Primary Health, 2012. **18**(4): p. 289-294.

In the case of publication 2, appearing in Chapter 6, the nature and extent of my contribution was the following:

Nature of contribution	**Extent of contribution (%)**
Substantial contribution to conception and design of the paper, data acquisition and data analyses, drafting and re-drafting and final approval of the version to be published	80

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	**Nature of contribution**	**Extent of contribution (%) for student co-authors only**
Dr Matthew McGrail	Substantial contribution to data acquisition and data analyses and critical revision of drafts	n/a
Emeritus Professor John Humphreys	Substantial contribution to conception and design of the publication, data acquisition and critical revision of drafts	n/a
Professor John Wakerman	Critical revision of drafts	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature	[redacted]	**Date** 21/2/2014
Main Supervisor's Signature	[redacted]	**Date** 21/2/2014

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Research

What factors contribute most to the retention of general practitioners in rural and remote areas?

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Abstract. The objectives of this study were to measure the relative strength, significance and contribution of factors associated with rural and remote medical workforce retention. Length of stay data from two Australian GP workforce datasets, the 2008 National Minimum Data Set (4223 GPs) and a subset of the 2008 Medicine in Australia: Balancing Employment and Life dataset (1189 GPs), were separately analysed using multiple linear regression models and the results compared. Length of employment in their current practice location was the outcome measure. Consistent results were obtained across both datasets. The most important factors associated with the retention of rural and remote GPs, after adjusting for GP age, were primary income source, registrar status, hospital work and restrictions on practice location (which are linked to geographic location). Practice ownership was associated with ~70% higher retention than average, whilst undertaking hospital work in addition to routine general practice was associated with at least 18% higher retention compared with if no hospital work was undertaken. Less important factors included geographic location, procedural skills, annual leave, workload and practice size. Our findings quantify a range of financial and economic, professional and organisational, and geographic factors contributing to the retention of rural GPs. These findings have important implications for future medical workforce policy, providing an empirical evidence base to support the targeting and 'bundling' of retention initiatives in order to optimise the retention of rural GPs.

Additional keywords: Australia, health manpower, primary health care, rural health services, workforce.

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Introduction

The presence of a skilled medical workforce is a key prerequisite for delivering quality primary health care. However, a serious ongoing rural GP workforce shortage continues to jeopardise the capacity to provide quality health care to many communities (Australian Medical Workforce Advisory Committee 1996, 2005; Access Economics 2002; Productivity Commission 2005). Despite recent significant increases in medical student training places, indications are that these medical education and training measures alone will not fully overcome rural GP shortages due to the effects of an ageing GP workforce, fewer graduates choosing GP training, and increased consumer demand for medical care as the Australian population ages (Productivity Commission 2005; Australian Bureau of Statistics 2010).

In this context of workforce shortage and increasing pressures on finite health funding, it is important that rural and remote communities retain their existing health workforce, particularly given that retention may be 5–10 times less expensive than the costs associated with recruiting replacement staff (Murrow *et al.* 2007). For retention policies and incentives to be effective, it is necessary to understand what modifiable factors are associated with high, but somewhat avoidable, turnover and conversely, what factors are associated with optimal retention.

Key determinants of employee turnover and retention identified in the literature include factors relating to working conditions (such as remuneration, infrastructure and professional support), environmental conditions and employee characteristics (Mueller and Price 1990; Hoyal 1995; Buykx *et al.* 2010). These factors influence how long employees stay in their jobs through the intervening variables of job satisfaction, organisational commitment and intention to stay or leave (Mueller and Price 1990).

To date most of the health workforce retention research in Australia has been qualitative and focussed largely on intervening variables, such as professional satisfaction, rather than on primary determinants of retention *per se*, or has utilised intermediate outcomes, such as intentions to leave (or stay) rather than observed behaviour (Hays *et al.* 1997; McGlone and Chenoweth 2001; Ulmer and Harris 2002; Ozolins *et al.* 2004; Gardiner *et al.* 2006; Perkins *et al.* 2007). Research underpinned by strong quantitative methods has generally been lacking. Notable exceptions include studies by: Kamien (1998) and Humphreys *et al.* (2002) that sought to quantify the significance and relative contribution of individual elements of retention; Adhikari *et al.* (1993) who based their analysis on Medicare data; and Garnett *et al.* (2008) who utilised data from multiple existing databases in conjunction with survey data to describe the turnover and retention of nurses in the Northern Territory.

This study therefore stands apart in its objective to measure the strength and contribution of significant factors associated with the retention of Australian GPs, and thereby attempts to address an important knowledge gap. The knowledge generated by this study will therefore be of interest not only to health services, but also to policy makers and health workforce agencies responsible for developing workforce retention strategies for GPs in rural and remote areas.

Methods

Data sources

Medical workforce data were obtained from two sources. The first source of data was the Australian State and Territory Rural Workforce Agencies National Minimum Data Set (NMDS). This federal government mandated minimum dataset is maintained by annual surveys conducted by State and Territory Rural Workforce Agencies (which operate with the express purpose of supporting the rural medical workforce), and verified using additional sources of data (including practice managers surveys, Divisions of General Practice, regional training providers and state and territory medical boards). Length of stay data were available for 4223 Australian GPs (but not for South Australian GPs), representing 90.2% of GPs working in rural, remote and metropolitan area (RRMA) 4–7 regions (small rural centres with populations less than 25 000 and all remote locations), as at 30 November 2008 (Health Workforce Queensland and New South Wales Rural Doctors Network 2009).

The second source of data was the baseline cohort of Australian RRMA 3–7 GPs ($n = 1189$) undertaking clinical work during 2008 who responded to the Medicine in Australia: Balancing Employment and Life (MABEL) survey, a longitudinal study of the factors influencing workforce participation, labour supply and mobility of doctors in Australia (Joyce *et al.* 2010). Both datasets included de-identified unit level data for GP length of stay in current practice (the dependent variable), and age, gender, geographic location (measured using the *Rural Remote and Metropolitan Area* classification; DPIE 1994), total hours worked per week, on-call availability, weeks of annual leave taken and the business or primary income structure under which each GP worked (the explanatory variables). Categories for the latter variable differed slightly between the two datasets. Some explanatory variables were available for one dataset but not the other. For example, various procedural skills and hours worked in general practice were only available in the NMDS, while restrictions on location of practice (such as visas restricting practice to a 'district of workforce shortage' and an 'area of need' or rurally bonded graduates), practice size, proximity to the coast and educational facilities were only available in the MABEL dataset.

The rationale for parallel analyses of the NMDS and MABEL datasets is to have validation of each by the other. Whilst at the outset the MABEL data (with RRMA 3 and South Australian GPs removed) is a subset of NMDS data, the individual GP records utilised in the final multivariate models will most likely vary between MABEL and NMDS due to variation between the datasets in which records have missing values and therefore variation in which records are dropped (and which are retained).

Ethics approval was obtained from the Flinders University and Southern Adelaide Health Service Social and Behavioural Research Ethics Committee, Monash University Human Research Ethics Committee and the University of Melbourne Faculty of Economics and Commerce Human Ethics Advisory Group.

Statistical analysis

Multiple ordinary least-squares linear regression modelling using a manual backward elimination procedure was used to identify independent predictors of GP retention. The outcome variable required natural logarithmic transformation to approximate a normal distribution. Selection of predictor variables was guided by the health workforce retention literature, with restrictions imposed by availability of variables in the respective datasets. Following some preliminary analysis, age was modelled using a restricted linear spline with the knot at age 55 years (Dupont 2009). The use of two separate continuous age variables produced a significantly better fit to the data than did a single continuous age variable. Initial models were developed that utilised independent variables that the two datasets had in common and a similar population of GPs (with the result that locums, South Australian and RRMA 3 GPs were excluded from the MABEL dataset). This allowed a direct comparison of estimated effect sizes obtained from the two independently collected datasets. The effect size (exponentiated coefficient) is interpreted as the proportional difference either between a category and its reference level (for categorical variables) or the proportional change for each unit increase (for continuous variables). Variables with more than two categories utilised deviation contrasts, enabling the comparison of each category to the grand mean for that variable. More comprehensive models were developed that utilised the full suite of predictor variables available to each dataset and maximised use of available data. Regression diagnostics were checked for both datasets, indicating that the assumptions underpinning the models appear to be fulfilled. Statistical analyses were conducted using StataIC, release 10 (StataCorp, College Station, TX, USA).

Results

The strength of association between GP length of employment in their current position and each of the independent variables was in the same direction and of similar magnitude for both the NMDS and MABEL models (Table 1).

GP registrar status and GP age were significantly associated with length of employment in current practice, after adjustment for GP age. While NMDS and MABEL used different definitions of business and income structure, these factors had a significant association with GP retention, regardless of how they were defined. The MABEL model indicated that retention was highest for practice principals, whilst associates also had higher retention than salaried or contract employee GPs. The NMDS model indicated that retention was highest for GPs paid on a fee-for-service basis and least for GPs who were government salaried irrespective of rights to private practice (though GPs employed in Aboriginal Community Controlled Health Services and other non-government services had average retention).

Both models indicated that retention of GPs in rural (RRMA 4) locations was significantly higher than average, whereas retention of GPs in remote (RRMA 7) locations was significantly lower than average. The estimated percentage difference in GP retention in RRMA 4 compared with RRMA 7 was 32% (NMDS) and 59% (MABEL). Retention of GPs in RRMA 5 locations tended to be higher than average, though the estimate obtained from the MABEL data was not statistically significant at the 0.05 level. Retention of GPs in RRMA 6 locations was average, after adjustment for other factors.

Interpretation for continuous variables (Table 1) is exemplified by the small though significant estimated increases of 3% (NMDS) and 7% (MABEL) in GP's length of stay in their current location for each extra week of annual leave taken in the last year, after adjusting for other variables in the model.

Models explained 41% (NMDS) and 46% (MABEL) of the variance in GP length of employment in their current location. The most important variables (explaining the largest proportion of variance in retention) were age, business and income structure, registrar status, and hospital work.

Table 2 presents multiple linear regression Model 2, developed utilising data from the NMDS dataset (RRMA 4−7, excluding South Australia, no locums, $n = 4223$ GPs) with several additional variables included that weren't shared with the MABEL dataset. Whilst practice type (solo, group or other) was not significantly associated with retention (not shown), GPs with procedural skills had, on average, been in their current position for 26% longer than GPs with no obstetric, anaesthetic or surgical skills. Total hours worked was modelled as a categorical variable (which does not require assumptions of linearity of association). GPs who worked less than a total of 40 h per week had significantly shorter than average length of employment in their current location, whilst GPs who worked between 60 and 75 h per week had significantly longer than average length of employment in their current location.

Table 3 presents a more comprehensive multiple linear regression model, Model 2, developed utilising data from a wider MABEL dataset (inclusive of GPs in RRMA 3 as well as RRMA 4−7, South Australian GPs and locums, $n = 1189$ GPs). Additional explanatory variables were included in the modelling process. GPs with restrictions on their location of practice had

Table 1. Multiple linear regression models derived from variables common to the National Minimum Data Set (NMDS) and Medicine in Australia: Balancing Employment and Life (MABEL) dataset, using data from comparable populations of GPs

The outcome variable is length of GP employment in current practice. Continuous variables are shown in parentheses. ACCHS, Aboriginal Controlled Community Health Service; RRMA, rural remote and metropolitan area classification

Reference	Variable	NMDS Model 1 ($n = 4223$)			MABEL Model 1 ($n = 810$)		
		Effect size	95% CI	*P*-value	Effect size	95% CI	*P*-value
Average for all RRMA 4–7 GPs	RRMA 4	1.15	1.04–1.26	0.006	1.26	1.10–1.45	0.001
	RRMA 5	1.17	1.07–1.28	0.001	1.09	0.96–1.23	0.172
	RRMA 6	0.90	0.77–1.02	0.125	1.09	0.92–1.28	0.319
	RRMA 7	0.83	0.71–0.95	0.013	0.67	0.55–0.82	<0.001
Male	Female	1.03	0.91–1.16	0.612	1.25	1.05–1.48	0.010
Not a registrar	Registrar	0.45	0.37–0.55	<0.001	0.52	0.40–0.68	<0.001
Average income source	Fee-for-service	1.48	1.32–1.64	<0.001			
	Government salaried with no rights to private practice	0.79	0.65–0.93	0.007			
	ACCHS salaried	1.12	0.85–1.39	0.349			
	Non-government wage or salary	1.03	0.90–1.17	0.636			
	Government salaried with rights to private practice	0.74	0.59–0.90	0.005			
Average business structure	Principal				1.72	1.51–1.96	<0.001
	Associate				1.19	1.01–1.40	0.041
	Salaried employee				0.68	0.57–0.81	<0.001
	Contracted employee				0.72	0.64–0.82	<0.001
(For each week of leave taken)	Weeks annual leave taken	1.03	1.02–1.04	<0.001	1.07	1.04–1.10	<0.001
(For each year)	Age 55 years or less	1.07	1.06–1.08	<0.001	1.05	1.04–1.07	<0.001
(For each year)	Age over 55 years	1.01	1.00–1.03	0.098	1.03	1.00–1.05	0.024
(For each extra 8 h worked)	Total weekly hours worked[A]	1.05	1.02–1.09	0.001	1.03	0.99–1.08	0.153
No hospital work	Does hospital work	1.40	1.24–1.58	<0.001	1.28	1.11–1.48	0.001
No on-call availability	Available for on-call	1.36	1.17–1.57	0.001	1.09	0.89–1.34	0.381
After missing data:		$n = 1592$, $R^2 = 0.408$			$n = 735$, $R^2 = 0.460$		

[A]Total weekly hours worked excludes on-call hours.

Table 2. Multiple linear regression model derived from the National Minimum Data Set (NMDS)
ACCHS, Aboriginal Controlled Community Health Service; RRMA, rural remote and metropolitan area classification

Reference	Variable	NMDS Model 2 ($n = 4223$) Effect size	95% CI	*P*-value
Average for all RRMA 4–7 GPs	RRMA 4	1.15	1.04–1.27	0.005
	RRMA 5	1.18	1.07–1.28	<0.001
	RRMA 6	0.88	0.76–1.01	0.080
	RRMA 7	0.84	0.71–0.96	0.018
Male	Female	1.08	0.95–1.21	0.239
Not a registrar	Registrar	0.46	0.36–0.55	<0.001
Average income source	Fee-for-service	1.51	1.34–1.68	<0.001
	Government salaried with no rights to private practice	0.78	0.64–0.92	0.006
	ACCHS salaried	1.08	0.82–1.34	0.531
	Non-government wage or salary	1.05	0.91–1.19	0.492
	Government salaried with rights to private practice	0.75	0.59–0.91	0.007
(For each extra week leave taken)	Weeks annual leave taken	1.03	1.01–1.04	<0.001
(For each year)	Age 55 years or less	1.07	1.06–1.08	<0.001
(For each year)	Age over 55 years	1.02	1.00–1.04	0.013
Average total hours per week worked	Worked ≤40 h per week total	0.79	0.70–0.88	<0.001
	Worked 40–60 h per week total	0.96	0.87–1.05	0.408
	Worked 60–75 h per week total	1.23	1.07–1.40	0.002
	Worked >75 h per week total	1.07	0.85–1.29	0.528
No hospital work	Does hospital work	1.29	1.14–1.46	<0.001
No on-call availability	Available for on-call	1.32	1.13–1.52	<0.001
No obstetric, anaesthetic or surgical skills	Has procedural skills	1.26	1.11–1.43	<0.001
After missing data:		$n = 1555$, $R^2 = 0.420$		

Table 3. Multiple linear regression model derived from the Medicine in Australia: Balancing Employment and Life (MABEL) dataset
RRMA, rural remote and metropolitan area classification

Reference	Variable	MABEL Model 2: RRMA 3–7 ($n = 1189$) Effect size	95% CI	*P*-value
Average for all RRMA 3–7 GPs	RRMA 3	1.23	1.09–1.39	0.001
	RRMA 4	1.13	1.00–1.28	0.056
	RRMA 5	1.01	0.92–1.12	0.81
	RRMA 6	1.05	0.90–1.23	0.509
	RRMA 7	0.67	0.57–0.81	<0.001
Male	Female	1.24	1.08–1.42	0.002
Not a registrar	Registrar	0.51	0.41–0.64	<0.001
Average business structure	Principal	1.69	1.51–1.89	<0.001
	Associate	1.29	1.12–1.49	<0.001
	Salaried employee	0.71	0.61–0.83	<0.001
	Contracted employee	0.82	0.73–0.92	0.001
	Locum/other	0.78	0.63–0.97	0.023
(For each extra week leave taken)	Weeks annual leave taken	1.04	1.01–1.06	0.003
(For each year)	Age 55 years or less	1.06	1.05–1.07	<0.001
(For each year)	Age over 55 years	1.01	1.00–1.03	0.141
(For each extra 8 h worked)	Total weekly hours worked	1.04	1.00–1.08	0.028
No hospital work	Does hospital work	1.18	1.05–1.33	0.007
No restrictions on practice location	Restricted practice	0.48	0.41–0.57	<0.001
(For each extra GP)	Practice size	1.02	1.00–1.04	0.024
After missing data:		$n = 1079$, $R^2 = 0.492$		

been in their current practice location for a significantly shorter period of time compared with GPs with no such restrictions. Practice size was also significantly associated with current retention. On average, GPs in larger practices had been in their current practice for longer than GPs in smaller practices. Non-significant explanatory variables included international medical graduate (IMG) status, availability for on-call work and proximity to the coast and to private schools (not shown).

Discussion

This study provides valuable new evidence of the statistical significance, strength and importance of associations between specific demographic, geographic, practice setting and GP workload factors and the retention patterns of rural and remote GPs. A real strength of the study is that consistent results were obtained across two comparable but different datasets, demonstrating that the most important factors associated with GP retention at a specific practice location, having adjusted for the effects of GP age, are business structure, income source, registrar status, hospital work and restrictions on practice location. The remaining variables, including geographic location, procedural skills, annual leave, total hours worked and practice size, whilst statistically significant, collectively explain only a small additional proportion of the variance in retention of rural and remote GPs and are thus less important. The evidence supporting the significance of gender and GP availability for on-call work was mixed, whilst IMG status, practice type and proximity to the coast or to private schools were not significantly associated with GP retention after adjustment for other factors. Despite the complexity of the medical workforce retention problem (World Health Organization 2009) our models were able to explain up to 49% of the variance in GP retention.

Several limitations of this study are acknowledged. First, the choice of variables studied was restricted to those available in each dataset. The selection of variables for initial inclusion was, however, informed by the extant literature. Whilst there are few quantitative studies of Australian rural and remote GP actual retention behaviours, an important study by Kamien (1998) found that the ability to resolve issues such as overwork was associated with longer retention (staying). Since administrative databases do not collect information such as GP perceptions of overwork, in our modelling proxies for the concept of perceptions of overwork included total hours worked per week, on-call availability and hours worked in general practice. Similarly, in our work, the variable representing the possession of procedural skills (in obstetrics, anaesthetics and surgery) was a proxy for the concept Kamien identified as 'forced deskilling'.

A second methodological limitation relates to the use of cross-sectional data, which results in censoring of the outcome measure and an inability to attribute causality. Third, the inclusion of demographic variables (such as age) within the model increases its ability to predict retention; however, these associations do not indicate the underlying reasons why and how, for example, a younger age might be associated with reduced retention. Explaining such relationships requires further investigation. Fourth, both datasets were to some degree limited by missing data for some variables of interest. Last, the outcome variable showed some evidence of response bias, with missing values in the NMDS dataset being associated with slightly shorter periods of current employment. In the case of the MABEL data, detailed investigation showed that there was no serious response bias with respect to age, gender, geographic location and hours worked despite the overall low (18%) response rate of GPs (Joyce *et al.* 2010).

Despite these limitations the findings of our study reinforce the existing body of health workforce literature showing that the retention of GPs is complex, with multiple factors including financial and economic, professional and organisational, and social and external factors contributing to their retention (Hays *et al*. 1997; Kamien 1998; Humphreys *et al.* 2002; Buykx *et al.* 2010). Importantly, in addition, this study has been able to disentangle some of these factors and provide important additional quantitative insights into the retention of rural GPs. It identifies business ownership as having an important association with the retention of GPs (72% longer retention than average). It has also quantified the generally shorter retention of GPs working with restrictions on their practice location (52% shorter retention than those GPs with no restrictions). This is not surprising given the likelihood of either recent graduation (bonded students) or relatively recent arrival in Australia (visa restrictions). IMG status *per se* was not significantly associated with shorter retention. These observations are highly relevant for future rural workforce planning, particularly given the crucial role that overseas trained doctors have in contributing to Australia's rural and remote GP workforce, but also because of the changing demography of the GP workforce, with 'Generation Y' becoming a larger component of the workforce, yet whose members are less inclined to consider practice ownership.

Further quantitative research on the underlying contributors to GP workforce retention could be enhanced by the inclusion of additional factors influencing rural and remote workforce mobility in future health workforce surveys. Ideally such factors would be supported by an existing evidence base, be amenable to measurement and able to be influenced by management policy (such as remuneration, availability of suitable housing, paid locum relief, work culture and perceptions of work−life balance). Such information may facilitate the further 'unpacking' of factors that have been demonstrated to be important for Australian rural and remote GP retention.

This study stands apart from the vast extant Australian literature on medical workforce supply as the only study of its kind that has sought to quantify the significance, strength and relative contribution of factors associated with the actual retention of Australian rural and remote GPs. Evidence that places a metric on each of the factors associated with health worker retention and evaluates their relative importance provides valuable insight that can assist health workforce policy makers in how to target and 'bundle' retention incentives and strategies more effectively, and thereby optimise health worker length of employment.

Conflicts of interest

None declared.

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6.1.1 Summary of findings and implications of Russell et al. 2012 paper

The approach taken in this paper, whereby two different datasets underwent analysis in parallel, enabled the associations found in one analysis to be compared with and validated by the associations found in the other analysis. Importantly, one of these datasets, derived from the RWA National Minimum Data Set for 2008, was not just a sample of rural and remote Australian GPs, but an entire population of all 4,223 GPs providing rural and remote (RRMA 4 to 7) PHC services to all Australian states (except South Australia). The separate, but parallel analyses also enabled the investigation of associations of retention with additional variables found only in one of the datasets.

Whilst the cross-sectional data and the linear regression method limit the ability to attribute causality, the findings of associations between each of the factors and retention are nevertheless of great interest to policymakers. This methodological approach has the advantage of being able to measure the extent to which each variable explains the variance in GP length of stay in the current positions. This study found that the most important factors – that is, those explaining the largest proportion of variance in rural or remote GP retention – are business structure (working as a principal, associate, salaried employee etc.) or income source (fee-for-service remuneration, government salaried, ACCHS salaried, other source of salary), registrar status, hospital work and regulatory restrictions on practice location.

The most important variables associated with GP retention are therefore related to financial and economic, professional and organisational, and educational and regulatory categories of retention factors. A number of additional professional and organisational factors were less important, but still statistically significantly associated with GP retention. This study confirmed that geographical location is a significant predictor of GP retention, but overall it was less important than the aforementioned financial, professional and regulatory factors.

The findings of this paper have substantial implications for the development of local, regional, jurisdictional and national GP retention strategies, and for future GP supply in rural and remote Australia. These implications will be discussed more fully in Chapter 8, where they are integrated with the findings from other research papers of this thesis. Importantly, whilst the factors identified in this study as being of most importance fall into the financial and economic, professional and organisational and educational and regulatory categories of retention factors, factors in these categories have also been identified as being more modifiable or responsive to policy interventions compared with personal and family factors and community and location factors (see Figure 3.1, Chapter 3) (Humphreys et al., 2009).

The findings of this research not only have substantial implications for rural and remote workforce policy-making, but also contribute to informing the research undertaken in the following paper, which also relates to the retention of Australian GPs.

6.2 Background to Russell et al. 2013 paper

The second published paper in this chapter, titled "*The Value of Survival Analyses for Evidence-based Rural Medical Workforce Planning*" (Russell, Humphreys, McGrail, et al., 2013) reports on an analysis of longitudinal data on GPs. For this paper, data were accessible at a jurisdictional rather than national level (NSW rural and remote GPs, excluding GP Registrars). These data were similarly collected by a RWA (NSW Rural Doctors Network) and therefore comprise the entire population of 2,783 GPs providing (non-locum) PHC within NSW over the 10 year period between 2003 and 2012. As such, there will be some overlap with the population of GPs captured by the 2008 national 'snapshot' of Australian rural and remote GPs drawn from the RWA 2008 National Minimum Data Set. Some of the variables available for analysis are also similar to those available for the previous cross-sectional analyses.

Whilst the focus of the published paper was on the metrics derived from survival analysis, preliminary data analyses included the calculation of annual turnover (separation) rates and stability rates. Calculation of turnover rates revealed some clear patterns in GP turnover. Figure 6.1 indicates, for example, that younger GPs born on or after 1970 have a higher annual turnover rate from rural and remote NSW communities compared with older GPs.

Figure 6.1 Annual turnover rate of NSW GPs by birth year

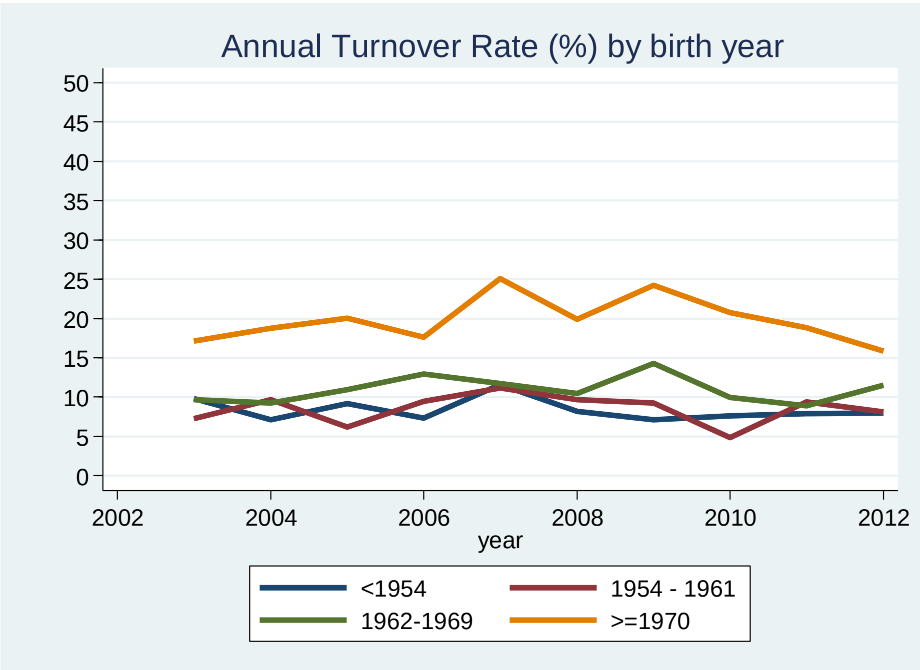
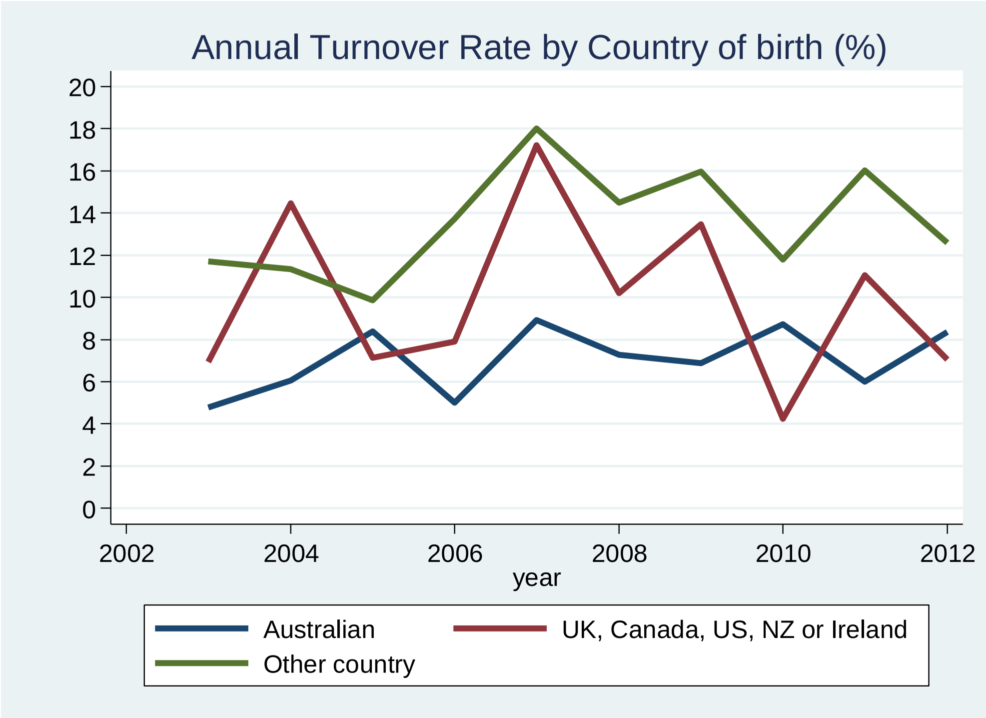


Figure 6.2 Annual turnover rate by country of birth of GP

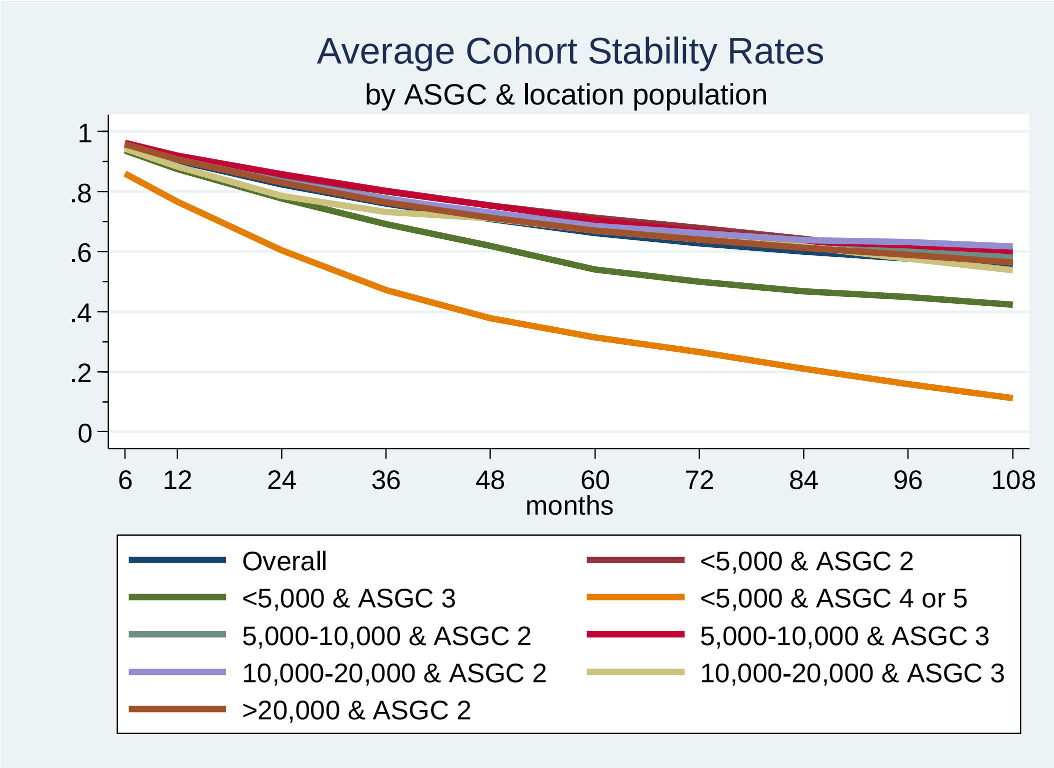


Other patterns of turnover, however, were less clear-cut and more difficult to interpret. For example amongst GPs born in Australia the annual turnover rate was approximately 5 to 8% whilst for GPs born in 'Other' countries, annual turnover rates were generally higher, varying between 10% and 18%, as shown in Figure 6.2. Whilst these figures are useful as an indication to workforce planners that the risk of leaving is higher for GPs born in 'Other' countries, it is difficult to be certain of the extent to which this is true based on these data alone.

Similarly stability rates were calculated and average (mean) stability rates graphed, as shown in Figure 6.3. By averaging the stability rates for multiple cohorts (new cohorts of PHC workers were defined at the commencement of each calendar year), it was possible to increase the amount of data included in the analysis and to reduce some of the variation in stability rates that may occur between different cohorts. This enables patterns in the data to be more readily apparent.

In the example shown, variation in stability was investigated according to geographical location and population size. As can be seen, stability rates are considerably lower for GPs working in small communities (population size<5,000) in remote and very remote NSW, and slightly lower for GPs working in small communities (population size<5,000) in outer regional NSW compared to the stability rates for GPs working in other locations.

Figure 6.3 Average cohort stability rates by ASGC-RA and population size



These stability rate calculations do not, however, make any adjustments for GP length of stay in a community. We do not know, for example, whether it is newly commenced or very experienced GPs who are leaving. Additionally, information is lost for those GPs who commence in a position after a cohort has been formed, and leave before a new cohort is defined. Our main analysis, therefore, focussed on the metrics derived from survival analysis, as survival analysis overcomes these methodological shortcomings.

As the title "*The Value of Survival Analysis for Evidence-based Rural Medical Workforce Planning*" indicates, this published paper highlights the usefulness of survival analysis and Cox Proportional Hazards modelling for providing an empirically derived evidence-base to inform rural and remote PHC workforce planning and policy-making. Analysis of NSW rural and remote GP workforce data is undertaken to illustrate the different forms that evidence can take to inform policy-making in this area. For example, the usefulness of survival curves is illustrated by comparing the differences in rural and remote NSW GP retention according to geographical location and population size. When data are presented using an easy to understand graphical summary of complex employment commencement and exit data, it is far easier to identify differences in retention patterns between groups. A Cox proportional hazards model of the risk factors for rural GPs leaving employment within a rural or remote community is presented as a means of comparing the magnitude and significance of differences between groups of GPs, whilst adjusting for the influence of multiple factors. Further, the statistical modelling is demonstrated as a method for estimating future retention of GPs, showing how variation in factors found to be significantly associated with retention can play out in terms of the predicted median number of years that GPs will stay (within a rural or remote community in the example provided).

This paper also demonstrates the use of a method, the Prentice, Williams and Peterson model (Prentice, Williams, & Peterson, 1981), for maximising the use of data on PHC workers who have repeated stints in a rural community, region etc. This is a methodological advance on studies in the existing rural and remote PHC workforce retention literature which mostly use data from just the first stint and disregard all subsequent stints, thus losing potentially valuable information. These patterns of repeated stints of employment are often important for providing PHC to rural and remote health populations, with many rural and remote health services re-employing previous staff who may have left for reasons including stress management, maternity leave or professional development, only to later return for a further stint of employment – a phenomenon reported elsewhere as 'orbiting' staff (Wakerman et al., 2012).

Monash University

Declaration by candidate regarding publication 3

Russell, D.J., Humphreys, J.S., McGrail, M.R., Cameron, W.I., and Williams, P.J., *The value of survival analyses for evidence-based rural medical workforce planning.* Human Resources for Health, 2013. **11**: p. 65

In the case of publication 3, appearing in Chapter 6, the nature and extent of my contribution to the work was the following:

Nature of contribution	Extent of contribution (%)
Substantial contribution to conception and design of the study, data acquisition, data analyses, drafting and re-drafting of the manuscript and final approval of the version to be published	75

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms is stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Emeritus Professor John Humphreys	Substantial contribution to conception and design of study, data acquisition and critical revision of drafts	n/a
Dr Matthew McGrail	Substantial contribution to data analysis and critical revision of drafts	n/a
Dr Ian Cameron	Substantial contribution to data acquisition and critical revision of drafts	n/a
Mr Peter Williams	Substantial contribution to data acquisition and critical revision of drafts	n/a

Candidate's Signature	[redacted]	**Date** 21/2/2014
Main Supervisor's Signature	[redacted]	**Date** 21/2/2014

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The value of survival analyses for evidence-based rural medical workforce planning

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Abstract

Background: Globally, abundant opportunities exist for policymakers to improve the accessibility of rural and remote populations to primary health care through improving workforce retention. This paper aims to identify and quantify the most important factors associated with rural and remote Australian family physician turnover, and to demonstrate how evidence generated by survival analysis of health workforce data can inform rural workforce policy making.

Methods: A secondary analysis of longitudinal data collected by the New South Wales (NSW) Rural Doctors Network for all family physicians working in rural or remote NSW between January 1st 2003 and December 31st 2012 was performed. The Prentice, Williams and Peterson statistical model for survival analysis was used to identify and quantify risk factors for rural NSW family physician turnover.

Results: Multivariate modelling revealed a higher (2.65-fold) risk of family physician turnover in small, remote locations compared to that in small closely settled locations. Family physicians who graduated from countries other than Australia, United Kingdom, United States of America, New Zealand, Ireland, and Canada also had a higher (1.45-fold) risk of turnover compared to Australian trained family physicians. This was after adjusting for the effects of conditional registration. Procedural skills and public hospital admitting rights were associated with a lower risk of turnover. These risks translate to a predicted median survival of 11 years for Australian-trained family physician non-proceduralists with hospital admitting rights working in small coastal closely settled locations compared to 3 years for family physicians in remote locations.

Conclusions: This study provides rigorous empirical evidence of the strong association between population size and geographical location and the retention of family physicians in rural and remote NSW. This has important policy ramifications since retention grants for rural and remote family physicians in Australia are currently based on a geographical 'remoteness' classification rather than population size. In addition, this study demonstrates how survival analysis assists health workforce planning, such as through generating evidence to assist in benchmarking 'reasonable' lengths of practice in different geographic settings that might guide service obligation requirements.

Keywords: Australia, Cohort studies, Family physician, Family practice, General practitioner, Health manpower, Health policy, Health workforce, Personnel turnover, Policy making, Primary health care, Retention

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Background

Health workforce undersupply in rural areas is a persistent global problem, which contributes to inequitable health outcomes for rural populations in high-, middle-, and low-income countries alike [1-3]. Rural health workforce supply reflects the balance between current stocks and subsequent inflows (recruitment) and outflows (turnover) of workers. Considerable research has been undertaken into the complex range of issues that influence health workers' decisions to take up, stay in, and leave rural practice (including economic, professional, personal, and community factors) [4-7].

Unfortunately, however, substantial gaps remain in our knowledge of the flows of health workers into and out of rural areas. Much of the existing research has focussed on health worker's job satisfaction or intentions to leave rural practice, rather than on actual observed behaviour, though within the Australian rural context there are several exemplary studies [7,8]. Little is known, for example, about what length of stay might reasonably be predicted for a family physician practising in rural or remote locations [9]. This lack of empirical data on health worker flows and behaviours continues to hinder rural health workforce planning and decision making [10-12].

The research reported in this paper is designed to add to the existing evidence-base. The research aims first to identify and quantify the most important factors associated with the risk of rural and remote Australian family physicians leaving a practice, and secondly, to demonstrate the value of evidence generated by rigorous survival analysis of longitudinal health workforce data to inform rural health workforce planning and retention strategies. Although this paper examines the retention of family physicians within a single jurisdiction in one high-income country, there are important parallels with other similar geographically large developed countries, including Canada, United States of America, and Germany, and the analytical method demonstrated is one that can readily be adapted to a range of settings.

Improving our knowledge of what constitutes effective workforce retention strategies is dependent on several pre-requisites. In the first instance, it is important to understand what the most appropriate metrics are for measuring rural health worker turnover and retention. A second critical requirement for strengthening the evidence base is the availability of appropriate data and sufficient capacity to analyse and report selected indicators. Thirdly, the ability to make valid comparisons between different groups, and quantify differences in workforce retention is important for policy, as it assists targeting policy to specific groups of interest more effectively. A final requirement is familiarity with the types of interventions that might be used to improve retention, together with knowledge of their effectiveness and how much they might cost [13,14]. Within Australia, key current rural workforce strategies include the scaling of retention incentives according to location (based essentially on the degree of geographical remoteness) and restricting provider access to Medicare (the Australian universal health insurance scheme) for international doctors to designated 'districts of workforce shortage' and 'areas of need' [15]. However, despite the significant financial commitment to such programs, little is known about their effectiveness or their impact on patterns of turnover and retention. This paper seeks to show how empirically derived evidence can assist to inform policy development in this area.

Methods

A recent review of the utility of different metrics for measuring health workforce turnover and retention in rural and remote contexts indicates that metrics derived using survival analysis methods have significant strengths to inform health workforce planning [16]. Survival analysis measures the time until an event occurs. In the case of this health workforce turnover and retention study, the event of interest is the time between take-up of a position until a health worker leaves that appointment. Hence, the data required include accurate commencement and exit dates for individual practitioners working in rural areas.

Data

Despite the abundance of Australian medical workforce survey data collected over recent decades, health workforce planning and research is still handicapped by a lack of access to good national data at an individual practitioner level. For this study, rural and remote medical workforce data were available for the most populous Australian state, New South Wales (NSW). For more than ten years, longitudinal data have been collected by the NSW Rural Doctors Network (NSW RDN), a state and federally funded rural workforce agency established in 1998 to respond to workforce recruitment and retention issues facing rural family physicians in NSW. In Australia, family physicians are more commonly termed 'general practitioners' (GPs). Data are collected annually by the NSW RDN through a GP workforce and skills survey of GPs for the express purpose of rural workforce planning. These survey data are supplemented from other sources, including biannual practice manager surveys and the Australian Health Practitioner Regulation Agency register of physicians. Many of the data items are mandated as part of the National Minimum Data Set for rural health workforce agencies, which specifies core questions that have been developed and standardised across Australia's states and territories [17].

Individual-level de-identified data were extracted for all family physicians who worked in non-metropolitan geographical locations in NSW at any time between January 1st 2003 and December 31st 2012. These include all inner regional, outer regional, remote, and very remote locations as defined by the Australian Standard Geographical Classification – Remoteness Areas (ASGC-RA) (Figure 1). The ASGC-RA classifies all of Australia based upon the road distance to the nearest city or town in each of five classes based on population size [18]. Data on community population sizes were obtained from the Australian Bureau of Statistics 2011 Census Urban Centres and Localities structure.

Statistical analysis

The Kaplan-Meier method of survival analysis was used to analyse the data [19]. This technique enables employment data for all family physicians who have worked in rural NSW during the period of interest to be included in analysis. This is irrespective of whether or not they were practising in rural areas at the beginning of the study, or whether they were still providing primary care to rural NSW populations at the end of the study.

Each family physician could potentially have multiple 'appointments' over the 10-year period of the study. A new 'appointment' was defined each time a family physician moved their main practice location a distance of more than 15 km or had a break in continuous service provision of more than 3 months. A 'failure' event was defined as a family physician leaving an appointment whilst a 'censored' event was defined as a family physician remaining in an appointment at the end of the study observation period. Hence, another way of viewing a 'failure' is as a break in the provision of continuous care within a community. This was selected because relational continuity is known to be central to the development of trust and improved communication between doctors and their patients and to the securing of optimal health outcomes in the community [20]. Periods at risk were defined in days for each person.

Multiple 'failures' per family physician during the time period in question were permitted (though only one appointment could be held at a time), so the conditional risk set model proposed by Prentice, Williams and Peterson was used for modelling time until appointments ended [21]. This is an extension of the Cox proportional hazards model that stratifies by failure order and adjusts for violating the assumption of independence of failure times. The data were left truncated [22]; this meant that family physicians who already held an appointment at the start of the study were deemed to be 'at risk' of leaving that appointment only after January 1st 2003. Main outcome measures were Cox proportional hazards ratios (comparative risk of one group of family physicians leaving an appointment compared to another group) and predicted median survival (the time in years, predicted by modelling, from commencing of appointments until half the workforce had left).

Family physician vocational trainees (or registrars) were excluded from analysis, as were family physicians

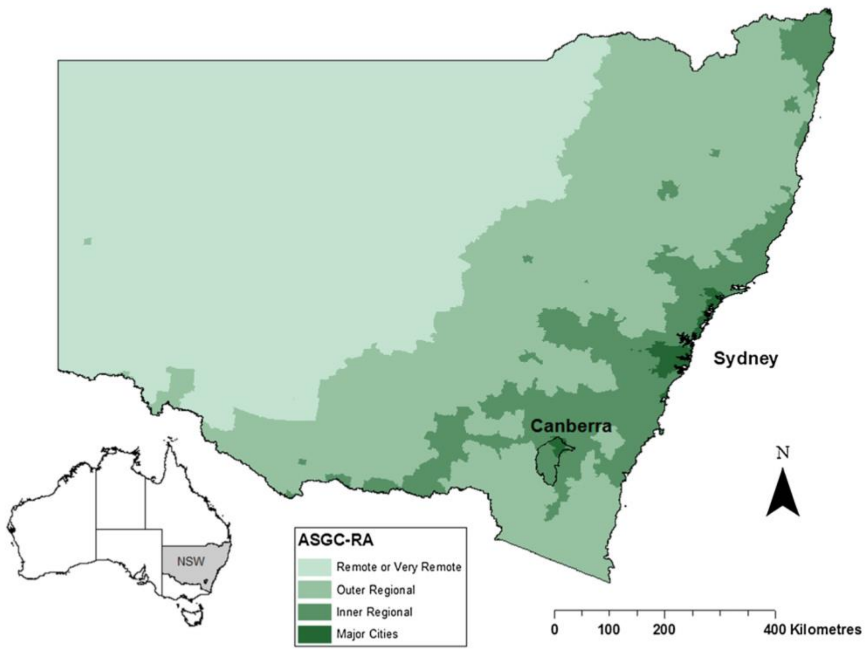

Figure 1 Map of the Australian standard geographical classification – remoteness areas for New South Wales, Australia.

in offshore locations (Lord Howe and Norfolk Islands), family physicians working in border towns located outside of NSW, and family physicians acting as *locum tenens*. Univariate analyses were initially undertaken and only independent variables with a P value less than 0.25 were tested in subsequent multivariate analyses. A step-wise elimination procedure was undertaken to derive the most parsimonious model, using a P value of 0.05 as the basis for elimination. In order to minimise listwise deletion occurring as a result of missing data, variables with 20% or more missing data were excluded from multivariate analysis.

Non-metropolitan communities were grouped by population size and geographical location guided by previous research which shows significant differentiation between them based on an association between family physician workload and town population size and geographical location [23,24]. Locations greater than 25 km from the coast were deemed to be inland.

Calculations were performed using StataIC, release 11.2 (StataCorp, College Station, TX, USA). Straight-line distances were calculated using ArcGIS 9.2 (ESRI, Redlands, CA, USA).

Ethics approval

Ethics approval was received from the Monash University Human Research Ethics Committee (Ref. CF12/3902 – 2012001863).

Results

Between January 1st 2003 and December 31st 2012 there were 3,354 family physician appointments in rural and remote NSW, representing 2,783 individual family physicians (83% of appointments were first rural appointments for that physician, 13% were second appointments, 3% were third appointments, and less than 1% were fourth or subsequent appointments). Over the 10-year period of this study, a total of 14,992 family physician-years of observation time were analysed, and 1,646 (49%) appointments ended – that is, on 49% of all occasions the doctor moved a distance greater than 15 km, or left the practice for a period of at least three months to undertake other activities. Of the 2,783 rural family physicians, 1,864 (67%) were male and 1,533 (55%) were known to be Australian graduates (Table 1).

Of the 3,354 family physician appointments in rural and remote NSW, 2,237 (67%) were known to be held by family physicians who were not undertaking procedural activities in any of anaesthetics, obstetrics, or operative surgery; 492 appointments (15%) were known to be associated with 'conditional' registration of the family physician (conditional registration in its various forms enables overseas trained doctors who are yet to gain Australian Medical Council accreditation to work in supervised practice in designated 'districts of workforce shortage' and 'areas of need' [15,25]); and 1,741 (52%) were known to be associated with the family physician having Visiting Medical Officer (VMO) rights (rights to provide medical services in a public hospital) (Table 2).

Table 1 Characteristics of all family physicians who worked in rural NSW between 2003 and 2012

Variable	Category	Frequency	Percent
Gender	Male	1,864	67.0
	Female	919	33.0
Country of primary medical degree	Australia	1,533	55.1
	UK, Ireland, Canada, US, NZ	266	9.6
	Other	914	32.8
	Missing	70	2.5
Date of birth	Prior to 1950	463	16.6
	1950–1954	311	11.2
	1955–1959	396	14.2
	1960–1964	381	13.7
	1965–1969	386	13.9
	1970–1974	289	10.4
	During or after 1975	214	7.7
	Missing	343	12.3
Age at graduation	25 or younger	1,523	54.7
	Between 25 and 30	596	21.4
	30 or older	250	9.0
	Missing	414	14.9
	Total of each variable	2,783	100.0

Univariate analyses revealed significant ($\alpha = 0.05$) differences in the risk of family physicians leaving an appointment according to geographic location and population size, birth year, country in which the family physician obtained their medical degree, procedural skills, registration status, age at graduation, spousal rural location prior to the family physician's first rural posting, and VMO rights, though not according to gender. Figure 2 illustrates retention patterns for family physicians working in small towns (population size <5,000) in inner regional, outer regional, and remote/very remote locations. Retention is higher in inner regional small towns compared with outer regional and remote/very remote small towns. Unadjusted estimates of the increased risk of leaving outer regional and remote/very remote small town family practices are 1.50 (1.25, 1.79) and 2.03 (1.61, 2.56) times the risk for inner regional small towns.

Multivariate Cox proportional hazards modelling revealed that family physicians practising in remote/very remote and outer regional towns with fewer than 5,000 inhabitants have a significantly increased risk of leaving town compared with family physicians located in inner

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Table 2 Characteristics of family physician appointments in rural NSW between 2003 and 2012

Variable	Category	Frequency	Percent
Location population and remoteness	<5,000 population size and inner regional	582	17.4
	<5,000 population size and outer regional	433	12.9
	<5,000 population size and remote/very remote	92	2.7
	5,000–15,000 population size and inner regional	611	18.2
	≥5,000 population size and outer regional	277	8.3
	>15,000 population size and inner regional	1,359	40.5
Proceduralists	Yes	579	17.3
	No	2,237	66.7
	Missing	538	16.1
Registration	Full	2,656	79.2
	Conditional (Area of need or Overseas trained family physician)	492	14.7
	Missing	206	6.1
Visiting medical officer	Yes	1,741	51.9
	No	1,158	34.5
	Missing	455	13.6
	Total of each variable	3,354	100.0

regional NSW towns (Table 3). Family physician age was also significantly associated with risk of leaving town: the youngest family physicians (those born in 1970 or later) and the oldest family physicians (those born before 1945 and likely to be approaching retirement age) were at increased risk of leaving compared to family physicians born between 1945 and 1970; the increased risk for these groups was 1.54 and 1.45 times, respectively. Additional factors significantly associated with risk of family physicians leaving town include country of medical school graduation, procedural practice (not practising any of operative surgery, anaesthetics, or normal obstetric deliveries), having VMO rights, and holding conditional medical registration at any time during an appointment. The largest hazard ratio was for family physicians practising in small towns (population size <5,000) in remote/very remote Australia, and was associated with a 2.65 times greater risk of leaving compared to family physicians working in inner regional NSW. Graduating from medical schools in countries other than Australia, UK, Ireland, Canada, US, or New Zealand was associated with a 45% increased risk of leaving compared to the risk for Australian

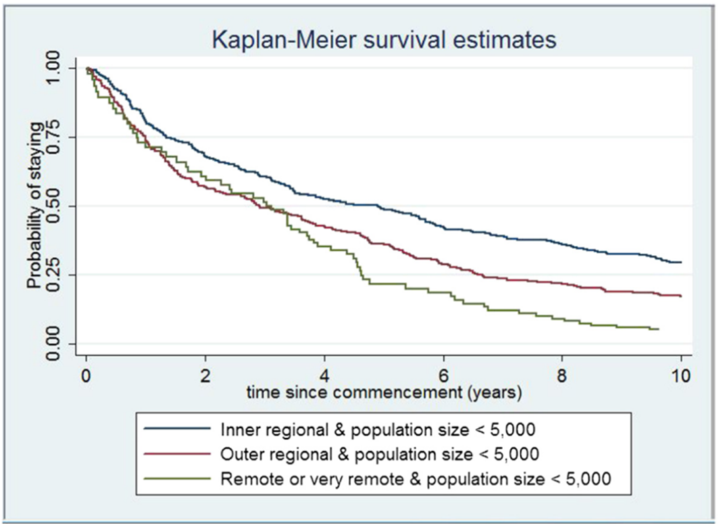

Figure 2 Family physician survival curves by geographic location and population size.

Table 3 Cox proportional hazards model: risk factors for rural family physicians leaving an appointment

Variable	Baseline	Comparators	Hazard ratio	LL 95% CI	UL 95% CI
Population size and remoteness classification	<5,000 and inner regional	<5,000 and outer regional	1.33	1.12	1.57
		<5,000 and remote/very remote	2.65	2.03	3.46
Country of primary medical degree	Australia	'Other' country	1.45	1.26	1.68
Proceduralist	Yes	No	1.42	1.21	1.68
Registration	Conditional	Full	1.49	1.24	1.79
Visiting medical officer rights	Yes	No	1.49	1.30	1.71
Birth year	1945–1970	Pre 1940	1.45	1.13	1.85
		1940–1945	1.36	1.03	1.79
		1970–1975	1.45	1.21	1.75
		After 1975	1.54	1.18	1.99
Coastal location	Yes	No	1.22	1.08	1.39

CI: Confidence interval; LL: Lower limit; UL: Upper limit; n = 2379 appointments after listwise deletion.
'Other' country – countries NOT including Australia, UK, Ireland, Canada, US, or New Zealand.

graduates. Family physician age upon graduation, however, was not significantly associated with turnover risk.

Translating these ratios into predictions of median survival (the length of time until half the workforce has left), revealed, for example, a difference in length of stay of 8.1 years on the basis of geography and population size alone for Australian-trained family physicians with VMO rights and not undertaking procedural activities. Predicted median survival for those working in small towns in coastal inner regional NSW was 11.1 years compared with 3.0 years in small towns in remote/very remote NSW (Table 4).

Discussion

This innovative study breaks new ground in medical workforce research in Australia. For the first time, this study applies rigorous quantitative methods to Australian longitudinal medical workforce data to identify important correlates of the risk of family physicians leaving a rural or remote location. The use of survival (time to event) analysis enables important comparisons to be made on the basis of sentinel variables such as geographical location, population size, age, and professional status, and the statistical significance, magnitude, and direction of associations to be measured and reported. For the purpose of

Table 4 Predicted median survival of rural family physicians based on Cox proportional hazards model

Country of primary medical degree	Workload characteristics	Predicted median survival (years)† Inner regional and population size less than 5,000: Coastal	Inner regional and population size less than 5,000: Inland	Outer regional and population size less than 5,000: Coastal	Outer regional and population size less than 5,000: Inland	Remote and population size less than 5000: Inland
Australia	Proceduralist VMO rights	19.5	14.2	12.6	9.6	4.2
	Non-proceduralist VMO rights	11.1	8.6	7.7	5.9	3.0
	Non-proceduralist No VMO rights	6.6	5.3	4.8	3.9	2.1
'Other' country	Proceduralist VMO rights	10.7	8.4	7.4	5.8	2.9
	Non-proceduralist VMO rights	6.7	5.4	4.9	4.0	2.2
	Non-proceduralist No VMO rights	4.5	3.6	3.4	2.8	1.7

†For fully registered family physicians born between 1945 and 1970; VMO: Visiting Medical Officer.
'Other' country – countries NOT including Australia, UK, Ireland, Canada, US, or New Zealand.

developing effective medical workforce policies and planning, these analyses provide several key insights.

First, our research shows that over the past ten years, the risk of family physicians leaving an appointment is strongly and significantly associated with geographical location and population size. For family physicians working in small towns with a population less than 5,000 a gradient of risk was found, whereby the risk of leaving was lowest in closely-settled coastal locations, intermediate in areas of moderate population density, and highest in the most sparsely-settled locations. For Australian trained family physicians who are non-procedural and have VMO rights, these findings translate into a predicted length of service of 11 years in small coastal towns in closely-settled locations. This compares with 6 years for family physicians in small inland towns with moderate population density and 3 years for family physicians in small inland towns in sparsely settled locations. Periods of service less than this might be interpreted as indicating 'premature' or 'avoidable' turnovers, and health authorities and workforce planning agencies could monitor any 'hot spot' locations to see whether any specific additional interventions are required in order to extend the length of practice of family physicians.

This significant differentiation in the risk of leaving is not surprising given the demonstration by Humphreys et al. of significant associations between professional indicators known to be related to family physician retention and geographical location and population size [23]. The extent to which shorter retention in small, more sparsely settled locations is 'optimal' (that is, all that might be expected in these locations) or 'sub-optimal' (that is, illustrates premature or avoidable turnover that could be adjusted through workforce incentives or interventions), remains a moot point. It is nevertheless important to interpret these observations in the context of substantial and increasing spending by the Australian federal government on direct financial incentives paid over this period to rural and remote family physicians in an attempt to improve retention. In particular, given that the Australian government is 'scaling' incentives according to geographical remoteness, these results provide, for the first time, empirical evidence to guide such differentiation in the allocation of retention incentives [25].

In Australia, expenditure on specific rural family physician workforce incentives has escalated almost six-fold from $19.9 million over the eight year period between 2004–2005 and 2012–2013 [25,26]. Whilst these incentives are scaled according to remoteness, community population size is not taken into account. In the absence of any definitive evidence about the effectiveness of medical workforce retention grants, our findings suggest that existing workforce retention interventions are insufficiently effective to ensure equality of continuity of family physician care for residents of remote and very remote areas. Given that numbers are small (92 appointments or less than 3% of total appointments) in remote and very remote NSW, opportunities exist to significantly strengthen retention strategies for this group of family physicians without necessarily having a large impact on the overall program budget. Improved targeting of retention strategies to family physicians in sparsely settled locations is especially pertinent given the recent finding that the major growth in family physician rural retention payments since 2010 has been in closely-settled areas, where retention is already relatively high [25].

In addition, the evidence generated by our study may help guide the relative lengths of service that might be required in the form of 'return of service obligation' for medical practitioners mandated or bonded to work in non-metropolitan areas. A range of Australian government programs currently scale return of service obligations, once again only according to geographic remoteness (ASGC-RA), but not on the basis of any empirical evidence. For example, the scaling ratio for reducing return of service obligations for the Medical Rural Bonded Scholarship Scheme is inner regional 1.0: outer regional 1.3: remote 1.5: very remote 1.8. Our work suggests that population size should also be taken into account and that the ratios for remote and very remote locations compared to inner regional locations could be higher.

A further important finding is that graduates from medical schools in countries without an Australian Medical Council-designated competent authority (countries other than Australia, UK, Canada, US, New Zealand and Ireland, which we term 'other' countries) had a substantially (1.45 times) increased risk of leaving a family physician appointment in rural NSW compared with Australian graduates. In terms of predicted median length of stay, this translates to Australian trained graduates staying for almost a year longer in small remote towns and for almost 2 years longer in small inland towns in regions of moderate population density. These differences are after the modelling adjusts for the lower risk of leaving an appointment for family physicians with conditional registration. Our findings are consistent with existing evidence that physicians obliged to work in a location not of their choosing are at increased risk of leaving that location in the longer term compared to non-obliged physicians [5,14]. These findings are particularly important for rural and remote workforce policy development since such a large proportion (33%) of family physicians in rural and remote NSW during the past 10 years are graduates of 'other' medical schools. Indeed, in 2009–2010 almost 50% of all family physicians in rural and remote Australia were international medical graduates [25]. Given this heavy reliance on internationally trained family physicians, it becomes critical to identify the root causes of their high turnover and address them as a matter of urgency. Recent work by McGrail et al. indicates a much higher relative dissatisfaction of overseas-trained family physicians (especially those with restrictions on where they can practise) compared with local graduates [27]. Their study also pinpoints various professional and non-professional aspects associated with dissatisfaction, some of which may be responsive to policy intervention.

Finally, our research has identified VMO status and procedural activities in the area of obstetrics, anaesthetics, and operative surgery as important correlates of reduced risk of family physician turnover, consistent with previous cross-sectional analyses [7]. Not only are these professional activities likely to be associated with a higher overall income, but also with a greater sense of autonomy, a wider variety of work, increased opportunities to use an extended skill set, and a heightened sense of responsibility. In other words, VMO status and procedural activity are associated with important indicators of family physician professional satisfaction [28], which may in turn be associated with reduced turnover. These findings have important implications for future investment in rural training pathways that develop advanced skills needed for rural and remote hospital work, as for instance with the successful generalist model being promoted in Queensland, Australia [25]. Furthermore, provision and maintenance of infrastructure to foster hospital-based activities of rural and remote family physicians is also important because of its association with relatively higher family physician retention.

A number of limitations of this study are acknowledged. First, despite family physician vocational trainees making a substantial and important contribution to the rural and remote workforce in NSW, they were excluded from analysis since the factors driving their relocation decisions are likely to be different from those of family physicians and because their training program often requires rotations at various times regardless of their satisfaction with any practice location. Second, some variables of interest were not included in the final multivariate model because of the extent of missing data. These included rural origin of spouse and recipient status for some specific rural scholarships. Some variables of current policy relevance, such as Medical Rural Bonded Scholarships, also had insufficient numbers of recipients to permit reliable estimation of the effect. This is due to the long lag time between receipt of financial support and commencement of rural or remote practice as a family physician. Third, the retention profile used in this study coded a 'failure' as a location move of more than 15 km or break in service provision of more than 3 months [29], in recognition of the importance of continuity of care as a key dimension of primary health care [30]. While realistic and relevant for our research in non-metropolitan Australia, this retention profile may not be appropriate for all workforce-planning purposes. Pathman's pioneering work on physician retention described how physicians may variously be considered as being successfully retained when they stay with an initial practice, when they stay within the initial community, when they stay within any rural location within the jurisdiction, or even when they remain actively practising clinical medicine [29]. Indeed, a strength of survival analysis is that it can successfully be applied to each of these different policy problems simply by coding a 'failure' in different ways – for example, as leaving a particular ASGC-RA, or as leaving rural NSW or even as leaving the medical profession – depending on the availability of requisite data and the particular policy question being asked.

Conclusions

This study highlights how survival analyses can be used to generate rigorous evidence to inform policy development in the area of health workforce planning, particularly, for example, in the strengthening and improved targeting of retention strategies in rural and remote areas. In this instance, survival analyses identified strong associations between geographical location and population size, country of primary medical degree, procedural activity, and VMO status, and the risk of NSW rural and remote family physicians leaving a community. Such quantitative empirical evidence establishes a better baseline against which to monitor the effectiveness of workforce strategies and guide workforce planning.

Importantly, the value of these analyses is their potential application across a wide range of countries, most notably high-income developed nations where workforce patterns and problems are not dissimilar to Australia. It is worth pointing out, however, that developing countries and even some rural and remote areas within developed countries may not have sufficiently supported human resource capacity to collect the required high quality data and undertake appropriate analyses without assistance from the regional offices of the health authorities responsible for human resource planning. The value of survival analyses is also applicable across a range of different health worker professions since both data collection and the method itself can be tailored to specific contexts. Development of empirical evidence in this way provides a far better basis than *ad hoc* cross-sectional turnover studies or anecdotal information to guide the development and evaluation of sound and comprehensive workforce retention strategies.

Abbreviations

ASGC, RA: Australian standard geographical classification – remoteness areas; GP: General practitioner; NSW: New South Wales; RDN: Rural doctors Network; VMO: Visiting medical officer.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
DR and JH conceived and designed the study. IC and PW were responsible for the acquisition of data. DR, JH, and MMcG were involved in analysis and interpretation of the data. All authors were involved in drafting and critical revision of the manuscript. All authors read and approved the final manuscript.

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6.2.1 Summary of findings and implications of Russell et al. 2013 paper

This paper reports important empirical evidence confirming a significant and large effect of geographical location and community population size on the risk that rural and remote NSW GPs leave their community. Proximity to the coast is shown to be an additional significant geographical locational factor associated with GP retention. The findings are of fundamental importance to current Australian Commonwealth Government policy-making, particularly because they inform how rural and remote GP retention incentives could be better distributed.

The paper additionally highlights the increased risk of leaving rural and remote communities for GPs who have gained their primary medical degrees outside of Australia. As IMGs form such a large proportion of the Australian rural and remote GP workforce these, too, are important findings that warrant policy attention. Similarly, the finding that procedural skills and having public hospital admitting rights are associated with a lower risk of leaving, has policy implications related to the provision of generalist training pathways and up-skilling opportunities for rural and remote practitioners, and to the funding of hospital infrastructure in rural and remote Australia.

These specific empirical findings aside, this research also has substantial implications for the methods of research used when undertaking PHC workforce retention analyses. This paper demonstrates the usefulness of survival analysis and a survival analysis regression analogue, Cox proportional hazards models, for strengthening the existing evidence-base to inform workforce planning and policy-making in the context of improving the supply of the rural and remote PHC workforce.

The important empirical evidence presented in this chapter is complemented by the additional empirical evidence presented in the next chapter. Whilst this chapter has provided empirical evidence about the retention of rural and remote GPs in Australia, Chapter 7 provides two further published papers about the retention of non-GP PHC workers. In these two papers, new empirical evidence on the actual turnover and retention of Australian rural and remote nurses, AHPs and AHWs is proffered.

Chapter 7: Patterns of retention amongst rural and remote nurses and allied health professionals

This chapter shifts the focus of inquiry from investigating the factors associated with the retention of rural Australian GPs, as reported in the previous chapter, to investigating factors associated with the retention of other types of rural Australian PHC workers. The two papers presented in this chapter are of great significance given the paucity of quantitative studies investigating the actual rural retention of PHC workers in professions other than the medical profession. These two papers use quantitative methods to address the substantial evidence gaps identified in Chapter 3 regarding the factors associated with the retention of rural and remote non-physician PHC workers. As was the case for the papers presented in Chapter 6, the two papers in this chapter measure the magnitude, statistical significance and strength of association between a range of factors and actual PHC worker retention. These papers therefore address research question 3 of this thesis: What is the magnitude, direction of association and relative importance of factors associated with rural and remote primary health care workforce turnover and retention?

Both papers in this chapter additionally address research question 2 of this thesis: What does use of these metrics reveal about patterns of turnover and retention amongst the rural and remote Australian primary health care workforce, including any variation according to profession and geographic location? Importantly, both papers analyse primary data collected on Australian PHC workers from more than one profession, thus allowing comparisons of retention to be made across professions. The first paper investigates the factors associated with the retention of Victorian AHPs. AHP groups compared are dietitians, occupational therapists, physiotherapists, podiatrists, psychologists, social workers and speech pathologists. The second paper compares the retention of rural and remote Australian GPs, nurses, AHPs, AHWs, and health service managers. Both papers also investigate the role of geographical location as a determinant of turnover and retention of rural and remote PHC workers.

The second paper in this chapter additionally addresses research question 4: What are appropriate benchmarks, for reasonable length of stay for the rural and remote Australian primary health care workforce, that take account of differences according to profession and geographical location? Meeting this objective required the synthesis of different types of data from different sources. The three strategies employed comprised a comprehensive literature review of PHC workforce performance indicators and benchmarks, the acquisition and analysis of existing secondary PHC workforce data from Australian State and Territory health authorities and RWAs, and the acquisition and analysis of primary workforce data collected via a survey of 108 rural and remote Australian health services located throughout RRMAs 5-7.

7.1 Background to Chisholm et al. 2011 paper

The first published paper in this chapter, titled "*Measuring Rural Allied Health Workforce Turnover and Retention: What are the Patterns, Determinants and Costs?"* (Chisholm et al., 2011), reports on the turnover and retention of Victorian AHPs using the five key metrics outlined in Section 5.2. Importantly, their use as a 'package' demonstrates how each metric can provide policymakers and workforce planners with small pieces of additional, yet complementary information. This research additionally highlights the usefulness to policymakers of the information provided by survival analysis methods. Survival curves, for example, are demonstrated as providing data in an easy to understand graphical format, facilitating the identification of patterns of turnover and retention that might otherwise remain obscure.

The analysis investigates differences in patterns of AHP turnover and retention according to geographical location (regional, rural and remote) and profession (seven different allied health professions). Differences in the risk of AHPs leaving the rural or remote health service according to gender, age category when they commenced employment, and employment grade on commencement were also investigated.

As revealed by the literature review undertaken in Chapter 3, there is almost a complete absence of high quality quantitative studies investigating the factors associated with the actual turnover and retention of AHPs. This is a substantial gap, and given existing and long standing maldistribution of many types of PHC workers in rural and remote areas it is imperative that this knowledge gap is addressed so that effective workforce policies and planning to overcome geographical maldistribution can be evidence-based. In this regard, the first paper is ground breaking. It helps extend our current knowledge base, reducing the need to rely on generalising from what is known about the factors associated with the retention of rural and remote medical PHC providers to AHPs.

This study involved the collection of secondary data, on the tenure of individual AHPs, from 11 rural and remote health service human resources databases, thus using existing, but previously under-utilised resources. Additional data were collected on the costs of replacing AHPs who leave. The tools used to collect these data are included as Appendix 2. In undertaking this study, the authors also sought access to state-wide secondary data on AHPs from the Victorian Department of Health and the State Services Authority. Despite protracted negotiations, access to required individual-level retention data was unsuccessful.

Monash University

Declaration by candidate regarding publication 4

Chisholm, M., **Russell, D.,** and Humphreys, J., *Measuring rural allied health workforce turnover and retention: what are the patterns, determinants and costs?* Australian Journal of Rural Health, 2011. **19**(2): p. 81-8.

In the case of publication 4, appearing in Chapter 7, the nature and extent of my contribution to the work was the following:

Nature of contribution	Extent of contribution (%)
Substantial contribution to data analyses and drafting and re-drafting of the manuscript	40

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Ms Marita Chisholm	Substantial contribution to conception and design of the study, data acquisition, data analyses, drafting and re-drafting of the manuscript and final approval of the version to be published	55
Emeritus Professor John Humphreys	Substantial contribution to conception and design of the study, data acquisition and critical revision of drafts	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work

Candidate's Signature	[redacted]	**Date** 21/2/2014
Main Supervisor's Signature	[redacted]	**Date** 21/2/2014

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Original Article

Measuring rural allied health workforce turnover and retention: What are the patterns, determinants and costs?

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Abstract

Objectives: *To measure variations in patterns of turnover and retention, determinants of turnover, and costs of recruitment of allied health professionals in rural areas.*

Design: *Data were collected on health service characteristics, recruitment costs and de-identified individual-level employment entry and exit data for dietitians, occupational therapists, physiotherapists, podiatrists, psychologists, social workers and speech pathologists employed between 1 January 2004 and 31 December 2009.*

Setting: *Health services providing allied health services within Western Victoria were stratified by geographical location and town size. Eighteen health services were sampled, 11 participated.*

Main outcome measures: *Annual turnover rates, stability rates, median length of stay in current position, survival probabilities, turnover hazards and median costs of recruitment were calculated.*

Results: *Analysis of commencement and exit data from 901 allied health professionals indicated that differences in crude workforce patterns according to geographical location emerge 12 to 24 months after commencement of employment, although the results were not statistically significant. Proportional hazards modelling indicated profession and employee age and grade upon commencement were significant determinants of turnover risk. Costs of replacing allied health workers are high.*

Conclusions: *An opportunity for implementing comprehensive retention strategies exists in the first year of employment in rural and remote settings. Benchmarks to guide workforce retention strategies should take account of differences in patterns of allied health turnover and retention according to geographical location. Monitoring allied health workforce turnover and retention through analysis of routinely collected data to calculate selected indicators provides a stronger evidence base to underpin workforce planning by health services and regional authorities.*

KEY WORDS: *allied health, cost, retention, rural, workforce.*

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Introduction

Allied health professionals (AHPs) are an essential component of the rural health workforce, with demand for their services increasing because of an ageing population, the growing burden of chronic disease and increased emphasis on the delivery of multidisciplinary care. While the patterns of allied health workforce shortage vary among professions and jurisdictions,[1] nowhere are workforce shortages more acute than in rural and remote areas.[2,3] The ratio of AHPs to population falls from 2.66 per 10 000 in capital cities to between 1.41 and 1.81 in regional areas, 1.17 in remote areas and 0.60 in very remote areas[4] as a result of increased difficulties recruiting and retaining AHPs with increasing distance from metropolitan areas.[5] Under-representation of AHPs in non-metropolitan communities limits access to much needed health services which in turn contributes to the poorer health status of rural people.[6]

Given the shortages of AHPs in many non-metropolitan locations, and the concomitant difficulties of recruitment to such areas, the need to minimize avoidable staff turnover and retain existing AHPs in rural areas is increasingly important. Optimizing workforce retention requires a sound understanding of what factors contribute to length of stay, and what issues need to be addressed in order to minimize avoidable turnover.

To date, most Australian research into the recruitment and retention of AHPs has comprised qualitative case studies investigating the personal, organizational and professional reasons why AHPs leave or stay.[5–15] Little

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***What is already known on this subject*:**
- *Many rural and remote communities experience difficulties recruiting and retaining allied health professionals.*
- *A wide range of personal, organizational and professional factors contribute to the decisions of allied health professionals to stay or leave.*
- *Most studies of allied health workforce recruitment and retention have been qualitative case studies.*

***What this study adds*:**
- *Demonstration of a methodology which can be used by health services and authorities to monitor workforce retention using existing human resources data.*
- *Quantitative evidence highlighting differences in crude patterns of workforce turnover and retention of allied health professionals according to geographical location which is useful to developing workforce performance benchmarks.*
- *Identification of the magnitude and significance of profession, grade and age as determinants of allied health turnover together with an indication of the costs associated with recruiting allied health professionals in differing geographical locations.*

high quality quantitative research has been undertaken to measure the patterns, determinants and costs associated with turnover and retention within the allied health workforce. It is this knowledge gap that this study seeks to redress.

Specifically, four important questions are investigated:

1. Does the turnover and retention of AHPs vary according to community size and location?
2. Does rural workforce turnover and retention vary significantly between allied health professions?
3. What are the most significant determinants of allied health workforce turnover?
4. Does the cost of replacing AHPs vary according to rural location?

Methods

Eighteen health services were purposively selected from within three Victorian Health Regions using stratified sampling methods. Services were stratified by distance from Melbourne (<200 km or >200 km) and town population (<5000, 5000–10 000, >10 000) in an attempt to obtain sufficient geographical diversity of health services for this pilot study. Given the need to meet privacy and confidentiality requirements data were analysed in revised categories, specifically remote (>200 km and population <5000), rural (>200 km and population >5000) or regional (<200 km and population >10 000). Sixteen health services initially agreed to participate in the study, but only 11 health services returned the requested data.

Data were collected using a survey which comprised three sections:

1. De-identified individual-level employment entry and exit data and selected personal characteristics data for all dietitians, occupational therapists, physiotherapists, podiatrists, psychologists, social workers and speech pathologists employed at each service at any time during the period 1 January 2004 to 31 December 2009.
2. The overall direct and indirect costs currently associated with recruiting an AHP to the health service. Health services were asked to indicate whether costs were actual or estimated.
3. Health service characteristics, numbers and composition of their allied health workforce, manager's perceptions of workforce retention and factors influencing turnover and retention measures implemented by the health services.

Five indicators, detailed elsewhere, were used to measure workforce retention and turnover.[16]

- *Annual turnover rate* – measuring the proportion of the workforce that left during each calendar year;
- *Stability rates* – measuring the proportion of original employees who remain after 1, 2, 3 and 4 years;
- *Median length of employment in current position* – a summary measurement of length of time that current employees have been employed;
- *Survival probabilities* – the likelihood that employees will remain employed beyond 1, 2, 3 and 4 years after commencement of employment; and
- *Median survival* – the elapsed time since commencement whereby half the workforce have left and half remain employed.

Simple descriptive statistics, arithmetic calculations, Kaplan–Meier survival analysis and proportional hazards regression modelling were used to analyse and model the data.[17] Data analyses were undertaken using PASW Statistics 18, StataIC, release 10 (StataCorp LP, College Station, TX, USA) and Microsoft Office Excel 2007 (Microsoft Corporation, Redmond, WA, USA).

Ethics approval was obtained from the Monash University Human Research Ethics Committee.

Results

The distribution of demographic characteristics on a total of 901 AHPs is shown in Table 1 (*locum tenens* were excluded from the analysis). Rural AHPs were overwhelmingly young women, with physiotherapists, occupational therapists and social workers comprising the largest groups. Not all health services employed the full range of AHPs, with remote health services offering a more limited range of allied health services. A second distinguishing characteristic was that rural and remote health services generally offered a greater range of workforce retention incentives to their allied health employees. Formal monitoring of the effectiveness of retention incentives on length of stay was not undertaken by health services.

Length of stay of allied health professionals by community size and location

Table 2 and Figure 1 indicate that, while not statistically significant, crude measures of allied health workforce turnover and retention do exhibit some variation by rurality. Remote health services have the highest annual turnover rates, lower stability rates after 2, 3 and 4 years and lower survival probabilities after second and subsequent years of employment together with shorter median survival and median length of stay in current position compared to rural or regional health services. Figure 1 indicates that little variation in employee survival exists

TABLE 1: *Characteristics of allied health professionals*

Characteristics	*n*	(%)
Gender		
Female	773	(85.8)
Male	128	(14.2)
Allied health profession		
Dietitian	92	(10.2)
Occupational therapist	175	(19.4)
Physiotherapist	250	(27.8)
Podiatrist	51	(5.7)
Psychologist	77	(8.6)
Social worker	171	(19.0)
Speech pathologist	85	(9.4)
Age on commencement		
≤30 years	539	(59.8)
Over 30–35 years	112	(12.4)
>35 years	245	(27.2)
Missing	5	(0.6)
Grade on commencement		
Grade 1	336	(37.3)
Grade 2	371	(41.2)
Grade 3 or higher	63	(7.0)
Missing	131	14.5
RRMA		
RRMA 3	655	(72.7)
RRMA 4	79	(8.8)
RRMA 5–7	167	(18.5)
Total	901	(100)

RRMA, Rural, Remote and Metropolitan Areas Classification.

TABLE 2: *Length of stay indicators by regional, rural and remote health services*

Indicator	All health services (*n* = 11)	Regional health services	Rural health services	Remote health services
Annual turnover (%)	26.0	18.7	25.4	30.2
Median length of stay in current position (years)	3.1	4.1	3.1	2.7
Stability after 1 year (%)	92.5	85.3	94.9	93.2
Stability after 2 years (%)	66.4	70.7	77.3	50.8
Stability after 3 years (%)	59.5	64.7	71.5	46.2
Stability after 4 years (%)	56.3	60.4	66.9	46.2
Survival probability after first year (%) (95% CI)	74.7 (71.7, 77.5)	74.9 (71.3, 78.1)	74.5 (67.4, 80.3)	71.9 (58.7, 81.6)
Survival probability after 2 years (%) (95% CI)	57.5 (54.0, 60.8)	60.4 (56.3, 64.2)	51.4 (43.3, 59.0)	40.9 (27.6, 53.7)
Survival probability after 3 years (%) (95% CI)	49.7 (46.1, 53.2)	53.0 (48.8, 57.0)	41.7 (33.6, 49.7)	30.7 (18.2, 44.1)
Survival probability after 4 years (%) (95% CI)	43.7 (40.0, 47.3)	47.2 (42.8, 51.4)	35.5 (27.5, 43.6)	25.1 (13.5, 38.6)
Median survival (years) (95% CI)	3.0 (2.4, 3.5)	3.5 (2.7, 4.3)	2.1 (1.7, 3.1)	1.7 (1.3, 2.5)
n (AHPs)	901	655	182	64

AHPs, allied health professionals; CI, confidence interval.

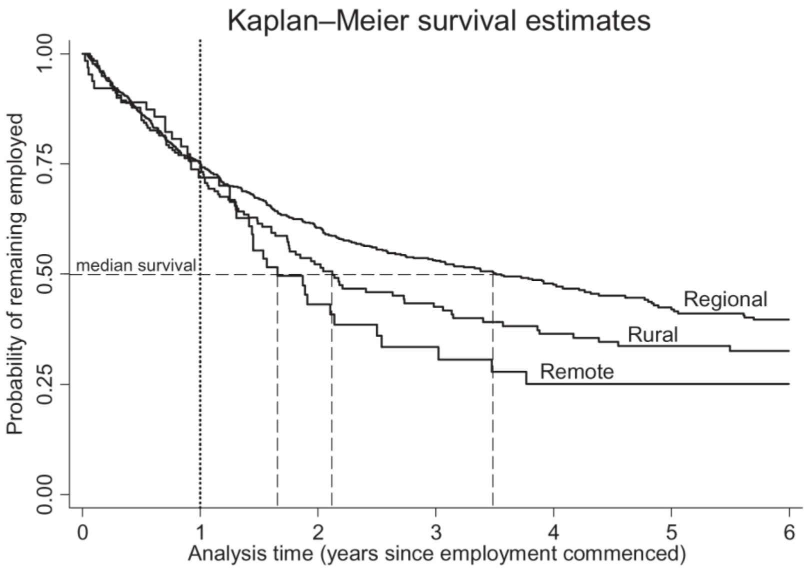

FIGURE 1: *Survival curve analysis for regional, rural and remote health service employees.*

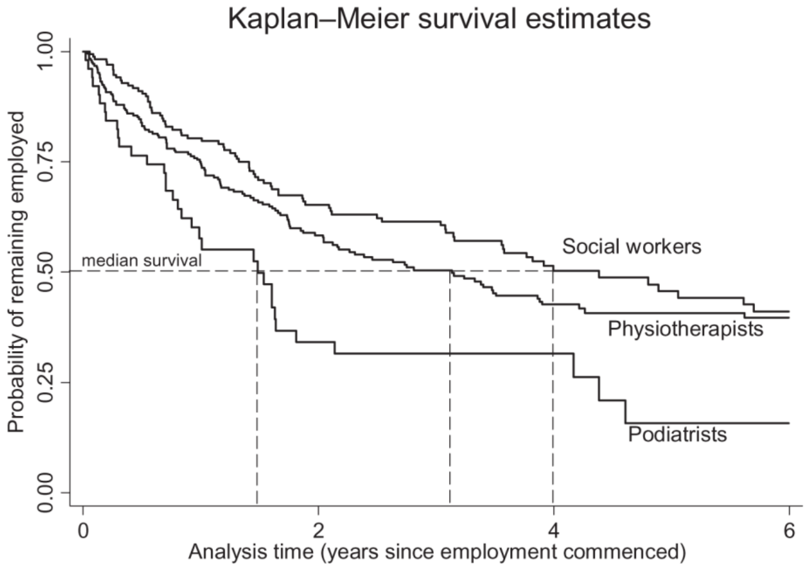

FIGURE 2: *Survival curve analysis for selected allied health professions.*

in their first 12 months of employment, but that notable differences according to geographical classification emerge between 12 and 24 months and are subsequently sustained. Thus while rural classification as measured by the Rural, Remote and Metropolitan Areas Classification is not a statistically significant determinant of turnover hazard either crudely or once adjustments are made for other factors (Table 3), survival analysis graphing provides insight as to why this is the case.

Variation in length of stay by allied health profession

Figure 2 illustrates the unadjusted differences between social workers, physiotherapists and podiatrists in the probability of remaining employed. The median survival for podiatrists is 18 months, for physiotherapists about 3 years and for social workers 4 years. Not illustrated is the median survival for dietitians (18 months), speech

TABLE 3: *Proportional hazards regression model*

Reference	Variable	Turnover hazard ratio	*P* value	Lower limit 95% CI	Upper limit 95% CI	*P* value
Physiotherapist	Dietitian	1.17	0.270	0.86	1.59	0.005
Physiotherapist	Occupational therapist	0.84	0.133	0.66	1.07	
Physiotherapist	Podiatrist	1.79	0.054	0.99	3.23	
Physiotherapist	Psychologist	1.24	0.321	0.78	1.98	
Physiotherapist	Social worker	1.09	0.429	0.86	1.40	
Physiotherapist	Speech pathologist	0.94	0.722	0.64	1.37	
≤30 years of age at employment commencement	>30 to 35 years of age	0.79	0.306	0.48	1.29	0.032
≤30 years of age at employment commencement	>35 years of age	0.64	0.012	0.46	0.88	
Female	Male	1.25	0.188	0.88	1.79	
Grade 1 on employment commencement	Grade 2	0.75	0.038	0.58	0.98	0.087
Grade 1 on employment commencement	Grade 3 or higher	0.57	0.025	0.36	0.92	
RRMA 3	RRMA 4	0.89	0.528	0.59	1.33	0.51
RRMA 3	RRMA 5–7	1.14	0.318	0.86	1.52	

CI, confidence interval; RRMA, Rural, Remote and Metropolitan Areas Classification.

therapists (2.6 years), psychologists (2.5 years) and occupational therapists (3 years). This analysis indicates the presence of differences of up to 2.5 years in the length of employment that a manager might reasonably expect from an AHP in regional, rural or remote Victoria, depending on their profession, if other factors are not taken into account. Some of these differences might be related to differing age and grade structures within professions. For example, once adjustments for differences in age and grade on commencement (Table 3) were made the differences between social workers and physiotherapists were not statistically significant.

Determinants of allied health professional length of stay by commencement grade

The Cox proportional hazards regression model developed to model AHPs from commencement of employment with the health services took account of multiple factors which might be associated with the likelihood of employees leaving (Table 3). The hazard ratios demonstrate that at any instant, an AHP who commences employment at either Grade 2 or at Grade 3 or higher has a significantly reduced risk of leaving employment compared to those who commence at Grade 1.

Other determinants of allied health professional turnover

Age category of AHPs when commencing employment was shown to have an important and statistically significant association with turnover risk. However, neither employee gender nor whether an AHP was employed in a full-time versus part-time capacity (not shown) had a significant association with turnover risk.

Cost of replacing allied health professionals by location

Table 4 shows the direct and indirect costs per AHP that are incurred by regional, rural and remote health services when replacing staff. The median total cost incurred by remote health services to replace an AHP was \$45 781, while the median cost for regional health services was \$23 010. The main cost components for rural and remote health services were direct costs, which comprised temporary staffing and overtime, advertising, interviewing and relocation costs and orientation and training costs. Vacancy costs were particularly high for remote health services. Indirect costs provided were estimates, while some, although not all, health services were able to provide actual direct costs of staff replacement.

Discussion

This study illustrates how allied health workforce patterns can be evaluated by extracting employment data

TABLE 4: *Cost of recruiting an allied health professional*

Allied health professional recruitment costs	Direct costs				Indirect costs			Total costs
	Vacancy costs† Median§ ($)	Recruitment costs‡ Median§ ($)	Orientation training costs per new recruit Median§ ($)	Total direct costs Median§ ($)	Cost of decreased productivity among remaining staff members Median§ ($)	Cost of initial reduced productivity of new recruit Median§ ($)	Total indirect costs Median§ ($)	Total Costs Median§ ($)
All health services (n = 11)	3 130	3 740	3 200	18 882	600	600	1 200	26 721
Regional health services	0	2 150	8 360	10 510	10 000	2 500	12 500	23 010
Rural health services	3 130	3 800	3 100	18 882	600	2 000	5 300	26 721
Remote health services	42 049	3 888	2 030	45 241	360	180	540	45 781

†Vacancy costs include cost of temporary staff, overtime, expenses due to patient transfer and loss of contractual work; ‡recruitment costs include advertising, search firm costs, interviewing costs and relocation expenses; §because of skewed data the median is a better measure of central tendency than mean. However, medians cannot be totalled across the table.

from existing health service human resources databases, then using carefully selected sentinel workforce indicators to measure workforce retention and turnover patterns to provide critical evidence to underpin workforce retention strategies. Several key findings emerge that have significant implications for rural allied health workforce planning, including the implementation of retention strategies and incentives.

1. Our understanding of the patterns of workforce retention can be furthered by employing a range of different measures of turnover and retention, selected from *annual turnover rate*, *stability rates*, *median length of employment in current position*, *survival probabilities and regression modelling*.
2. Some differences in crude patterns of workforce turnover and retention according to geographical location and town size emerge from 12 to 24 months after the commencement of employment. The lack of statistical significance of differences in employee survival according to geographical location might occur because the differences take time to emerge (whereas the analysis has considered the entire length of employment) as well as possibly because of data limitations related to sample size. Importantly, the direction of differences in employee turnover according to geographical location as well as their delayed emergence are consistent with both anecdotal evidence and findings from the literature, supporting the notion that this area of investigation warrants further research. Our findings additionally suggest that the first 12 months of employment in rural and remote settings could provide an opportunity for implementing comprehensive retention strategies. Moreover, despite the overall lack of a statistically significant association between geographical location and turnover hazard, it remains appropriate that crude benchmarks to guide use of retention incentives take account of geographical location.
3. Patterns of turnover and retention vary by allied health profession. This effect is evident in both the unadjusted survival curves and with regression modelling.
4. Although many professional, organizational and personal factors impact upon turnover and retention of AHPs in rural and remote areas, a key factor appears to be the significance of career grade. Lack of opportunity for grade advancement is an issue in small rural and remote health services where opportunities for employing AHPs at higher levels might be limited.
5. The direct vacancy costs of replacing AHPs increases with increasing remoteness, and are quite considerable. This creates opportunities for managers to implement retention incentive strategies

which remain cost neutral to the health service, although clearly careful evaluation is indicated to ensure their effectiveness.

Several limitations characterize this study but should not detract from its overall importance. Although the study aimed to ensure a good representation of health services located in towns of varying location and size, the purposive stratified sampling procedure and the small number of health services providing data both contribute to a limited ability to generalize the findings to health services beyond the study. Estimates of annual turnover, stability rates and median length of stay in current position likewise lacked precision, and therefore can be considered to be indicative at best. Another issue was the variability in the quality of data provided, something that reflected the capacity of health services to generate quality human resources data easily, and estimate costs accurately. Median direct and indirect cost estimates also lack precision because of the small number of health services participating in the study.

For health services to monitor workforce patterns, several prerequisites need to be met at local and regional levels. Agreement needs to be reached on the appropriate indicators to use for monitoring turnover and retention. At the local level, efficient and consistent workforce data collection processes need to be implemented. Regular analysis and reporting of workforce patterns can be undertaken by health service management, as the basis for evaluating existing retention strategies and to further inform workforce planning. For this to occur local and regional health services must be resourced with the expertise and infrastructure required to collect, analyse and report on workforce performance. Regional authorities also need to facilitate data analysis and data linkage allowing comparisons to be made across similar services.

Conclusion

Optimizing health workforce retention is the key to ensuring locally delivered, appropriate and sustainable health services and can contribute significantly to overcoming the rural workforce shortage. The retention of AHPs in rural and remote Australia for reasonable lengths of time is becoming an increasingly important issue for policy makers, researchers, health service managers and rural communities. This study demonstrates the feasibility of using appropriate analysis of routinely collected employment data to monitor allied health workforce patterns. A national study capturing a diversity of geographical locations and larger numbers of AHPs has the potential to generate a robust evidence-base which can better inform health services and authorities about workforce performance. Linking this with knowledge of the costs associated with avoidable turnover can open the way for the development of cost-neutral retention incentives and ultimately lead to improved retention of rural AHPs and enhanced delivery of allied health services to rural areas.

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Author contributions

J.H. conceptualized and designed the study. M.C. undertook the literature search and data collection. D.R. undertook the analysis of data. All authors contributed equally to the writing of the manuscript.

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7.1.1 Summary of findings and implications of Chisholm et al. 2011 paper

Applying the five key turnover and retention indicators to the secondary data on 901 AHPs employed at 11 Victorian rural and remote health services reveals important patterns in the turnover and retention of AHPs. Mean annual turnover is found to increase with increasing remoteness (within three levels of geographical remoteness, as defined in the paper), whilst average length of tenure of current employees decreases with increasing remoteness. The stability rates, however, do not display such clear-cut patterns: stability after 1 year is lowest in regional health services whereas stability after 2 years is lowest in remote health services.

The display of these data using survival curves helps tease out these patterns further. Survival curves demonstrate that retention of AHPs in the first 12 months of their employment at a health service shows little difference according to remoteness. However, after the first 12 months, employment differences according to geographical location and community population size emerge, with the survival curves for AHPs employed at regional, rural and remote health services diverging for the next 12 months of employment. Thereafter, these differences according to remoteness are maintained (the survival curves run parallel after the first 2 years of employment). This analysis therefore is able to identify a crucial period during the employment of AHPs that results in differential retention according to remoteness, and during which policy interventions and incentives may be most effectively used to increase length of stay.

The study also investigates associations between allied health profession and retention. The paper illustrates unadjusted differences in retention according to allied health profession using survival curves. Podiatrists are shown to have the lowest retention of all AHPs included in this study, with physiotherapists having intermediate retention, and social workers having higher retention. These crude differences according to health profession translate as a median survival of less than 2 years for podiatrists, compared with 4 years for social workers.

The Cox proportional hazards regression model is able to make additional adjustments for the effects of demographic factors, employment grade and remoteness on AHP retention, and quantify the effect size and statistical significance of differences according to allied health profession. Once these factors are simultaneously taken into account, the extent to which podiatrists exhibit lower retention is revealed: podiatrists are 1.8 times more likely to leave employment at a Victorian health service at any point in time, compared with physiotherapists. The most stable group of rural and remote AHPs are occupational therapists. The Cox modelling confirms that differences in retention according to allied health profession are both statistically significant and the strength of association is moderate to strong.

These findings are therefore not only ground-breaking but of great interest and usefulness to policymakers and workforce planners. They provide empirical evidence to support the development of retention benchmarks that vary according to health worker profession and geographical location. The application of empirical research evidence to the development of rural and remote PHC worker retention benchmarks shall be explored further in the second published paper in this chapter.

7.2 Background to Russell et al. 2013 paper

The second published paper in this chapter, titled "*What is a Reasonable Length of Employment for Health Workers in Australian Rural and Remote Primary Healthcare Services?*" (Russell, Wakerman, & Humphreys, 2013), applies the results of quantitative analyses of how PHC worker profession and geographical location are associated with retention to demonstrate how tentative benchmarks can be proposed that can help guide policy-making and workforce planning. Quantitative data to inform this benchmarking process were sought from three different sources:

1. Existing literature which reports differences in Australian PHC worker retention according to geographical location and profession;
2. Secondary analysis of Australian PHC workforce datasets that were accessible for research purposes;
3. Analysis of primary data collected via a postal survey of 108 Australian PHC services located in RRMA 5-7.

Benchmarking is a useful tool for workforce planners when applied within a quality improvement framework. Knowing what average or 'benchmark' lengths of stay are for different PHC workers according to their profession and geographical context helps with the identification of health services that are outperformers, and conversely, with the identification of health services that are underperformers with respect to retention of staff. This knowledge can then help identify underlying practices which might be driving health service turnover or retention performance.

An Australian example of how benchmarking data can be applied to rural and remote health workforce turnover and retention issues is found in the research of Hegney et al. into the factors associated with resignation of nurses from rural and remote Queensland Health facilities (Hegney, McCarthy, Rogers-Clark, & Gorman, 2002a; Hegney et al., 2002b; Hegney, McCarthy, Rogers-Clark, & Gorman, 2002c). Hegney and colleagues' research population was initially identified by reference to the benchmarked average annual turnover rate (at district level, averaged between 1994-1998) for nurses working in Queensland Health facilities, which was 20% (Queensland Health, 1999). The researchers investigated the reasons underpinning the higher than average turnover of nurses in 18 rural and remote Queensland Health Service Districts that were experiencing higher than average turnover rate.

It is envisaged that in a similar way that the Hegney et al. research was informed by a health worker turnover performance benchmark, the tentative retention benchmarks for PHC worker length of stay reported in this paper have the potential to assist health workforce policymakers identify drivers of above average rural and remote PHC worker retention and translate these strategies to comparable contexts (according to profession and geographical location) but where the retention patterns indicate underperformance.

Monash University

Declaration by candidate regarding publication 5

Russell, D.J., Wakerman, J., and Humphreys, J.S., *What is a reasonable length of employment for health workers in Australian rural and remote primary healthcare services?* Australian Health Review, 2013. **37**(2): p. 256-261.

In the case of publication 5, appearing in Chapter 7, the nature and extent of my contribution was the following:

Nature of contribution	Extent of contribution (%)
Substantial contribution to conception and design of the study, data acquisition, data analyses, drafting and re-drafting of the manuscript and final approval of the version to be published	80

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms is stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Professor John Wakerman	Substantial contribution to conception and design of the study, data acquisition, drafting and re-drafting of the manuscript and critical revision of drafts	n/a
Emeritus Professor John Humphreys	Substantial contribution to conception and design of the study, data acquisition and critical revision of drafts	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature	[redacted]	**Date** 21/2/2014
Main Supervisor's Signature	[redacted]	**Date** 21/2/2014

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Feature

What is a reasonable length of employment for health workers in Australian rural and remote primary healthcare services?

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Abstract

Background. Optimising retention of rural and remote primary healthcare (PHC) workers requires workforce planners to understand what constitutes a reasonable length of employment and how this varies. Currently, knowledge of retention patterns is limited and there is an absence of PHC workforce benchmarks that take account of differences in geographic context and profession.

Methods. Three broad strategies were employed for proposing benchmarks for reasonable length of stay. They comprised: a comprehensive literature review of PHC workforce-retention indicators and benchmarks; secondary analysis of existing Australian PHC workforce datasets; and a postal survey of 108 rural and remote PHC services, identifying perceived and actual workforce-retention patterns of selected professional groups.

Results. The literature review and secondary data analysis revealed little that was useful for establishing retention benchmarks. Analysis of primary data revealed differences in retention by geographic location and profession that took time to emerge and were not sustained indefinitely. Provisional benchmarks for reasonable length of employment were developed for health professional groups in both rural and remote settings.

Conclusions. Workforce-retention benchmarks that differ according to geographic location and profession can be empirically derived, facilitating opportunities for managers to improve retention performance and reduce the high costs of staff replacement.

What is known about the topic? Health services located in small rural and remote locations are likely to continue to experience workforce shortages and high costs of recruitment. Health workforce retention is therefore crucial. However, effective rural health workforce planning and use of strategies to maximise retention of existing health workers is hindered by inadequate knowledge about baseline employment-retention patterns.
What does this paper add? Differences in health worker retention patterns by geographic location and profession are most evident after the first 6 months through until the end of the second year of employment. Health worker-retention benchmarks that differ according to geographic location and profession are proposed.
What are the implications for practitioners? Benchmarking workforce retention in comparable health services can enable identification of best practice and the underpinning retention strategies. Workforce planners can use this, together with knowledge of baseline retention patterns and the high cost of staff replacement, to guide the design, timing and implementation of cost-neutral retention strategies.

Additional keywords: Aboriginal health workers, allied health, benchmark, costs, costs analysis, doctors, managers, nurses, retention, workforce.

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Introduction

A key factor in ensuring sustainability of primary healthcare (PHC) services in rural and remote Australia is the maintenance of an adequate, appropriately qualified health workforce.[1] Persistent workforce undersupply translates into recruitment difficulties to these areas, which combines with high staff turnover to result in restricted access to appropriate PHC for many rural and remote residents.

Despite a raft of government measures to improve workforce supply in rural and remote areas, recruitment of health workers to rural areas remains problematic.[2,3] Health services in these areas must therefore focus on retaining health workers for as long as feasible through minimising avoidable turnover of staff and the associated high costs of their replacement.

Optimal workforce retention is vital to efficient functioning of health services and delivery of improved health outcomes.[4] Employee longevity is important because it takes time for the worker and client to build trust and interact successfully. Good employee retention also results in improved patient care as managers have a more experienced group of healthcare workers who require less direct supervision. This in turn can enhance workforce stability and job satisfaction, and result in higher productivity, the delivery of continuous, high-quality healthcare, greater patient satisfaction and lower costs.[5] In contrast, high turnover is linked to reduced productivity and burnout of staff covering the vacant position, thereby affecting the organisation's ability to fulfil its program goals.[6]

Optimising retention does not imply an indefinite length of service in one location. Career progression invariably necessitates movement between positions, services and organisations, and most health services seek some staff change. Nevertheless health services aim to minimise avoidable premature departure of their staff through workforce strategies designed to retain staff for some critical minimum length of service.[7–9] Exactly what constitutes a sufficient length of service is likely to vary according to profession and position, as well as by geographic location and characteristics of the community and health service. Unfortunately, little is known about existing retention patterns, and what retention benchmarks are appropriate to guide health workforce planning. This hinders our understanding of the effectiveness of retention strategies.

This article identifies what might be a reasonable length of employment for selected PHC workers in Australian rural and remote services, based on the performance indicator health worker median survival.[10] The objective is to develop workforce-retention benchmarks for this indicator (and for the complementary indicators survival probability after 12 and 24 months of employment) that take account of differences in geographic context and profession, and to discuss the implications for workforce-retention strategies.

Health workforce benchmarking

Benchmarking can be simply defined as 'finding and implementing best practice.'[11] The simplicity of this definition belies the considerable power that benchmarking has to promote and manage change, most notably within a quality-improvement framework. Although benchmarks are numerical values that are tied to corresponding performance indicators (and sometimes to financial rewards or penalties),[12] it has been noted that to maximise the scope for improvement it is important to emphasise the processes involved rather than the numerical values.[13] These processes include:

- identifying what aspect of healthcare delivery to benchmark and who to benchmark against,
- identifying suitable performance indicators and deriving benchmarks with which to make comparisons with peers,
- identifying outperformers and investigating the underlying practices that drive their superior achievements, and
- implementing best practices and monitoring to ensure sustained improvement.[14]

The benchmarking process consumes scarce resources, and therefore must focus on a small number of the most important and challenging goals that are central to a healthcare organisation's purpose. Retaining an adequate health workforce is recognised as being fundamental to the performance of rural and remote health services, especially to their sustainability.[14–16] It remains crucial, therefore, to identify performance indicators and their benchmarks relevant to the retention of health workers in rural and remote health settings.

The identification of understandable, feasible and responsive retention indicators and setting corresponding workforce benchmarks for use within rural and remote Australian health services is still in its infancy. The process has been dogged by a lack of accessible, specific and high-quality data and inconsistencies in how different health professional groups are defined and workforce data is collected.[17,18] This limits comparative analysis even when data are accessible. Nevertheless, health services can gain financially from benchmarking health worker retention if employee retention can be optimised and high costs of recruitment subsequently reduced.

Methods

Three broad strategies were employed to examine workforce-retention patterns, identify relevant indicators and develop benchmarks. First, a comprehensive literature review (both 'black' and 'grey') of relevant rural and remote PHC workforce performance indicators and benchmarks was undertaken.[19,20]

Second, existing health workforce datasets from Australian, state and territory health authorities and rural workforce agencies were sought in order to undertake analysis of retention patterns that could inform the setting of benchmarks. In particular, de-identified individual-level data were sought that could be used for the calculation of Kaplan–Meier survival probabilities and median survival.

Third, a survey was posted to a stratified random sample of 108 health services located in Rural, Remote and Metropolitan Areas 5, 6 or 7.[21] Services were stratified by jurisdiction and service type.[19]

The survey questionnaire collected data including:

1. de-identified commencement and exit dates for all doctors, nurses, allied health professionals (AHP), Aboriginal health workers and health service managers employed at each service at any time between 1 January 2003 and 31 August 2009;
2. total direct costs associated with replacing each type of health professional; and
3. managers' perceptions of workforce retention.

Descriptive statistical analysis and estimation of Kaplan–Meier survival probabilities and Cox proportional hazards modelling[22] was undertaken using StataIC, release 10. Analysis took account of right-censoring (ongoing employment at end of observation period), left-truncation (commencement of employment before start of observation period) and clustering of sampling of employees (by health service).

A Reference Group comprising senior policy advisors and workforce data experts assisted with scoping the study, maximising access to available relevant literature and data, and dissemination and take up of the study outcomes.

Empirically based retention benchmarks for:

1. reasonable length of employment (median survival);
2. survival probability after 12 months of employment; and
3. survival probability after 24 months of employment

were derived by evaluating health worker-retention data obtained using all three strategies. Benchmarks were validated through site visits to five PHC services across different rural and remote settings.[19] Ethics approval for the study was obtained from the Flinders University Ethics Committee.

Results

Patterns of workforce retention and costs of turnover in rural and remote PHC services

A comprehensive literature search revealed that most of the measures of Australian health workforce turnover and retention reported in the literature (including annual turnover rates, stability rates after 1 and 2 years, length of service in current location, and average length of service in current location) are largely unsuitable for establishing retention benchmarks for what might be a reasonable length of employment. Reports of employment-survival probabilities, the most useful measure reflecting average length of employment of all employees (i.e. both former and current), were largely absent in the literature. One notable exception showed the unadjusted median survival of around 16 months for Northern Territory hospital nurses and around 21 months for remote area nurses during the period 1995–2007.[23] Another indicated that the unadjusted median survival for AHP was similar in rural compared with remote Victorian health services (1.7 and 2.1 years respectively).[24]

The second strategy, securing access to longitudinal, de-identified individual-level secondary data from the Australian Government Department of Health and Ageing (Medicare data), state and territory health authorities and workforce agencies was largely unsuccessful, despite the existence of significant amounts of health workforce data that are routinely collected by these agencies. National datasets maintained by rural workforce agencies and the Australian Institute of Health and Welfare are cross-sectional. Those collected by the Australian Bureau of Statistics are not accessible at de-identified unit record level. Those data provided by four state health authorities were limited in usefulness for estimating health service survival probabilities because length of service related to tenure with the entire health authority rather than a specific health service. Additional data limitations included: access to de-identified individual-level commencement and exit data being refused; fields of interest, such as geographic location of health service, not being accurately maintained in centralised health authority databases; and definitions of specific health disciplines not being consistent across jurisdictions.

Empirical evidence of existing patterns of workforce retention therefore largely depended on the collection and analysis of primary data. Of the 108 health services approached to participate, 44 surveys were returned; 33 of these provided employee commencement and exit data. Of the non-responders, 11 declined to participate, 17 indicated that they did not have the capacity to provide data within the timeframe required, and others were unable to provide data on all employees but instead provided only partial data, such as for current or recent employees but not others. Twenty services provided data on 1285 employees of sufficient quality and completeness for calculation of survival probabilities. Of these, 12 health services were located in small rural towns providing data on 776 employees, and eight health services were in remote locations providing data on 509 employees. Most employees were either nurses (69%) or AHP (21%). Unfortunately because of the small numbers of services participating, our survey obtained data on relatively small numbers of doctors (67), Aboriginal health workers (39) and health service managers (22).

Although not attaining statistical significance, differences in employee retention according to geographic location began to emerge 6 months after commencement and were sustained for the next 18 months. Retention patterns according to profession showed a similar but statistically significant pattern, with further examination of these differences (Fig. 1) revealing that retention of nurses was 53% longer in health services in small rural towns compared with those in remote locations (hazard ratio 1.53; 95% CI 1.01, 2.30, modelling not shown). Retention patterns for AHP exhibited little difference according to geographic location.

Cox proportional hazards modelling confirmed that AHP were statistically significantly more likely than nurses to leave employment (Table 1, Model 1). After adjustments for remoteness AHP were 78% more likely to leave employment (hazard ratio 1.78; 95% CI 1.28, 2.48) compared with nurses (Table 1, Model 2).

The estimated median direct costs of replacement of health workers were highest for doctors ($74 000) and lowest for Aboriginal health workers ($13 700) (Table 2). The range of cost estimates of replacing staff was very large, within and between professional groups.

In general, surveyed health service managers considered 2 years to be a reasonable length of employment for doctors,

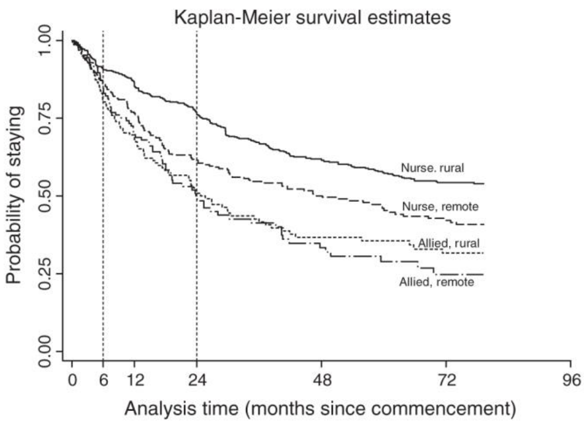

Fig. 1. Workforce survival curve by rurality and remoteness (rural, remote and metropolitan areas classification), and health discipline.

Table 1. Cox proportional hazards regression models showing relative hazard of leaving employment
CI, confidence interval; RRMA, rural, remote and metropolitan areas classification

Reference	Variable	Model 1		Model 2	
		Hazard ratio	95% CI	Hazard ratio	95% CI
Nurse	Doctor	1.81	0.61, 5.38	1.68	0.52, 5.44
	Allied health professional	1.84	1.36, 2.50	1.78	1.28, 2.48
	Aboriginal health worker	0.97	0.36, 2.66	0.87	0.31, 2.47
	Manager	0.76	0.44, 1.33	0.76	0.44, 1.32
Rural (RRMA 5)	Remote (RRMA 6 and 7)			1.23	0.78, 1.91

Table 2. Health worker total direct replacement costs in small rural and remote health services
Due to skewed data the median is a better measure of central tendency than the mean

Discipline	Total replacement cost[A]		
	Median ($)	Interquartile range ($)	*n*
Nurse	19 300	7028–36 000	23
Doctor	74 000	66 000–111 312	8
Allied health professional	21 925	8500–34 238	12
Aboriginal health worker	13 700	3534–43 600	5
Manager	29 600	16 500–36 000	13

[A]Total replacement cost = cost of vacancy + cost of recruitment + cost of orientation and training.

nurses, physiotherapists, mental health workers, psychologists, social workers, podiatrists and Aboriginal health workers, and 3 years for health service managers. There was, however, considerable variability in health manager perceptions, even after taking geographic location and profession into account. Perceptions of a reasonable length of employment for rural nurses, for example, ranged between 12 months and 20 years.

Deriving workforce-retention benchmarks that take account of differences in profession

Smoothing of the (unadjusted) survival curves derived from our primary data (and inspection of the Cox proportional hazards Model 1 in Table 1) revealed that, overall, retention of health service managers was highest (Fig. 2). This observation accorded with managerial perceptions of longer periods of retention being reasonable for managers compared with other types of health workers. Health service managers were less able to differentiate between reasonable retention of nurses, doctors, AHP and Aboriginal health workers, despite differences being apparent in our primary data survival analysis.

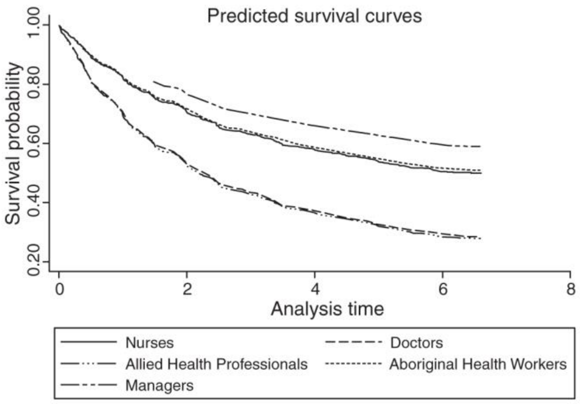

Fig. 2. Predicted workforce survival curve by health discipline.

Deriving workforce-retention benchmarks that take account of differences in geographic locations

Health service managers of both remote and small rurally located health services similarly perceived 2 years to be a reasonable employment length for most health workers. Primary data analysis, however, indicated differences in retention emerging between 6 and 24 months after commencement of employment, associated with an estimated 22% increased hazard of leaving employment for remote health workers compared with health workers in rural locations. Whilst not statistically significant when analysis extends to cover longer periods of employment, empirical research by Chisholm *et al.*[24] revealed a similar pattern evident in early phases of employment. Taking into account (1) the importance of retaining health workers for some critical minimum amount of time, so that problems associated with initial reduced productivity and high turnover can be curtailed, and (2) that significant differences according to geographic location emerge within the first 2 years of employment, at least for some professional groups, benchmarks were proposed that also differed according to geographic location.

Suggested empirically based benchmarks that differ according to profession and geographic location are presented in Table 3. Further adjustment to these benchmarks could be made for additional factors known or subsequently shown to be significant influences on the risk of employees leaving, for example, employee age, size of the service and provision of incentives.

Visits to five health service managers in five different sites provided an opportunity to present data about the retention performance of their health service in conjunction with the proposed reasonable length of employment benchmarks. The managers were able to authenticate that the proposed benchmarks were both appropriate and useful.

Discussion

There is great potential for the Australian rural and remote health workforce to be strengthened by establishing agreed indicators of workforce retention with corresponding performance benchmarks. Specifically, this research proposes preliminary benchmarks for reasonable length of employment according to

Table 3. Proposed retention benchmarks according to discipline and geographic location

Discipline	Rural (≤10 000 population)			Remote		
	Median survival	12-month survival probability	24-month survival probability	Median survival	12-month survival probability	24-month survival probability
Nurse	5	0.80	0.67	3.5	0.78	0.64
Doctor	3	0.75	0.60	2	0.68	0.50
Allied health professional	3	0.75	0.60	2	0.68	0.50
Aboriginal health worker	3	0.75	0.60	3	0.75	0.60
Manager	5	0.80	0.67	3.5	0.78	0.64

geographic context and health worker profession. Two complementary indicators, survival probabilities after 12 and 24 months' employment, and their corresponding benchmarks are also proposed.

Our study illustrates how empirically derived workforce-retention benchmarks can be developed using analysis of existing health service human resources datasets, and triangulation with other sources of evidence, including health manager perceptions of workforce retention, existing published black and grey retention literature, and analysis of other existing secondary data sources. Of course, these are not the only methodologies. External benchmarking with non-health sector Australian rural and remote workforces, or even with international comparators, are alternative approaches.

For several reasons, the specific numerical benchmark values proposed should be used with some caution. First, and most importantly, it is better to emphasise the underlying quality-improvement process that these benchmarks can drive, rather than the actual values. Second, the primary data may be biased toward reflecting better-managed PHC services capable of generating reliable workforce data. Third, the small number of health services providing primary data limits the confidence that we can have in the results. A similar study collecting data through face-to-face visits to health service managers (rather than through mailed surveys) yielded a far higher response rate and better-quality data.[24]

Notwithstanding these caveats, our findings are consistent with other Australian health workforce-retention studies[23–25] and provide important new insights. First, they highlight important differences in the patterns of workforce retention by professional discipline and geographic location. It is important, therefore, to differentiate workforce retention benchmarks accordingly. Of note, the scope of this research did not extend to analysis and comparison of retention patterns experienced in health services located in rural centres with a population >10 000. Further research is indicated to determine whether differences in retention patterns observed in the present study extend to these larger rural centres.

Second, by simultaneously extending our understanding of rural and remote health worker-retention patterns and costs of recruitment, an opportunity is provided for health service managers to make more efficient use of existing funding to enhance retention through careful structure and timing of incentives. For example, knowing that the median survival of AHP is 2 years (Fig. 1) and the total direct cost of replacing an AHP is \$22 000 (Table 2), a \$10 000 retention bonus offered to each AHP after completing an additional third year of service could improve retention and continuity of care and reduce recruitment costs. Here it is worth noting that direct replacement costs underestimate the total costs of health worker replacement. A recent study that factored in both direct and indirect costs estimated median replacement costs for rural AHP to be approximately \$27 000 and \$46 000 for remote AHP.[24]

Whichever indicators are used to develop appropriate workforce-retention benchmarks, the capacity to record commencement and separation dates and manage these data remains essential for all rural and remote health services, so that appropriate comparisons can be made. This requires standardisation of data collection, extraction, cleaning, analysis, compilation and reporting, rather than the current patchy and *ad hoc* approach. Accordingly, funders need to strengthen the capacity of services (infrastructure, training and human resource requirements) to collect and analyse appropriate workforce data if consistent national data aggregation and monitoring is to be a reality.

Conclusions

Despite the numerous health workforce recruitment and retention initiatives, it is probable that health services located in small rural and remote locations will continue to experience workforce shortages and high costs of recruitment.[3] It therefore remains important that health services in these locations optimise the retention of their health workforce, and minimise avoidable staff turnover. Importantly, our research has demonstrated how evidence from a range of different sources can be triangulated to establish retention benchmarks appropriate to discipline and context. Although the benchmarks are tentative, they provide a much better comparator of average rural or remote health worker retention than has previously been available.

Further, through identifying workforce performance indicators and their corresponding benchmarks according to geographic location and profession, this research has the potential to assist managers to better understand their baseline retention patterns, and how they compare with other similar services. This, in turn, provides improved possibilities for identifying best practice in health worker retention, and subsequent adoption of more effective retention strategies through quality-improvement processes, ultimately benefitting the health worker (through better support), the health service (through greater staff stability and retaining staff with high-level skills and experience) and the community (through improved continuity and quality of care). Most importantly, such evidence-based improvements can be implemented without additional costs to either the health service or the regional health authority.

Competing interests

The authors declare that they have no competing interests.

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7.2.1 Summary of findings and implications of Russell et al. 2013 paper

The multifaceted approach taken in this study highlighted an existing dearth of information to inform rural and remote health workforce planners about differences in the length of employment that might be anticipated from PHC workers according to their profession and the geographical location of the health facility in which they provide services.

Analysis of actual employment data on Australian PHC workers working in health facilities in remote and small rural (<10,000 population size) towns revealed large differences in retention according to PHC worker profession. Doctors and AHPs had a 1.8 times increased risk of leaving at any point in time compared with nurses and AHWs. Geographical location was also significantly associated with the retention of nurses, with nurses in remote locations 1.5 times more likely to leave at any point in time compared to nurses in small rural communities. There was, however, no significant difference in the retention of AHPs in health facilities located in small rural towns compared with remote locations (retention was comparatively poor in both remote and small rural towns).

Importantly, this study also demonstrates how empirical evidence can be used to develop PHC workforce retention benchmarks that differ according to context. In the current policy environment, the context relates to variations in retention according to PHC worker profession and geographical location and population size. However, the method could equally be adapted and applied to propose benchmarks that differ according to other factors of policy relevance.

Whilst the workforce retention benchmarks proposed in this paper are at best tentative, due to the limited nature of the data informing their development, the demonstration of a methodology for the development of retention benchmarks has fundamental importance for future retention research and for informing future workforce planning. The findings of this paper therefore add significantly to the existing evidence-base on the retention of rural and remote PHC workers.

Whilst Chapters 5, 6 and 7 have introduced five different publications, and discussed their empirical findings and importance, on a publication by publication basis, the following chapter, Chapter 8, will integrate the findings of these papers with the four research questions posed in this thesis. Chapter 8 will additionally discuss the entire body of research captured within this thesis, and its implications for rural and remote health workforce policy-making.

Chapter 8: Integrative discussion

Chapter 8, the final chapter in this thesis, will demonstrate how the research and publications of this thesis has achieved its broad aim, and contributed to an improved understanding of the patterns, determinants and metrics of rural and remote Australian PHC worker turnover and retention. Section 8.2 of this chapter details the key findings emanating from the research of this thesis, in relation to each of the four research questions of this thesis. The key findings are integrated with what is already known from the literature. An acknowledgement of the limitations of the research is provided in Section 8.3, whilst in Section 8.4 the key implications of the research for rural and remote PHC workforce policy are explored. Section 8.5 provides a workforce planning framework to help guide decision making. Recommendations for further research in this field are made in Section 8.6, followed by some final concluding remarks in Section 8.7.

Firstly, however, Section 8.1 aims to provide additional contextualisation for the research of this thesis. This section will help policymakers place rural and remote PHC workforce turnover and retention within the much broader framework of population access to PHC services, which requires provision of:

> *"the right (health) service at the right time in the right place".* (Rogers, Flowers, & Pencheon, 1999, p. 866)

8.1 Placing turnover and retention within the broader framework of rural health access problems

In the first instance this thesis has focussed on the issues of turnover and retention of rural and remote PHC workers because of the important contribution that the flows of PHC workers due to recruitment, turnover and retention have on the overall geographical distribution of PHC workers. This section aims to show that whilst it is important that policymakers are highly cognisant of the geographical distribution of PHC providers (such as their number and geographical location), there are other important considerations to simultaneously take into account, if health system goals of achieving equitable access to PHC are to be accomplished.

Firstly, health system characteristics (such as the geographical distribution of PHC providers) must be considered in conjunction with *population* characteristics (such as population size, location and mobility). Further, policymakers must clearly understand that the ability of rural and remote populations to access PHC in times of need is not merely a function of the spatial accessibility of PHC care services. Access has other important dimensions that need to be taken into account when developing policy. Unfortunately, however, the literature on rural and remote PHC access is vast and complex, and frequently presented in a format that is itself difficult to understand and use for policy-making purposes. This is critical, because whilst the quest to bring about equitable and improved health outcomes for rural and remote Australians depends greatly on our ability to make incremental improvements in the geographical distribution of PHC workers and to increase the overall supply of rural and remote PHC workers, a range of other factors must also be addressed to ensure that populations most in need of PHC can access appropriate care.

Penchansky and Thomas' sentinel publication *"The Concept of Access"* described access to health care as a general concept that comprises 5 specific dimensions (Penchansky & Thomas, 1981). The required incremental PHC workforce improvements, referred to above, relate primarily to addressing the *geography* and service *availability* dimensions of access (which Penchansky and Thomas termed accessibility and availability). It is important, though, that policymakers understand the other dimensions of access that may require policy attention including *affordability, accommodation, acceptability* and *awareness,* as individuals may struggle to overcome barriers to accessing needed PHC across any or all of these dimensions. The concept of access and its dimensions are explained in the peer reviewed published paper titled "*Helping Policy-makers Address Rural Health Access Problems",* which situates the research on PHC worker retention undertaken in this thesis within the broader notion of population access to PHC services (Russell, Humphreys, Ward, et al., 2013).

The publication synthesises a complex body of literature on the concept of access. The importance of this from a policy-making perspective should not be understated, as this is a body of literature that is often either poorly understood, or misunderstood. The lack of a full and shared understanding held by policymakers of what 'access' means has potentially dire consequences. This paper therefore clarifies what is meant by access, identifies the main dimensions of access, and draws out key aspects of access that are important from a policy-making perspective.

Monash University

Declaration by candidate regarding publication 6

Russell, D.J., Humphreys, J.S., Ward, B., Chisholm, M., Buykx, P., McGrail, M., and Wakerman, J., *Helping policy-makers address rural health access problems.* Australian Journal of Rural Health, 2013. **21**(2): p. 61-71.

In the case of publication 6, appearing in Chapter 8, the nature and extent of my contribution to the work was the following:

Nature of contribution	Extent of contribution (%)
Substantial contribution to conception and design of the publication, review of the literature, drafting and re-drafting of the manuscript and final approval of the version to be published	70

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms is stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Emeritus Professor John Humphreys	Substantial contribution to conception and design of study and critical revision of drafts	n/a
Dr Bernadette Ward	Substantial contribution to critical revision of drafts	n/a
Ms Marita Chisholm	Substantial contribution to systematic literature searching and critical revision of drafts	10
Dr Penny Buykx	Substantial contribution to critical revision of drafts	n/a
Dr Matthew McGrail	Substantial contribution to critical revision of drafts	n/a
Professor John Wakerman	Substantial contribution to critical revision of drafts	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature	[redacted]	**Date** 21/2/2014
Main Supervisor's Signature	[redacted]	**Date** 21/2/2014

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Review Article

Helping policy-makers address rural health access problems

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Abstract

This paper provides a comprehensive review of the key dimensions of access and their significance for the provision of primary health care and a framework that assists policy-makers to evaluate how well policy targets the dimensions of access. Access to health care can be conceptualised as the potential ease with which consumers can obtain health care at times of need. Disaggregation of the concept of access into the dimensions of availability, geography, affordability, accommodation, timeliness, acceptability and awareness allows policy-makers to identify key questions which must be addressed to ensure reasonable primary health care access for rural and remote Australians. Evaluating how well national primary health care policies target these dimensions of access helps identify policy gaps and potential inequities in ensuring access to primary health care. Effective policies must incorporate the multiple dimensions of access if they are to comprehensively and effectively address unacceptable inequities in health status and access to basic health services experienced by rural and remote Australians.

KEY WORDS: *health service, health services accessibility, policy, primary health care, rural and remote.*

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Quantifying each Author's contribution: J.H. conceptualised and designed the review, and D.R. undertook the literature search and synthesis. J.H and D.R. led the writing of the paper. All authors contributed to the writing, critique and revision of the manuscript.

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Introduction

Primary health care (PHC) has an important role to play in achieving equitable population health outcomes.[1] Because health care is a fundamental human right, governments are obliged to ensure that populations have the opportunity to access adequate and appropriate PHC at times of need.[2,3] The universal importance of access to PHC is evident – equitable PHC access is a central goal of health systems locally, nationally and globally. In Australia, for example, both the *National Health and Hospital Commission's Report* and the *National Primary Health Care Strategy* identify the improvement of equity of access to PHC as a priority area within the current reform agenda.[4,5]

Despite the extensive literature on health care access, consensus is yet to be reached on how best to define this complex concept. In 1998, Berk and Schur drew attention to 'the lack of agreement about standards for measuring access from an operational point of view and a lack of consensus about the conceptual definition of access.'[6] This paper seeks to address these issues. Firstly, we define access, highlighting the most important characteristics from a policy-making perspective. Secondly, we identify the key dimensions of access and outline the significance of each dimension for rural and remote populations. Thirdly, we recommend a framework that policy-makers can use to evaluate how well their

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What is already known on this subject::
- *Ensuring access to primary health care is a central goal of health systems.*
- *Access is a complex, multidimensional concept.*
- *A lack of agreement about the definition of the concept of access and the terms used to describe the dimensions of access creates confusion for policy-makers and hinders their ability to ensure that policy responses are targeting the problem of access adequately.*

What this study adds:
- *A detailed analysis of the major dimensions of the concept of access based on extant literature, highlighting their significance for policy-making in rural and remote contexts.*
- *A framework for evaluating how well policies designed to bring about improved access to primary health care for rural and remote areas actually addresses each dimension of access.*

policies address the various dimensions of access, illustrating its utility using national Australian rural and remote PHC policies.

What is access?

The extensive literature on access and health care reveals an abundance of definitions which have developed from a range of different perspectives over time, as demonstrated in Table 1.

Comparison of definitions reveals that access to health care involves dynamic interactions between health service characteristics and population characteristics, something Penchansky and Thomas termed 'fit'.[10] The implication for policy-makers is that it is not sufficient to consider policy interventions which simplistically target only the 'supply' (health service characteristics) side without considering interplay with the 'demand' side (population characteristics, including need). This notion has become especially important in Australia as the Commonwealth Government seeks to reorganise the provision of regional primary care services into *Medicare Locals*.[14] McIntyre *et al.* take this requirement for consideration of population characteristics further, explicitly referencing the obligation of policy-makers to actively address population characteristics, for example through policies which specifically target the empowerment of consumers.[15] Given that population characteristics show considerable variation, there is also an implied necessity for custom-made policy.

A second key observation is that access is multidimensional. Disaggregation of the complex concept into distinct dimensions is of great value for policy implementation. For example, by highlighting the inadequacy of policy platforms which focus only on a single dimension of access in isolation, it reduces the risk of certain subgroups of the population facing disadvantage or exclusion from access to appropriate PHC in times of need.

Also evident is a lack of consistency in the terminology of access and its dimensions. For example, there are numerous instances of different terms being used interchangeably, most commonly '*access*' and '*accessibility*' with '*availability*'.[16] This increases the likelihood that misunderstandings will arise, and arguably contributes to the shortcomings associated with policies formulated to maximise access to PHC.

A further factor for consideration, less readily apparent, but nevertheless implicit, is whether access is considered as the opportunity to receive health care (potential access), utilisation of health care services (realised access) or both.[11] In Australia, legislation governing universal access to Medicare PHC rebates, for example, has ensured that improved possibilities of affordable PHC exist for all. This implicit focus on potential access, and its enshrinement within Medicare legislation, demonstrates recognition by policy-makers of their obligation to address potential access.

Mindful of these factors, and the need of policy-makers to formulate policy in very practical ways, population access to health services can be defined as *the potential ease with which consumers can obtain health care at times of need*. It follows that access is determined by the fit between how well the health system meets differing population characteristics across a set of specific dimensions. These dimensions are identified and defined in the following section and in Table 2.

What are the main dimensions of access and what is their significance to rural and remote populations?

Access dimension 1 – availability

Availability refers to the volume and types of PHC services and facilities in relation to the health care needs of the population.[10] Policy-makers must therefore identify the health needs of rural and remote populations,

TABLE 1: *Definitions of access*

World Health Organization 1978[7]	'Accessibility implies the continuing and organized supply of care that is geographically, financially, culturally and functionally within easy reach of the whole community. The care has to be appropriate and adequate in content and amount to satisfy the needs of people and it has to be provided by methods acceptable to them' (pp. 58–9).
Bureau of Health Planning 1979[8]	'..the ability of a population or a segment of the population to obtain available health services. This ability is determined by economic, temporal, locational, architectural, cultural, organizational and informational factors which may be barriers or facilitators to obtaining services' (p. 54).
Aday and Andersen 1981[9]	'..those dimensions which describe the potential and actual entry of a given population group to the health care delivery system' (pp. 5–6). Elements of *potential access* include availability, organization, predisposing, enabling and need factors. Elements of *realized access* include convenience, availability, financing, provider characteristics, quality, health service type, site, purpose and time interval of care.
Penchansky and Thomas 1981[10]	'..a general concept that summarizes a set of more specific dimensions describing the fit between the patient and the health care system. The specific dimensions are availability, accessibility, accommodation, affordability and acceptability' (p. 127).
Khan and Bhardwaj 1994[11]	'Access (is)..defined either as the ability to obtain needed services, or in terms of potential/actual entry into the health care system.. Access is conceptualized as the outcome of a process, determined by an interplay between the characteristics of the health care service system and the characteristics of potential users' (pp. 65–66).
Rogers *et al.* 1999[12]	'Optimal access means providing the right service at the right time in the right place' (p. 866).
Haggerty *et al* 2011[13]	'The operational definition of first-contact accessibility is 'the ease with which a person can obtain needed care (including advice and support) from the practitioner of choice within a time frame appropriate to the urgency of the problem' (p. 2).

determine how PHC can best respond to the needs, and what core PHC services should be available to meet these needs.

The dimension 'availability' has a significant impact on rural and remote populations because of the chronic undersupply of providers across many health professions being felt more acutely as remoteness increases.[31] This effect is compounded by the high and complex PHC needs of rural populations compared with metropolitan populations.[32,33]

Access dimension 2 – geography

Geography, in the context of access, refers to the ability and ease with which populations can transcend distance between their location and that of the services needed.[10] It therefore has two central components: proximity (of PHC service providers to PHC service users) and mobility (the means by which the geographical separation is overcome). The impact on the most geographically isolated populations is significant, particularly where settlement is sparse and workforce maldistribution is most evident.[18,31,34] Geographical barriers are also critical for consumers who lack personal mobility, transport or technological means to overcome distance to the service provider.[35]

Increasingly, alternative models of PHC service provision are being used to overcome the tyranny of distance and lack of locally available services for rural and remote populations. These include fly-in fly-out, hub-and-spoke models of care, and telehealth.[36] However, significant challenges remain, namely to identify which services are best provided locally, which should be provided through visiting services, and which should be provided through telehealth or similar modalities.

Access dimension 3 – affordability

Affordability refers to the ease with which consumers can meet the total costs for needed health care, including upfront payments and indirect costs.[10] Indirect costs include costs incurred travelling to care and those associated with lost opportunity to generate income because of unreasonable or excessive travel and waiting time.

Affordability is an important access barrier for consumers with limited resources to meet PHC costs. Within Australia, disadvantaged populations include individuals ineligible for Medicare; patients who require frequent and complex PHC consultations; patients requiring PHC services not reimbursed by Medicare; patients in need of expensive or multiple medications, aids and appliances or investigations; consumers who

TABLE 2: *Dimensions of access*

Dimension	Definition: The fit between: Health system characteristic	↔	Population characteristic	Alternative terms (related to the meaning of this dimension)	Why this dimension is important
1. **Availability**†[9,10,17,18]	The volume and type of services	↔	The volume and type of population needs	• Right service[12] • Resources[19]	There must be PHC facilities and providers with the required competencies to meet the needs of the consumers, AND
2. **Geography**†[7,20]	The proximity of providers to consumers	↔	The ease with which the population can transcend this space	• Proximity and mobility[18] • Accessibility[10] • Locational[8] • Right place[12] • Distribution/location[11] • Ecological[16]	The spatial separation between PHC facilities or providers and consumers must be surmountable, AND
3. **Affordability**‡[10]	The direct and indirect costs of securing health care	↔	The consumer's ability to meet direct and indirect costs of health care	• Financial[7,9,11,16,20,21] • Economic[8,11] • Costs[17]	The consumers must be able to meet the costs incurred for health care, AND
4. **Accommodation**‡[10,13]	The manner in which the supply resources are organised	↔	The consumers' ability to contact, gain entry to and navigate the health system	• Organisation(al)[8,9,11,16,22] • Usability • Functional(ity)[7] • Architectural[8]	Consumers must be able to contact, gain entry to and navigate the health care system, AND
5. **Timeliness**‡	The time until health care can be provided	↔	The urgency of the need for health care	• Time[12,23] • Time interval[9] • Temporality[8,20,22]	Consumers must be able to receive health care in a timely manner, AND
6. **Acceptability**‡[10,24]	The provider's attitudes and beliefs about health and personal characteristics of consumers (eg. age, gender, religion, ethnicity)	↔	The consumer's attitudes and beliefs about health and personal and practice characteristics of providers	• Attitudes and culture[25] • Cultural[7,8,20,23] • Social[11,22,23] • Social structure[26] • Psychosocial[11] • Psychological[22] • Preferences/prejudices[11] • Health beliefs[26] • Attitudes and values[11] • Beliefs[26] • Trust[25]	The health service and PHC provider must be socially and culturally acceptable to consumers, AND
7. **Awareness**‡	The communication of health and health systems information to consumers	↔	The consumer's understanding of their health needs and knowledge of how to have these needs met.	• Information(al)[17,22,23] • Knowledge[27] • Health literacy • Cognitive[21] • Communication • Engagement[28]	Consumers must be aware of the existence of a health issue and health care provider with the competencies to meet their need.

†Access dimensions 1 and 2 are often covered in the literature by the terms spatial accessibility,[29,30] geographic accessibility[19] or spatial.[11]
‡Access dimensions 3–7 are often covered by the terms socio-organisational,[19,22] aspatial[11,29] or non-spatial.[30] PHC, primary health care.

face high upfront or out-of-pocket costs for consultations; isolated consumers who must travel long distances; and Indigenous Australians.[37–39] Given that rural populations are poorer, live further from health providers, face higher out-of-pocket costs and have poorer health status than metropolitan populations, affordability of PHC is especially important for this group.[40]

Access dimension 4 – accommodation

Accommodation is the way in which PHC resources are organised in relation to consumer ability to contact, gain entry to and navigate the system at times of need.[10] This dimension therefore concerns the separation of PHC provider and consumer by PHC organisational factors which must be negotiated (e.g. the physical environment of the health service, meeting eligibility criteria, navigating appointment systems and the level of integration and coordination of PHC services) as well as organisational obstacles for the consumer (such as fitting in appointments around work, family and social commitments). The significance of accommodation is greatest for consumers with the most complex problems requiring integrated care from multiple providers, and consumers who have difficulty negotiating appointment systems or who lack capacity to organise themselves to attend an appointment.[39,41]

Access dimension 5 – timeliness

Timeliness involves the extent to which PHC is sought, offered and received within a time frame that is considered optimal in terms of achieving the best consumer health outcomes. It therefore refers to the degree of separation by time between health care providers and health care consumers, relative to the urgency of the PHC need. Populations for whom this dimension is most important include those requiring the most urgent PHC or those who are more likely to face time delays in receiving care, including rural and remote populations where delays may be more likely to occur as a result of travel time, reduced availability of PHC providers relative to need and the use of periodic visiting service models.[42]

Access dimension 6 – acceptability

Acceptability relates consumer attitudes and beliefs about their health to the personal and practice characteristics of providers (e.g. age, gender, religion, ethnicity, culture). These attitudes and beliefs are tightly linked to the respective social and cultural backgrounds of consumers and are demonstrably different for rural compared with urban consumers.[43,44] Acceptability additionally encompasses health care provider attitudes towards the health and personal characteristics of clients.[10] The social and cultural attitudes of providers manifest at different levels of the health system – with individual clinicians, or in the way health services or health systems are organised – and may act to either include or exclude certain consumer subgroups from receiving PHC. The extent to which the PHC service has the capacity to meet the sociocultural needs of consumers is therefore a key question for policy-makers.

Acceptability is important generally, but of most importance where there is a large disparity between the beliefs and attitudes of providers and consumers, for example due to differing ethnic, cultural or religious backgrounds. Most frequently, it is realised when there is a lack of choice of provider available, for example when a female practitioner is strongly preferred but only a male available. Acceptability is of great importance to Indigenous Australians.[45] It is also important to rural and remote consumers more generally because of the limited choice of providers and the high proportion of rural and remote PHC providers who are overseas trained.[34]

Access dimension 7 – awareness

Awareness refers to the communication of health and health system information between health services and consumers. It is most important for consumers who lack knowledge about their health and are unfamiliar with health services available to them. Consumers new to an area or living a long way from their PHC providers are less likely to be aware of health services, as are those who have cognitive impairments or other communication difficulties, including language and literacy barriers.[46] A key issue for policy-makers is therefore to determine the extent to which rural and remote consumers are engaged within their community and understand their personal health issues and what PHC services are available to address these.

Table 3 summarises key questions which policy-making must address to ensure adequate access to PHC for rural and remote consumers.

What are the policy implications regarding provision of PHC in rural and remote areas?

This section provides a framework (shown in bold in Table 4) which PHC policy-makers can use to evaluate how well the various dimensions of PHC access are being addressed in a population of interest. We populate the framework using current Australian national rural and remote PHC policy as an illustrative example. The framework could equally be applied in another country at either a national or a regional level.

TABLE 3: *Key questions policymakers must address to ensure reasonable rural and remote PHC access*

Access dimension	Key policy question
Availability	• Are sufficient core PHC services available to consumers in rural and remote communities?
Geography	• How easily can consumers in rural and remote communities get to PHC services, or services be delivered to consumers?
Affordability	• How easily can consumers in rural and remote communities afford PHC services?
Accommodation	• Is the PHC service organised in such a way that suits the context from which the consumer comes?
Timeliness	• Is the PHC service easily obtained in a timely way?
Acceptability	• How well does the PHC service meet the sociocultural needs of consumers?
Awareness	• How well do consumers understand their health issues and the PHC services available to them?

PHC, primary health care.

Our analysis reveals that major Australian policies addressing availability of PHC focus on developing infrastructure, and expanding new entries to the health workforce through increasing skilled migration and boosting student doctor training numbers. In contrast, efforts to improve availability through enhanced worker productivity, reduced workforce attrition, health worker substitution (such as nurse practitioners and physician assistants) or shaping demand for PHC have been relatively minor. Also apparent is a lack of policy attention to strengthening the supply of nursing and allied health professionals.

Policies seeking to overcome geographical barriers to accessing PHC have mainly been directed at bringing PHC services to consumers through improving workforce distribution, introducing alternative models of intermittent service delivery, for example through fly-in fly-out services or hub-and-spoke PHC models, and through telehealth initiatives. Anticipated demographic changes, including population ageing, reduced personal mobility, together with an expected decline in informal carers, bring with them an added need for policy-makers to begin systemically addressing the mobility of PHC consumers or risk the most vulnerable groups not being able to physically get to even highly proximate basic PHC.

Policies addressing the affordability of PHC tackle the direct costs of PHC, mainly through the Medicare Benefits Schedule (MBS), the Pharmaceutical Benefits Schedule (PBS) and to a lesser degree through the Pharmaceutical and Extended Medicare safety nets. However, national policy linking MBS rebates with consumer ability to pay is limited, and there is no price ceiling for a health provider visit. Pharmaceutical benefits, while linked with consumer ability to pay, cover a restricted range of pharmaceutical products, leaving consumers exposed to paying upfront market costs for pharmaceuticals not covered by the PBS, and claiming back a proportion of costs once the safety net threshold has been reached. A lack of consistent national policy addressing indirect costs of PHC is also evident, particularly those related to overcoming the increased costs of transport incurred by rural consumers.

National policies tackling the dimension of accommodation have recently focussed on improving the integration and coordination of care, for example through Medicare Locals, co-locating PHC professionals at General Practitioner (GP) Super Clinics and the introduction of personally controlled electronic health records.[14,47,48] Mostly, however, policy initiatives directed at improving how PHC delivery is organised occur at the individual health service level and, as such, lack a consistent and coordinated approach. The issue of consumer capacity to adapt to the organisation of PHC is largely unaddressed within the PHC policy arena.

Timeliness is recognised at the national PHC policy level through GP accreditation processes which require provision of timely care and advice.[49] While national policy targets a provision of timely emergency PHC outside of normal hours, individual health services mostly formulate their own policies to manage assessment of urgency of need and scheduling of appointments within usual hours. However, national policy which systemically addresses the provision of timely PHC within usual hours is lacking.

There is some attempt to address the dimension of acceptability at a national level through funding cultural awareness programs and targeting increased representation of minority groups in the health workforce. Community participation structures have also been used to improve community engagement and strengthen the acceptability of health services and providers to consumers, most notably within Aboriginal Community Controlled Health Services, many of which are exemplars of high acceptability. The delivery of PHC by private practitioners working within privately owned GP premises, however, presents a policy-making challenge because of wide variations in the appreciation of the existence, importance and impact of mechanisms for increasing acceptability by private practitioners.

TABLE 4: *Framework for evaluation of PHC policy against dimensions of access [Acronyms shown on next page]*

Access Dimension	Dimensional components	Major national health policies	Key features of existing policies
Availability	*Volume and type of services:* i. Health facility ii. Provider – Current providers – New entries – Attrition	 • PHC infrastructure grants (NRRHIP), ACCHSs • increased generalist training • skilled immigrant visas • provider substitution (e.g. NPs, PAs)	• over-reliance on internationally trained graduates • training policies have long lag time • lack of national coordination • limited efforts to reduce attrition or improve productivity (e.g. through provider substitution) • limited policy attention to non-doctor PHC professions • training generalists to enhance workforce flexibility
	Consumer need	• Medicare Locals to assess and address regional consumer health care needs	
Geography	*Proximity of health facilities and providers* – Services to consumers	 • specific workforce incentives and support to practice in rural areas • funding support for residential aged care and home visits • visiting services (eg. RFDS clinics), hub-and-spoke models • 24-hour telephone triage (e.g. healthdirect Australia)	• comprehensive targeting of training pipeline, but long lag • targeting of current providers restricted by provider type • consumer mobility unaddressed • lack of adherence to medical school rural entry quotas • incentives linked to geographical classification system rather than existing provider distribution
	Mobility – Consumers to services	• fly out PHC maternity services for very remote patients	
Affordability	*Costs of services* – Direct/Indirect	 • PHC billing subsidies (MBS, PBS) • safety nets	• no price ceiling on consults • indirect PHC costs not addressed • upfront payment precedes safety net claims • MBS rebate links to provider type • fees weakly linked to ability to pay
	Ability to pay	• means tested PBS entitlements	
Accommodation	*Flexibly organised health service (including eligibility criteria, operation of booking systems, integrated care)*	• private practice 'closed books' • walk-in appointments • Medicare Locals, Super Clinics, State- funded co-location models of care • PCEHR's, e-health records	• eligibility gaps (no obligation to accept patients) • lack of funding and incentives for electronic connectivity for non-GP PHC providers • Medicare Locals focus on better integration of PHC
	Adaptability of consumers		

TABLE 4: (continued)

Access dimension	Dimensional components	Major national health policies	Key features of existing policies
Timeliness	*Health service factors affecting timely PHC:* – Phone triage capacity – Appointment scheduling – After hours care	• GP accreditation • after hours initiatives	• lack of performance measurement and incentives to improve • current move to new after hours arrangements (Medicare Locals) • risk that an added layer of bureaucracy further delays care
	Urgency of PHC need		
Acceptability	*Health service staff and health provider beliefs and attitudes*	• RAPTS Cultural competency training • Indigenous scholarships, National Indigenous Health Workforce Training Package	• private delivery of PHC and lack of direct incentives or disincentives limit possibility of community participation • Medicare Locals are not scoped to address community participation
	Consumer beliefs/attitudes	• community participation structures, ACCHSs, • gender-specific health programs	
Awareness	*Provision of information about health, health services and providers*	• translating and interpreting services • Medicare Locals' role in information sharing	• limited policy reducing PHC system complexity and health literacy demands on consumers • policy targets improving provision of health and health service information using different media and improving literacy especially among high risk individuals
	Consumer knowledge and understanding of their health and health services	• chronic disease self-management strategies • PCEHRs and health information policy procedures • case management	

Note: Health service characteristics (not shaded) and population characteristics (shaded) are separated within each dimension as shown by shading.
Acronyms used in Table 3:
ACCHSs Aboriginal Controlled Community Health Services
GP General Practitioner
MBS Medicare Benefits Schedule
NPs Nurse Practitioners
NRRHIP National Rural and Remote Health Infrastructure Program
PAs Physician Assistants
PBS Pharmaceutical Benefits Schedule
PCEHRs Personally Controlled Electronic Health Records
PHC Primary health care
RFDS Royal Flying Doctor Service
RAPTS Recruitment, Assessment, Placement, Training, Support for International Medical Graduates.

Policy directed at improving PHC access through enhanced awareness mostly focuses on providing better information to consumers, through strategies that include nationwide free access to telephone interpreter services for doctor–patient consultations. It remains to be seen how effective recent policy efforts to improve PHC system integration are in reducing the health literacy demands on consumers.

Having examined major PHC policies against each of the dimensions of access, it is also instructive to appraise policies according to how well they target health service characteristics and population characteristics. In

Table 4, health service characteristics and population characteristics are separated by a broken line for each of the access dimensions, revealing that PHC policy-making overwhelmingly targets rural and remote health service characteristics in preference to population characteristics. This constitutes a potentially significant risk, especially to the most vulnerable and needy populations, who may well remain disempowered, with limited ability to access basic PHC.

Discussion

Access remains a critically important aspect of health systems designed to ensure the equitable provision of adequate and appropriate PHC. Policy-makers must recognise that the concept of access is complex, and it represents a 'package' of distinct dimensions. Each of these must be addressed in order to provide effective PHC to rural and remote populations and achieve more equitable health outcomes. Too often, only a few dimensions of access are considered in policies, or attention is focussed on health system characteristics and disregards the fit with population characteristics. These approaches may lead to incomplete and ineffective provision of PHC in rural and remote areas and persisting poorer health outcomes. By identifying key policy questions for each dimension of access, this paper helps policy-makers consider all key aspects of access. Importantly too, we propose a framework for evaluating policy across the different dimensions of access and demonstrate its use. While Australian national rural and remote PHC policy examples are used for illustrative purposes, the framework can be applied to other populations and health policy contexts. Used in this way, the framework is potentially a very powerful means of helping policy-makers and consumer advocates take a structured, systematic approach to addressing complex problems of ensuring fair and reasonable access to health care for our most marginalised populations.

Recognising the many constraints under which policy-makers operate (such as the scarcity of resources, the resultant need to prioritise funding allocation and the political risks associated with different priorities), we acknowledge that some dimensions of access are likely to be considered by both providers and consumers to be more important than others, depending on the specific type of health care required and the particular context within which PHC is sought.[11,16] Australian rural and remote populations are diverse and have differing needs for PHC.[44] Therefore, it is difficult to make generalisations about the relative importance of dimensions of access, other than to indicate that the basic structural elements of availability and geography must first be present before other aspects of access can be considered. For many rural and remote Australian communities, these fundamental aspects of access are far from assured.

Undeniably, of further interest to policy-makers is knowledge and understanding of how the various dimensions of access fit together and interact with the important social, biological and environmental determinants of health, which in combination form the overarching model of the pathways to utilisation (realised access) and ultimately to health outcomes.[33] While acknowledging the importance of utilisation to health outcomes, this paper has deliberately not discussed these issues, nor has it addressed questions of how different interpretations of access impact upon the equity of provision of rural health services and health outcomes for rural and remote populations. These issues will be addressed as part of an ongoing research program of the Centre for Research Excellence in Rural and Remote Primary Health Care.[50]

Conclusion

It remains essential for policy-makers to develop an improved understanding of how access policy is applied across the multiple dimensions of access, and the extent to which policy targets population and health system characteristics. Use of the recommended framework can help enable policy-makers to comprehensively and effectively address unacceptable inequities in health outcomes and access to basic health services experienced by rural and remote Australians.

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This publication identifies *availability* and *geography* as dimensions of access that are of fundamental importance for rural or remote populations seeking PHC. As indicated in Chapter 2, the availability and geographical distribution of PHC providers has historically been inequitable, contributing to poorer health outcomes for rural and remote populations, not just in Australia, but in many countries across the globe. A substantial reduction in the geographical maldistribution of PHC workers requires improvements in the recruitment of PHC workers to rural and remote areas as well as improvements in their retention.

Bringing about meaningful changes in rural and remote PHC worker recruitment and retention necessitates policy interventions (at many different levels of the health system), due to the susceptibility of health care markets to 'market failure' (see also Chapter 2, Sub-section 2.3.1) and the shared understanding that health care is a 'merit good'. Given this important role of health workforce policy in correcting market failure and ensuring equitable access to PHC for rural and remote populations, it is critical that health workforce policy-making, at all levels of the health system, is well-informed by a sound evidence-base. It is especially important that the evidence-base carefully distinguishes between recruitment and retention, as factors affecting each of these components of supply differ, and policy interventions must therefore also differ accordingly. Unfortunately much of the extant evidence has not distinguished between current stocks, recruitment and turnover or retention sufficiently well, hence the need for the research undertaken in this thesis, with its specific focus on rural and remote PHC worker turnover and retention.

8.2 Main findings

The intention of this thesis, was

> *To understand the patterns, determinants and metrics of rural and remote Australian primary health care workforce turnover and retention, with a view to developing appropriate indicators and benchmarks to support rural and remote health service workforce retention and inform rural and remote health workforce policy-making.*

This aim fits well with the recently published *"National Rural and Remote Health Workforce Innovation and Reform Strategy"* (Health Workforce Australia, 2013b) which outlines a key principle for health workforce innovation and reform: to promote *evidence-based* workforce reforms that support workforce retention. The research of this thesis contributes to the development of this much-needed evidence-base in three distinct ways.

Firstly, there are methodological contributions. The research of this thesis provides guidance for workforce planners, policymakers and researchers on how best to measure health worker retention in rural and remote contexts. This contribution is detailed in Sub-section 8.2.1, where the use of a 'package' of metrics is highlighted as a key requirement for developing a full and comprehensive understanding of PHC worker retention in rural and remote areas. A further methodological contribution, detailed in Sub-section 8.2.4, is the demonstration of how to develop rural and remote PHC workforce retention benchmarks that take account of different contexts or organisational characteristics such as profession and geographical location, using empirical data.

Secondly, this thesis contributes new empirically derived knowledge. This knowledge includes how the retention of various types of rural and remote Australian PHC workers differs according to geographical location and population size. New empirical knowledge of associations between rural and remote PHC worker retention and a range of other factors, including professional and organisational factors, regulatory, personal and financial factors, are a further contribution. These contributions are detailed in Sub-sections 8.2.2 and 8.2.3.

Thirdly, this thesis provides a framework that workforce planners can adopt or adapt as the basis for bringing about improvements to PHC worker retention. This contribution is detailed in Table 8.5 and Section 8.5.

The distinctive contributions of the research and empirical evidence reported in this thesis add significantly to the evidence-base that Australian rural PHC workforce policymakers have necessarily relied upon until now. A number of specific features distinguish this research.

- Firstly it is conducted specifically on Australian rural and remote PHC professionals, and therefore problems associated with generalisation from international contexts that are dissimilar to the Australian rural and remote PHC context are avoided.

- Secondly, this research extends beyond the medical profession, to capture retention patterns and determinants amongst other important PHC professions, including nurses, various allied health professions, AHWs and health service managers who also play a leading role in delivering PHC to rural and remote Australians. This is a feature that is rare, even within the international literature, despite the increasing importance of other types of PHC providers in providing comprehensive PHC services in rural and remote settings.

- Thirdly, this research measures the *actual* retention of PHC workers, rather than relying on inferences drawn from PHC worker intentions about staying or leaving. As demonstrated in the literature review in Chapter 3, only a small number of international studies have taken this methodological approach. These, however, have provided policymakers with a powerful statistical basis for informing policy change.

- A fourth, and important feature of the body of research comprising this thesis has been the extensive utilisation of existing health workforce data, demonstrating that the evidence-base to better inform rural and remote PHC workforce policy-making has the potential to be substantially strengthened with a comparatively small investment in analytical and reporting capabilities.

The research questions investigated by this thesis are:

1. What PHC workforce turnover and retention metrics are best suited for use in rural and remote Australian contexts?

2. What does use of these metrics reveal about patterns of turnover and retention amongst the rural and remote Australian PHC workforce, including any variation according to profession and geographical location?

3. What is the magnitude, direction of association and relative importance of factors associated with rural and remote PHC workforce turnover and retention?

4. What are appropriate benchmarks for reasonable length of stay for the rural and remote Australian PHC workforce, that take account of differences according to profession and geographical location?

The specific findings of each academic publication have already been presented in the publications themselves, and in a summary section in the chapter in which each academic publication appeared. It is not the purpose of this chapter to re-iterate these findings publication by publication, but rather to integrate these findings according to the thesis objectives, and to investigate their implications for policy-making. Nevertheless, it may be useful for the reader to refer to a summary of the findings of each paper, and so this is provided in Table 8.1. Throughout the remainder of this chapter each publication will be referred to by the number of the order in which it appeared in this thesis (and as numbered in Table 8.1).

Table 8.1 Summary table of publications in this Thesis and key findings of each publication

Publication number, title, citation and thesis chapter in which it is found	Key Findings
1. *'How Best to Measure Health Workforce Turnover and Retention: Five Key Metrics'* (Russell, Humphreys, et al., 2012) CHAPTER 5	Five key workforce turnover and retention metrics are identified as being well suited for use in rural and remote PHC settings. These are crude turnover rates, stability rates, survival probabilities, median survival and Cox proportional hazards ratios. Whilst each of these metrics has specific strengths and weaknesses, the limitations of a single metric can be reduced by using it in conjunction with other metrics. The use of these five metrics as a 'package' additionally provides a more comprehensive picture of PHC worker turnover and retention patterns than does the use of any single metric.
2. *'What Factors Contribute Most to the Retention of General Practitioners in Rural and Remote Areas?'* (Russell, McGrail, et al., 2012) CHAPTER 6	A range of financial and economic, professional and organisational, and community and location factors are associated with the retention of rural GPs, after adjusting for the effect of GP age. Practice ownership, registrar status, hospital work and restrictions on practice location are the most important factors associated with GP retention. Other significant factors are geographical location and population size (as measured by RRMA), procedural skills, annual leave, workload and practice size. There was mixed evidence for a significant association between retention and gender or GP availability for on-call work. IMG status, proximity to the coast and proximity to private schools were not significantly associated with GP retention.
3. *'The Value of Survival Analysis for Evidence-based Rural Medical Workforce Planning'* (Russell, Humphreys, McGrail, et al., 2013) CHAPTER 6	A range of professional and organisational factors, and location factors are associated with the retention of rural and remote NSW GPs. These are community population size and geographical remoteness, coastal proximity, being a proceduralist, VMO rights, country of training, conditional visas, GP age. The use of survival analysis demonstrated the measurement of the relative hazard of leaving for different groups of GPs, and provided predictions of median survival. That is, how long, on average, GPs with certain characteristics might stay in a community with specified characteristics.

Publication number, title, citation and thesis chapter in which it is found	Key Findings
4. *'Measuring Rural Allied Health Workforce Turnover and Retention: What are the Patterns, Determinants and Costs?'* (Chisholm et al., 2011) CHAPTER 7	Profession and grade are quantitatively important determinants of allied health turnover. Differences in retention according to geographical location emerge between 12 and 24 months after employment commencement. Substantial costs are associated with recruiting AHPs. Replacement costs differ according to geographical location.
5. *'What is a Reasonable Length of Employment for Health Workers in Australian Rural and Remote Primary Healthcare Services?'* (Russell, Wakerman, et al., 2013) CHAPTER 7	Differences in health worker retention patterns by geographical location and profession are most evident after the first six months through until the end of the second year of employment. Health worker retention benchmarks that differ according to geographical location and profession are proposed.
6. *'Helping Policy-makers Address Rural Health Access Problems'* (Russell, Humphreys, Ward, et al., 2013) CHAPTER 8	Key goals of health systems are to ensure equitable outcomes in a cost-effective way. Provision of PHC services is important in reaching these goals. Ensuring adequate access to PHC for rural and remote populations requires health system and population characteristics to be addressed across each dimension of access. Spatial dimensions of access (availability and geography = spatial accessibility) are especially important for rural populations.

8.2.1 Research Question 1: What PHC workforce turnover and retention metrics are best suited for use in rural and remote Australian contexts?

This research question was addressed in Chapter 5 and in the peer reviewed publication presented in Chapter 5 (publication 1) which identified and critically appraised a suite of five key metrics for the measurement of PHC workforce turnover and retention in rural and remote Australian PHC contexts (Russell, Humphreys, et al., 2012). Other publications (publications 3, 4 and 5) subsequently demonstrated the use of some or all of these metrics within the rural and remote Australian PHC workforce policy-making context (Chisholm et al., 2011; Russell, Humphreys, McGrail, et al., 2013; Russell, Wakerman, et al., 2013). The five workforce turnover and retention metrics identified and appraised were: crude turnover (separation) rate, stability rate, survival probabilities, median survival and Cox proportional hazard ratios.

Specific strengths and weaknesses of each metric were identified and their use demonstrated using data from payroll records of nurses, AHPs, doctors, AHWs and health service managers working in Australian rural and remote health services. It was found that the information provided by the calculation of a single metric could be complemented by information provided by the calculation of additional metrics, and that using a suite of metrics, rather than a single metric not only provided additional and more comprehensive information that was of high interest to policymakers, but was able to overcome some of the limitations associated with the use of single metrics in isolation. Nevertheless, in recognition of the resourcing implications of having a multitude of indicators, this basket of indicators was confined to those that were likely to be of greatest use from a workforce planning and policy-making perspective. It is acknowledged that workforce planners may choose specific metrics from this suite of five metrics, depending on their particular needs and the resourcing available to them.

Having said this, it was found that metrics derived from survival analysis, especially median survival and Cox proportional hazards ratios, are particularly useful, as they provide a single summary statistic of complex information in a format that is understandable and relevant for many policy-making purposes. Survival analysis methods were also found to have substantial advantages within the context of rural and remote PHC workforce research, because the use of available data is maximised (for example, incomplete data on PHC workers still providing health services can be included in the analysis). Furthermore, different retention profiles of interest can be specified in a flexible way and regression analogues can be applied to survival data. This allows the contributions of different variables to PHC worker retention to be teased out, and the magnitude and statistical significance of any differences in retention to be calculated.

Publication 3 (Russell, Humphreys, McGrail, et al., 2013) demonstrated the use of an additional retention metric calculated using survival analysis: predicted median survival (see Table 4 in publication 3). This metric, too is well-suited for use in rural and remote Australian contexts, although has only rarely been used. As shown in the publication, results from regression modelling of actual survival data can be used to predict how long, on average, PHC workers with varying characteristics will be retained. Publication 3 also applied repeated measures survival analysis methods to the rural PHC workforce data. This was a methodological innovation not apparent in the extant literature reviewed in Chapter 3, but which further optimises study size by capturing and analysing data on more than a single stint of rural or remote PHC practice. In this regard, metrics derived using repeated measures survival analysis approach may be especially suited for use in rural and remote PHC settings which are otherwise frequently limited by small study size.

As indicated above, publication 1 makes an important contribution towards understanding how best to measure PHC worker turnover and retention in rural contexts and this is complemented by the research in publications 3, 4 and 5. As such, the research of this thesis, and especially publication 1, has the potential to be key resource for workforce policymakers and planners. It is the findings of publication 1 which largely informed the research design and methodology undertaken in this thesis, and contributes methodologically to future research endeavours in this field.

8.2.2 Research Question 2: What does use of these metrics reveal about patterns of turnover and retention amongst the rural and remote Australian PHC workforce, including any variation according to profession and geographical location?

This research question was addressed in each of the 4 research papers in Chapters 6 and 7 (publications 2, 3, 4 and 5).

i. Variation according to geographical location

Publication 2 (Russell, McGrail, et al., 2012) revealed significant differences in the retention of Australian GPs (in a rural practice) according to the remoteness of a geographical location and town population size. On average, retention was longer in rural towns than in remote towns. Retention was approximately 50% longer in small rural towns (RRMA 5) compared with small remote towns (RRMA 7). Retention was longer still in large rural towns (RRMA3) (about 85% longer than in small remote towns).

Publication 3 (Russell, Humphreys, McGrail, et al., 2013) also demonstrated statistically significant and substantial differences in NSW GP retention (in a rural community) according to geographical location and town population size, with a gradient in risk of leaving small communities (<5,000 population size) that increased with increasing geographical remoteness. The risk of GPs leaving outer regional small communities was 1.33 times the risk of leaving inner regional small communities. However, the risk of GPs leaving remote small communities was much greater again, at 2.65 times the risk of leaving inner regional small communities. There was no significant difference in the retention of GPs in larger communities (≥5,000 population size) located in outer regional or inner regional NSW compared with small inner regional NSW communities.

Publication 4 (Chisholm et al., 2011) reported data indicative of differences in AHP turnover and retention (in a rural health facility) according to community population size and geographical location. Differences in retention according to these factors became evident between 12 months and 24 months of AHP commencement at the facility. Although differences in the hazard of leaving according to RRMA were not statistically significant, in the Cox proportional hazards modelling it was estimated that the risk of leaving for AHPs working in health services located in small rural and remote locations (population size<10,000) was 1.28 times the risk of leaving facilities located in middle sized rural towns (population size 10,000-24,999).

Publication 5 (Russell, Wakerman, et al., 2013) reported that significant differences in retention according to geographical location and population size were evident for nurses but not for AHPs, and not overall, although sampling was restricted to PHC workers in RRMAs 5 (other rural areas population size<10,000), 6 and 7 (remote areas). These differences in retention were not immediately apparent but took time to emerge – up to 6 months for nurses.

ii. Variation according to PHC worker profession

Publication 4 (Chisholm et al., 2011) reported significant differences in the risk of Victorian AHPs leaving (a health facility) according to allied health profession. The risk was greatest for podiatrists, and least for occupational therapists, after adjusting for demographic and professional differences between the two groups. Podiatrists had in excess of twice the risk of leaving (Hazard Ratio 2.13) compared to occupational therapists. Examination of the graphed survival data indicated that the differences according to profession were evident from PHC worker commencement of employment and appeared to be sustained throughout the duration of employment.

Publication 5 (Russell, Wakerman, et al., 2013) reported significant differences in retention (in a rural or remote health facility) according to health profession: health service managers had the lowest risk of leaving, nurses and AHWs had an intermediate risk of leaving, and doctors and AHPs had the highest risk of leaving. As an indication of the magnitude of these differences, the hazard ratios were approximately 0.76, 1.00 and 1.80 respectively. Thus the differences in retention according to health profession were not only significant, but also substantial. Differences in retention between nurses and AHPs were not immediately apparent but began to emerge after the first 6 months of employment, and were sustained throughout the duration of employment.

iii. Summary and integration with existing evidence

The findings emanating from the research undertaken in this thesis amongst different populations of Australian rural and remote PHC professionals are generally consistent. Retention is demonstrated to differ substantially according to the health profession of the PHC worker, with rural and remote PHC workers from some professions being retained for up to twice as long as other professions. Whilst the underlying reasons for these differences have not specifically been examined in this thesis, it is probable that certain professional and organisational factors such as differences in career pathways and career opportunities contribute. Amongst the allied health professions there are important differences in opportunities for private practice which may in part explain why the retention of Podiatrists, for example, was found to be shorter than the retention of Occupational Therapists. Previous research has examined differences in actual retention according to medical specialty (Cullen et al., 1997; Horner et al., 1993; Pathman et al., 1992). However, the literature review revealed a lack of existing studies comparing retention of PHC workers across different professions. The research of this thesis therefore stands apart from the extant literature in its investigation of the association between PHC worker profession and their actual retention in rural and remote locations.

The research of this thesis also demonstrates that PHC worker retention differs substantially according to geographical location and population size: rural and remote PHC workers in small remote communities have a far higher risk of leaving compared to those working in inner regional communities. Analysis revealed that differences according to geographical location and population size may not be immediately apparent (upon commencement of employment), but instead may emerge some months after employment commencement. This observation may explain why, in some of the studies (publications 4 and 5), differences according to geographical location and population size did not attain statistical significance. It may also partly explain why, in another study (publication 2), geographical location and population size, whilst statistically significantly associated with GP retention, did not explain a large proportion of the variance in GP retention, and was therefore considered to be of lesser importance than certain professional and regulatory factors. The patterns of turnover and retention are consistent even though the specific rural and remote retention profiles examined in the studies varied, and included retention in a practice, retention in a community, and retention in a health facility.

Most existing research has compared differences in US physician or physician assistant retention in rural compared with urban counties (Horner et al., 1993; Larson et al., 1999; Singer et al., 1998). Studies which differentiate retention according to either the remoteness of a geographical location or the population size of the community or both are scant. A study by Thommasen of 1,979 Canadian family physicians and GPs found that community population size was associated with retention in non-metropolitan British Columbia, a finding consistent with the research of this thesis (Thommasen, 2000). Pathman et al., however, found mixed results when investigating whether working in a rural county adjacent to a metropolitan county was associated with the retention of USA physicians in underserved areas, perhaps reflecting differing effects of market competition in the USA health system and that the variable may not measure remoteness well (Pathman et al., 2004). The only other Australian study which compared retention according to geographical location found variation in the retention of nurses and midwives employed by the NTDH&F (Garnett et al., 2008). Garnett and colleagues found that stability rates for nurse and midwives in the non-remote community health sector were higher than in the remote health sector. However, the differences may have been due to variation in facility type, as the non-remote community health sector comprised nurses and midwives providing services at a range of facilities including mental health, alcohol and drug, and urban community health facilities. Additionally, no testing for statistical significance was undertaken in this study. Once again, therefore, the research of this thesis represents a valuable addition to what is currently known about associations between geographical location and population size, particularly as it applies to the Australian context.

8.2.3 Research Question 3: What is the magnitude, direction of association and relative importance of factors associated with rural and remote PHC workforce turnover and retention?

This research question was addressed in three peer reviewed publications in Chapters 6 and 7 (publications 2, 3 and 4). The factors associated with PHC worker retention (excluding geographical location and PHC worker profession which are considered separately in Sub-section 8.2.2) can be grouped using the same categories as used for the literature review: financial and economic factors, professional and organisational factors, educational and regulatory factors, personal and family factors, and community and location factors. It is acknowledged that there are considerable overlaps between these categories. For example, practice ownership, employment grade, undertaking hospital work and undertaking procedural work can each be considered as professional and organisational factors. However each of these factors may well also reflect a higher level of financial rewards, and could therefore arguably be categorised as a financial and economic factor. So too, having procedural skills additionally reflects an education in surgery, anaesthetics or obstetrics, and could therefore arguably be categorised as an ‘educational and regulatory’ factor. Despite these limitations in the categorisation of variables, these categories present a useful way of organising the findings of this research, and shall be used in this section.

A. Financial and economic factors

The association between GP source of income and PHC worker retention in rural and remote Australia was investigated in this thesis, although as mentioned above, other variables investigated may also be indirect indicators of financial and economic factors. The association between income source and GP retention was reported in publication 2, wherein analysis of data from the National Minimum Data Set for rural and remote GPs showed that payment via fee-for-service was associated with longer retention of GPs in their current practice. Not only was this association statistically significant, but payment via fee-for-service had a moderately strong association with longer retention (effect size estimated to be approximately 1.5). In contrast, government salaried GPs experienced significantly shorter retention than average (effect size estimated to be approximately 0.8). However, these findings reflect differences in practice settings (GPs in private practice are paid mainly through fee-for-service, GPs in government positions are paid via salaries or a mix of salary and fee-for-service) and the variable does not necessarily correlate with gross income. This variable could therefore arguably be considered as a professional and organisational factor.

This thesis did not investigate any associations between financial incentives offered to students (for example, as a rural scholarship) or retention incentives offered to practising rural and remote PHC workers. Whilst some data were available for recipients of MRBSs, the long lag time between receiving scholarships and completing service obligations meant that subsequent rural retention could be measured for too few recipients. No variables measuring the level of payment of retention incentives for PHC workers were available in the datasets used for the analyses undertaken in this thesis.

B. Professional and organisational factors

Associations between a range of professional and organisational factors and PHC worker retention in rural and remote Australia were investigated in this thesis. Explanatory variables examined included the structure of the business (principal, associate, contractor, salaried), provision of hospital services, practising advanced procedural skills in surgery, anaesthetics or obstetrics, the amount of annual leave taken, the total number of hours worked each week (excluding on-call) as an indicator of workload, practice size, grade of employment of AHPs, and availability for on-call duties.

GP Practice ownership was strongly associated with longer retention than average (Odds Ratio 1.72), whilst contractors and salaried GP employees had moderately shorter retention than average (Odds Ratios 0.68 and 0.72 respectively).

Undertaking hospital work was significantly associated with longer retention of rural and remote GPs. This finding was observed in the population of rural and remote GPs captured by the National Minimum Data Set, in the MABEL national sample of GPs and also in the population of NSW rural and remote GPs. Estimates of the effect of hospital work on retention varied from approximately 20% increase in retention (MABEL data, publication 2) to approximately 50% higher hazard of leaving for those without hospital visiting rights (NSW rural and remote GP data, publication 3).

Practising procedural skills was significantly associated with longer retention of rural and remote GPs. This finding was observed in the population of rural and remote GPs captured by the National Minimum Data Set (publication 2) and also in the population of NSW rural and remote GPs (publication 3). Procedural work was associated with 26% longer retention amongst the national population of GPs, whilst NSW GPs without procedural skills had a 46% increased hazard of leaving rural and remote communities.

Annual leave was found to be significantly associated with length of stay of Australian GPs in their current job (publication 2), with each week of annual leave that was taken having an estimated effect of between 3 and 7% longer retention. Whilst the effect size of each week is small, if this can be extrapolated to 4 or 6 weeks' annual leave taken, the additive effect size could potentially be quite substantial. These findings of small to moderate association between annual leave and retention were observed in two separate sets of data – the National Minimum Data Set and the MABEL data, but were not tested in the longitudinal study of NSW rural and remote GPs due to the variation in the number of weeks' leave likely to be taken over the ten year time frame of the study.

Workload, too, was only investigated in the two cross-sectional analyses (publication 2) of Australian GPs, due to its likely variability over time. Results of analyses indicated that this variable may best be modelled as a categorical variable, as the associations of hours worked with retention do not appear to be linear. Results indicate, perhaps somewhat counter-intuitively, that as the number of hours worked each week increases, so too does the length of stay of GPs in their current practice, up to the point where they are working in excess of 75 hours per week. At this very high workload, retention reduces (though even then, it is not significantly different from average GP retention). Retention is significantly and substantially (27%) lower than average for part-time GPs, and significantly and substantially (23%) higher for GPs working between 60 and 75 hours per week.

A single analysis, using MABEL data (publication 2), revealed a small but statistically significant association between GP practice size and the retention of rural and remote Australian GPs. The evidence for an association between being available for on-call and GP retention was, however, mixed. The MABEL data estimations found a small positive but non statistically significant association with length of stay in current practice (effect size 1.09 MABEL Model 1), whilst the estimations using the National Minimum Data Set for rural and remote GPs found that availability for on-call had a statistically significant and moderate association with length of stay in current practice (effect size 1.36 National Minimum Data Set Model 1). The smaller size of the MABEL sample of GPs included in the modelling (n=735) compared with the National Minimum Data Set model (n=1592) may partially explain why on-call was statistically significant in one model but not the other. It is also possible that differences in the wording of MABEL and NSW Rural Doctors Network survey questions about on-call may contribute to the differences. The MABEL Wave 1 survey asked GPs "Do you do any after hours or on-call yourself?" thereby not distinguishing between after-hours work (which may, for example, be provided as a regular evening or weekend clinic) and on-call services. The NSW Rural Doctors Network GP survey, on the other hand, asked "How many hours per week are you AVAILABLE on call at the practice or hospital?" and the GP response was coded as a binary variable for analysis.

The only professional and organisational variable found to be significantly associated with AHP retention (other than AHP profession) was employment grade upon commencement (publication 4). This was a strong association, with AHPs employed at grade 1 level having 1.75 times the hazard of leaving compared with AHPs employed at grade 3 (after adjusting for age).

C. Educational and regulatory factors

Associations between a range of educational and regulatory factors and PHC worker retention in rural and remote Australia were investigated in this thesis. Explanatory variables examined included the country of primary training as a PHC worker, regulatory restrictions on practice location, GP Registrar status, age at graduation and year of graduation.

Restrictions on practice location related to conditional registration were shown to have a significant and large association with GP retention in two separate publications. However, the direction of association with retention differs in each publication. In publication 2, analysis of the MABEL data indicated that GPs with restrictions on their practice location had been in their current practice for about half the length of time compared to GPs without such restrictions on their practice location. However, in publication 3, the hazard of GPs with full registration leaving rural and remote communities was found to be approximately 50% greater than the hazard for GPs with conditional registration. Whilst at first glance these two findings appear to be at odds with each other, they are in fact consistent. Each of these studies uses a different retention metric, and this explains why the direction of association of conditional registration with retention differs. Publication 2 reports on length of stay in current practice, whilst the main outcome measure in publication 3 is the hazard ratio (hazard of leaving at any point in time). GPs with conditional registration are likely to have only fairly recently arrived in Australia, whereas those without conditional registration may have graduated and been working in rural or remote Australia for many years. It is therefore unsurprising that GPs with restrictions on their practice location have been in their current practice for a much shorter length of time compared to GPs without such restrictions on their practice location. In this instance, the hazard ratio, as calculated in publication 3, provides a more useful (and perhaps less misleading) retention metric as it contrasts the hazard of leaving a rural community at any point in time (after commencement) according to conditional registration status. Thus, whilst conditionally registered GPs have been in their current practice for a shorter length of time compared with fully registered GPs, conditional registration is also associated with a reduced risk of leaving the community.

Publication 2, using national MABEL cross-sectional data, found that whether or not a GP was trained in Australia or elsewhere was not significantly associated with length of stay in their current practice (after adjusting for the effect of conditional registration). In contrast, longitudinal survival analysis revealed that country of training was statistically significant and moderately associated with the risk of GPs leaving rural or remote NSW communities (publication 3). GPs trained in countries other than Australia, UK, Ireland, Canada, USA or New Zealand were 1.45 times more likely to leave a rural or remote community (after adjusting for the effect of conditional registration) compared with Australian trained GPs. It is not clear why the findings of these two studies differ, however differences in the study designs, retention metrics, retention profile and definitions of IMGs may limit comparability and contribute to these differences.

Two studies in publication 2 examined the association between GP Registrar status and length of stay in current practice. The length of stay of GP Registrars was similar in both data sets, and was approximately half of the length of stay of non GP Registrars. The longitudinal analysis of NSW GP retention in publication 3 specifically excluded GP Registrars because of the regular changes in GP Registrar posts that are required to enable GP Registrars gain sufficiently broad training experiences.

Age at graduation and year of graduation were both found to be not statistically significantly associated with GP retention (publication 3).

D. Personal and family factors

Associations between a range of personal and family factors and PHC worker retention in rural and remote Australia were investigated in this thesis. Explanatory variables examined included PHC worker gender, age, spousal rural upbringing and rural exposures during childhood of metropolitan origin GPs.

Most studies included in this thesis found that PHC worker gender was not significantly associated with retention of either GPs or AHPs (publications 3, 4 and National Minimum Data Set data in publication 2), although the cross-sectional MABEL data indicate that female GPs had been in their current position for significantly longer than male GPs.

Whilst the two studies in publication 2 adjusted for the effects of age, it is inappropriate to rely on these estimations of association of age with retention because of collinearity between these variables. Instead, publications 3 and 4 model the association between retention and PHC worker age in a way which avoids problems of collinearity. The modelling in these papers also categorises age, so avoids problems associated with assumptions of a linear relationship between age and retention. Amongst GPs, retention is highest for those of intermediate age, that is, those born between 1945 and 1970. GPs who were born before 1945 or after 1970 have up to a 45% higher risk of leaving at any point in time compared with GPs born between these years. AHPs who commenced employment in a rural or remote health facility after they turned 35 had a substantially lower risk of leaving employment compared to AHPs who were 30 or younger when they commenced employment.

In univariate analysis only, having a spouse who had experienced a rural upbringing was associated with lower risk that a GP would leave a rural or remote community (publication 3). Similarly, univariate analysis indicated that GPs who were brought up in metropolitan environments but who had experienced frequent rural visits during their childhood experienced similar retention to metropolitan GPs who had not had rural exposures as a child (publication 3).

E. Community and location factors

Associations between several community and location factors and PHC worker retention in rural and remote Australia were investigated in this thesis. Much of the investigation centred on geographical remoteness of a location and community size, and the associations of these community and location factors with PHC worker retention were reported in Sub-section 8.2.1. Additional community and location explanatory variables examined were proximity to private schools and proximity to the coast.

Proximity to private schools was not significantly associated with retention of GPs in rural and remote Australia after adjusting for the effect of remoteness of a geographical location and community population size using the RRMA classification (publication 2, MABEL data). This lack of statistical significance of proximity to private schools in the multivariate model is most likely related to its inverse correlation with the included RRMA variable (higher RRMA locations are less proximate to private schools).

Studies in this thesis also found mixed evidence of a significant association between GP retention and proximity to the coast. Analysis of the MABEL data indicated that proximity to the coast was not significantly associated with GP length of stay in current practice after adjusting for remoteness using the RRMA classification (publication 2). Analysis of NSW GP longitudinal data, however, indicated that proximity to the coast had a small, though statistically significant (Hazard ratio 1.22) association with the risk of GPs leaving rural and remote communities, which remained after adjusting for remoteness using the ASGC-RA classification (publication 3). The reasons for these differences in findings are unclear, however differences in study design (one was cross-sectional, the other was longitudinal), retention metrics (length of stay in current practice in publication 2, hazard of leaving at any point in time in publication 3) and retention profile (retention in a single practice, retention in a community) may each contribute to the disparity. Additionally, differences in the other variables included in the modelling, including, for example, the geographical classification variables used in each study (RRMA which takes population size into account, versus ASGC-RA which doesn't) may also contribute to the differences in findings.

Integration with existing evidence

Overall, a constellation of professional and organisational factors, financial and economic factors, and educational and regulatory factors were found to have a strong association with PHC worker retention. Factors strongly associated with the retention of GPs, included practice ownership, primary income source, undertaking hospital work, regulatory restrictions on practice location, GP age, practising procedural skills and registrar status. AHP grade and age upon commencement of employment were also each independently strongly associated with subsequent retention of AHPs.

Several studies in the extant literature are consistent with the findings from this research that practice ownership has a strong association with the actual retention of PHC workers (Horner et al., 1993; Pathman et al., 2004). However, no other studies in the existing literature specifically examine the association between actual retention and payment via fee-for-service versus salaried payment. Much of the work conducted is on the retention of USA PHC physicians, and has limited generalisability to the Australian context, due to substantial differences in PHC provider payment structures and practice settings in the USA compared to Australia.

International differences in how PHC providers function within the broader health system may also explain the absence of studies in the existing literature which investigate associations between rural retention and VMO status or procedural skills. The moderate to strong associations found between the actual retention of rural NSW GPs and VMO status and procedural skills in the research of this thesis, therefore represents new findings which make a significant contribution not just to NSW and Australian PHC policy-making evidence-base, but also to the international literature.

Similarly, this research found that AHP grade of employment has a strong association with subsequent rural retention of AHPs (AHPs employed at higher grades have substantially lower likelihood of leaving). Unfortunately, grade of employment is not a variable that is investigated elsewhere in the extant literature for its association with the actual retention of PHC workers. The lack of supporting literature is likely to be related to most of the existing studies being conducted amongst PHC physicians who work in a relatively flat hierarchical structure which doesn't utilise grading. Once again, therefore, the findings of this research represent important new knowledge to inform the development of retention strategies for rural Australian AHPs.

The research of this thesis revealed that conditional registration was associated with substantially shorter GP retention in their current practice (perhaps related to relatively recent arrival in Australia), and a simultaneously substantially lower risk of leaving a community compared to fully registered GPs (although the risk of leaving for IMGs was higher once the effect of conditional registration was taken into account). International research on the association between regulatory restrictions on practice location and rural retention by Crouse and Munson found that physicians working under J-1 visa waivers had shorter retention in the long-term compared to physicians working without such restrictions on their practice location (Crouse & Munson, 2006). However, there was no difference in retention patterns for the first two years (whilst the visa waiver was in place). Thereafter, however, steep falls in the proportion of GPs retained at the second and third year anniversary of commencement were evident, indicating that once the restrictions imposed by the visa waiver are lifted, retention falls. Other studies of GPs providing return-of-service in rural and remote areas similarly indicate equal or better retention of obligants during the period of obligation (mostly between 2 and 4 years), but with a marked increase in the hazard of leaving immediately after obligated service was completed (Pathman et al., 1992; Rosenblatt et al., 1996; Singer et al., 1998). The research findings relating to conditional registration revealed in this thesis are therefore consistent with those in the international literature.

A further variable that was revealed in this research to have a moderate association with the risk of a rural PHC worker leaving their appointment was the PHC worker's birth year or age at the commencement of that appointment (publications 3 and 4). Most of the evidence from the extant literature indicates that age is not strongly associated with PHC worker actual retention (Heng et al., 2007; Horner et al., 1993; Pathman et al., 2004; Pathman et al., 1992; Rabinowitz, Diamond, Hojat, et al., 1999), although Singer et al. found that age was significantly associated with the retention of physicians who were not under NHSC obligations (Singer et al., 1998). As discussed in the literature review in Chapter 3, age has frequently been modelled in the existing literature as a continuous variable, with researchers testing for a linear relationship between age and retention. The research of this thesis, which models age as a categorical variable and therefore does not require linearity of association, finds that amongst NSW GPs, age does not have a linear association with rural retention: the risk of leaving is higher amongst the oldest and youngest GPs. In this respect, the findings relating to the age of PHC workers emanating from the research of this thesis are consistent with the extant literature (both indicating that no significant *linear* relationship exists between age and retention). The findings of this thesis suggest that future research, conducted amongst populations which exhibit the full range of PHC worker ages, should consider modelling PHC worker age as a categorical variable. This is a new finding, and represents an advance on what was previously known.

The research of this thesis showed that a range of other professional and organisational factors were statistically significantly associated with PHC worker retention but had a smaller, less important association with retention than the variables mentioned above. These factors included the amount of annual leave taken, total weekly hours worked and practice size. A review of the literature revealed no other similar studies investigating the association of annual leave or practice size *per se*, with rural PHC worker retention. The evidence from the existing literature for an association between workload and retention was mixed, with one study finding no significant association with workload (Pathman et al., 2004) whilst another found an association that changed over time (Singer et al., 1998).

In this thesis some variables were also found to be significantly associated with retention in one analysis, but not in another, so we can be less certain about their effect on retention. Availability for on-call, for example, was found in one analysis to have a moderate association with length of stay in current practice, whilst another analysis showed no statistically significant association. Only one study within the extant literature has previously investigated the association between PHC worker actual retention and availability for on-call. This was a study by Pathman et al. which found that being on-call 2 or fewer times per week was strongly associated with reduced risk of leaving amongst USA physicians (Pathman et al., 2004). The findings of these studies therefore suggest that the amount of on-call may be more important for GP retention rather than whether a GP does any on-call or not, although clearly further research is warranted.

Gender was another variable where the thesis research findings were not entirely consistent. Four out of the five studies within this thesis indicated that PHC worker gender was not significantly associated with retention of either GPs or AHPs, although the analysis of cross-sectional MABEL data showed a small but statistically significant association. These findings are consistent with the extant literature, which indicates that gender is not significantly associated with rural PHC worker retention (Crouse & Munson, 2006; Heng et al., 2007; Horner et al., 1993; Larson et al., 1999; Pathman et al., 2004; Pathman et al., 1992; Rabinowitz, Diamond, Hojat, et al., 1999; Singer et al., 1998; West et al., 1996).

Proximity to the coast was also found to have a small but statistically significant association with retention of NSW GPs, but not of Australian GPs when the MABEL data were analysed. Coastal proximity is not a variable that has been previously examined for its association with PHC worker retention, however.

The research of this thesis revealed that country of initial medical training was associated with the risk of leaving a rural or remote community, but not with the length of stay in a particular rural or remote practice after adjusting for the obligations associated with conditional registration. Whilst there are no studies within the existing literature which use variables which are directly comparable to those used in the research of this thesis, a number of researchers have reported a lack of association between health worker race or nationality and subsequent rural retention of PHC workers (Crouse & Munson, 2006; Pathman et al., 2004; Pathman et al., 1992; Singer et al., 1998).

In conclusion, the research undertaken in this thesis provides an evidence-base that strongly supports the association of multiple variables – many of them professional and organisational in nature and amenable to policy interventions – with longer PHC worker retention in rural and remote Australia. In general, these findings are consistent with the body of existing literature reviewed in Chapter 3, or else comprise new evidence which in some respects may be specific to the Australian rural and remote PHC worker context. Evidence supporting the role of some variables remains mixed and warrants further investigation. This is not surprising, given that conflicting evidence was a frequent finding between (and sometimes within) studies in the existing literature reviewed in Chapter 3, and different studies within this thesis are conducted on a range of different PHC professionals, working in a range of different rural and remote contexts which are not necessarily homogeneous.

8.2.4 Research Question 4: What are appropriate benchmarks, for reasonable length of stay for the rural and remote Australian PHC workforce, that take account of differences according to profession and geographical location?

This research question was substantially addressed in Chapter 7 in peer-reviewed publication 5, particularly in the two sections of this publication titled *'Deriving workforce-retention benchmarks that take account of differences in profession'* and *'Deriving workforce-retention benchmarks that take account of differences in geographic location'*. Tentative empirically-derived benchmarks for median survival, 12 month survival probability and 24 month survival probability, which differed according to profession and geographical location, were suggested (see Table 3 publication 5, reproduced below in Table 8.2 for the readers' convenience).

The main source of evidence to inform these tentative benchmarks were the results of survival analysis using primary data collected from Australian rural and remote health care facilities. Health service manager perceptions about what was a reasonable length of employment for members of each of the health professions acted to verify these results. As indicated in publication 5, the benchmarks proposed for AHPs were consistent with the findings of the Chisholm et al. study of Victorian AHPs (publication 4). However, it was also acknowledged in publication 5 that the primary

Table 8.2 Proposed retention benchmarks according to discipline and geographical location

Discipline	Rural (≤10 000 population)			Remote		
	Median survival	12-month survival probability	24-month survival probability	Median survival	12-month survival probability	24-month survival probability
Nurse	5	0.80	0.67	3.5	0.78	0.64
Doctor	3	0.75	0.60	2	0.68	0.50
Allied health professional	3	0.75	0.60	2	0.68	0.50
Aboriginal health worker	3	0.75	0.60	3	0.75	0.60
Manager	5	0.80	0.67	3.5	0.78	0.64

Source: (Russell, Wakerman, et al., 2013) data collection method obtained data on relatively few doctors. Therefore it is of interest to compare the benchmarks proposed for doctors to the survival patterns revealed in the subsequent analysis of NSW rural and remote GPs using the NSW Rural Doctors Network data (publication 3). Table 4 from publication 3 is reproduced below, as Table 8.3, for the reader's convenience.

It can be seen in Table 8.3 that the predicted median survival of non-procedural GPs (who outnumber procedural GPs 4:1) in small remote communities ranges from 1.7 to 3.0 years, and is approximately 2 years for IMGs or for Australian trained GPs without VMO rights or procedural skills. These data confirm the tentative benchmark for median survival of 2 years for remotely located GPs suggested in publication 5, and provide more refined retention benchmarks for rural and remote GPs which differ according to country of training, VMO status, proceduralism. More refined categories of geographical location are also used in publication 3 (inner regional, outer regional, remote; coastal). This presents an advance over the tentative benchmark for GPs proposed in publication 5, which only differentiated between rural and remote locations.

It can be seen from Table 8.3 that the predicted median survival of GPs in rural (inner regional and outer regional) NSW ranges from 2.8 years to 19.5 years, and most of the predictions are in excess of 3 years (the proposed benchmark for reasonable length of stay for GPs in rural Australia). The estimates made in publication 5, therefore, appear to be underestimations, and the more refined benchmarks for NSW GPs proposed in publication 3 present a further advance in the evidence-base. Clearly there remain opportunities to undertake similar analyses in other jurisdictions to determine whether these normative benchmarks are generalisable to other States and Territories.

Table 8.3 Predicted median survival of rural GPs based on Cox proportional hazards model

Table 4 Predicted median survival of rural family physicians based on Cox proportional hazards model

Country of primary medical degree	Workload characteristics	Predicted median survival (years)† Inner regional and population size less than 5,000: Coastal	Inner regional and population size less than 5,000: Inland	Outer regional and population size less than 5,000: Coastal	Outer regional and population size less than 5,000: Inland	Remote and population size less than 5000: Inland
Australia	Proceduralist VMO rights	19.5	14.2	12.6	9.6	4.2
	Non-proceduralist VMO rights	11.1	8.6	7.7	5.9	3.0
	Non-proceduralist No VMO rights	6.6	5.3	4.8	3.9	2.1
'Other' country	Proceduralist VMO rights	10.7	8.4	7.4	5.8	2.9
	Non-proceduralist VMO rights	6.7	5.4	4.9	4.0	2.2
	Non-proceduralist No VMO rights	4.5	3.6	3.4	2.8	1.7

†For fully registered family physicians born between 1945 and 1970; VMO: Visiting Medical Officer.
'Other' country – countries NOT including Australia, UK, Ireland, Canada, US, or New Zealand.

Source: (Russell, Humphreys, McGrail, et al., 2013)

8.3 General limitations

In conducting this research, a number of constraints and limitations are noted. These limitations relate to definitions and data, study design and sampling, and analyses undertaken.

8.3.1 Limitations in definitions and data

The research of this thesis takes a siloed approach to the provision of a PHC workforce for rural and remote Australians. PHC workforce retention is conceptualised according to specifically defined cadres of health worker for example, doctors, nurses, AHPs etc. as detailed in Chapter 2. However, in reality each profession or group of professionals does not operate in isolation from other professions or from the rest of the health system, and models of health service delivery are becoming increasingly complex (National Health Workforce Planning and Research Collaboration, 2011; Ono, Lafortune, & Schoenstein, 2013). This added level of complexity is not captured by the modelling undertaken in the research in this thesis. This is a limitation shared by all comparable modelling evident in the extant literature.

A related limitation is that the provision of PHC services was also simplified throughout this thesis by measurement according to PHC provider headcount, rather than using a standardised measure of human resourcing, such as FTE, FWE or total numbers of services provided, as these data are not routinely collected by rural workforce organisations and are less readily accessible from other data sources.

A third limitation related to the complexity introduced when health workers have multiple simultaneous but distinct roles. In the analyses reported in this thesis, only the main role held by each PHC provider was captured. This leads to some loss of information about secondary and other roles, and the factors associated with PHC worker retention in these roles.

A fourth limitation was associated with how some variables included in longitudinal analyses were defined. Variables such as provision of VMO services, availability for on-call and conditional registration may vary during a GP stint. To fully capture available information it is possible to model variables as time varying covariates. However, in this thesis variables such as these were coded as a constant, according to whether or not the variable was ever true during each GP stint. This simplification of complex data that changes over time also constitutes a loss of information. The decision to accept this loss of information was made in the interests of maintaining simplicity of interpretation of results.

Fifth, two different definitions of rural and remote were used in the publications of this thesis (RRMA and ASGC-RA geographical classifications). This reflects government changes in use of geographical classification systems during the period in which the research of this thesis was undertaken. This change in classification system creates difficulties when comparing the findings of research in a study which uses one geographical classification, with the findings of research in another study which uses a different geographical classification. It also created difficulties when the change in use occurred within the timeframe of a longitudinal study. In this instance only those GPs who were located in rural and remote areas of current interest to the RWAs were included in the analysis. The limitations imposed by the use of different definitions of rural and remote are not limited to the research of this thesis, however. This issue is a widely recognised limitation of the international extant literature, whereby the lack of universally accepted definitions of rural and remote limits comparability of international studies.

8.3.2 Limitations in study design and sampling

The research of this thesis, in common with international PHC workforce retention research, comprises observational, rather than experimental studies. A range of observational study designs and sampling methods were used. One publication used a cross-sectional study design (publication 2). Two specific limitations were associated with using a cross-sectional design. Firstly, inferences about causal relationships between variables and retention could not be made. Secondly, all retention data were censored. That is, all PHC workers remained employed at the time of the study, and so retention measurements were incomplete and underestimated.

Nevertheless, this thesis also included other studies (publications 3, 4 and 5) which used a different study design – specifically cohort or longitudinal analysis – which was able to address these limitations and produce results which were generally consistent with the findings of publication 2. Sampling methods varied from studying entire populations (publications 2 and 3), to stratified random sampling (publications 2 and 5), and purposive sampling (publication 4). Clearly the limitations related to sampling biases increase as sampling response rates fall and sampling is undertaken in a purposive manner. Once again, however, the relatively consistent findings despite different study designs and sampling methods indicate that the effect of these limitations is probably small.

The research in this thesis used data collected on rural and remote PHC workers from specified professions (see Chapter 2, Section 2.1). RWAs, for example, collect data on rural and remote GPs, but only collect data on metropolitan GPs working in ACCHSs, but not in other underserved metropolitan areas. This means that analysis which exclusively uses RWA data is unable to make comparisons with the retention of most metropolitan PHC workers. To do this would require linking RWA data to GP workforce data held by other organisations, for example with Medicare data or

AHPRA registration data. Linkage of rural and remote with metropolitan GP workforce data, however, was not attempted in this research.

The research of this thesis was limited by problems associated with the reliability of data provided. This was the case for both primary and secondary data collection and analysis. Even in databases with excellent built-in systems to ensure high quality data, such as that managed by the NSW Rural Doctors Network, inconsistencies in PHC provider self-reports were evident from year to year. For example, some PHC providers gave different answers to the same question from one year to the next, when the answer should have been the same (for example, whether or not they ever received a particular undergraduate scholarship). These occurrences were infrequent, however, and are likely to be non-differential. Data inconsistencies were handled by verification with the database manager, who in turn enabled verification with the GPs or practice managers. When inconsistencies were unresolved, the value was coded as missing. Limitations associated with missing data are addressed in Sub-section 8.3.3.

A further limitation encountered in this research was related to the use of secondary data. The use of purely administrative datasets limits the choice of explanatory variables that can be used. Fortunately, secondary datasets that were purposively designed to assist rural and remote PHC workforce planning were available for analysis. These datasets included many variables found in the extant literature to be associated with retention. Nevertheless, the coding of some of these variables in the longitudinal databases could be improved so that variables are more useable. Rural background of PHC worker was not included in one study analysis because it was coded as a series of string variables which were the names of the towns/cities spent during various periods of childhood. Unfortunately these variables could not easily be converted to a categorical or binary variable of rural background exposure.

Analyses of secondary data may also be limited by differences in how the data items are defined in different data sets. An example of this type of limitation was mentioned in Sub-section 8.2.3, whereby the MABEL survey questionnaire and the NSW Rural Doctors Network GP questionnaire each inquired about GP on-call in a different way. The lack of standardisation of items across data sets can limit comparability of research findings. Additionally, the use of secondary datasets did not permit voluntary turnover to be distinguished from involuntary turnover, nor permanent moves to be distinguished from temporary moves, even though the literature indicates that these are important to differentiate (Buchan, 2010; Wakerman et al., 2012). Further, this research primarily identifies factors associated with retention. It is acknowledged that these factors may not be responsive to policy interventions and therefore may not be very useful from a policy-making perspective. Nevertheless, identifying significant factors associated with retention is an important first step towards implementing effective retention strategies.

8.3.3 Limitations in statistical analyses

The turnover and retention metrics recommended for use in rural and remote PHC workforce contexts each have their own strengths and limitations (publication 1). Used together, as a suite of metrics, the limitations of individual metrics can be minimised. Nevertheless, as outlined in Chapter 5, survival analysis methods present particular advantages for producing an evidence-base to inform the development of rural and remote PHC workforce retention strategies, and have therefore been used extensively throughout this thesis. Survival analysis, however, is not without its limitations.

A limitation specific to the use of the Cox proportional hazards regression model relates to the underlying assumption of proportionality of the hazard of leaving for different groups at all observation times. The results of the research undertaken in this thesis indicates that for some variables differences do not emerge uniformly over time, but instead take some time to become apparent, thus indicating that the assumption of proportional hazards may not always be appropriate. For these variables, greater caution in interpretation is warranted as the assumption of proportional hazards may be associated with an underestimation of the overall effect size of a variable (since the effect is in fact occurring over a shorter time period than what is calculated in the analysis).

The research undertaken in this thesis also shares a limitation associated with regression methods in general, and this limitation was evident in the existing research reviewed in Chapter 3. It relates to the difficulties with model interpretation that occur when the different variables included in regression models are correlated with one another. Researchers, for example, have long highlighted the difficulties associated with separating out the effect on subsequent rural retention of physician rural background, rural undergraduate educational exposures and rural postgraduate educational exposures due to multi-collinearity between these variables (Curran & Rourke, 2004; Pathman, 1996; Pong & Heng, 2005).

A further limitation associated with the use of multivariate modelling in this thesis is that of listwise deletion. This means that observations, or ‘cases’, that have missing data for any variable included in the modelling were dropped from analysis. This can introduce bias if missing data are related to time since commencement. This is a difficult problem to completely eliminate, particularly in research involving analysis of secondary data, since collection of data on the full range of variables usually requires completion of periodic surveys. PHC workers with the shortest retention are more likely to not receive or complete periodic questionnaires designed to collect such information (they may commence after one survey and leave before the next survey).

8.4 Policy implications of this research

A key aspect of the research undertaken in this thesis is teasing out the implications of the findings for the purpose of strengthening and informing effective policies to improve PHC workforce retention.

The recent WHO publication, "*Increasing Access to Health Workers in Remote and Rural Areas Through Improved Retention. Global Policy Recommendations*", recommends that policies to improve rural health worker retention are based on a set of seven key principles (World Health Organization, 2010a). The research of this thesis, whilst relevant to all principles, specifically and fundamentally assists policymakers follow two of the seven recommended principles underpinning retention policy development. These are:

1. 'The choice of interventions should be informed by an in-depth **understanding of the health workforce**. This requires, at a minimum … an analysis of the factors that influence the decisions of health workers to relocate to, stay in or leave rural and remote areas'.

2. 'A commitment to **monitoring and evaluation and to operational research** is essential in order to evaluate effectiveness (of retention strategies), revise policies as necessary once implementation is underway, capture valuable lessons learnt, build the evidence-base, and improve understanding about how interventions work and why they work in some contexts but fail in others' .

At a national level, a key Australian rural and remote health workforce strategy document (Health Workforce Australia, 2013b) similarly identifies nine key principles of health workforce policy, planning and development, two of which are specifically and substantially informed by the work of this thesis:

1. 'Promote evidence-based workforce reforms that support workforce retention …'

2. 'Support robust monitoring and evaluation processes'

Sub-section 8.4.1 will explain how knowledge of the measurement of turnover and retention in rural and remote PHC workforce settings is essential for establishment of retention baselines, and for ongoing monitoring and evaluation of the effectiveness of retention strategies (addressing principle 2, above).

Sub-sections 8.4.2, 8.4.3 and 8.4.4 explain how the specific results of quantitative analyses of the factors associated with PHC workers staying in or leaving rural or remote Australian practice (addressing WHO principle 1, above) can inform the choice of retention interventions.

8.4.1 Implications related to the measurement of retention

This thesis has addressed problems associated with the measurement of health worker retention, including which turnover and retention metrics are best suited for use in rural and remote PHC workforce contexts, and the strengths and limitations associated with their use. The research indicates that applying this suite of turnover and retention metrics to primary or existing secondary workforce data can provide a more comprehensive workforce retention baseline to inform rural and remote PHC workforce planning. This foundational work is key to informing ongoing research on the effectiveness of rural retention strategies, because it helps address current identified inconsistencies and deficiencies in the reporting of rural and remote PHC worker retention outcomes (Dolea et al., 2010).

Knowledge of the appropriate metrics to use for rural and remote PHC workforce planning can also inform PHC worker turnover and retention monitoring and evaluation processes undertaken within or in conjunction with key health organisations including State and Territory governments, regional health organisations such as Medicare Locals or some other entity such as a Primary Health Network, Australian rural health workforce agencies and the DOH (which is set to subsume the previous national workforce planning role of HWA in 2015). The research of this thesis demonstrates that collation of individual-level workforce data (for example, compiling health workforce human resources records from multiple health services) enables comparisons to be made, so that factors associated with longer or shorter retention can be identified, or health service underperformers or exemplars can similarly be identified, and responses to policy interventions monitored. It is instructive to note that a current Australian GP retention intervention, GPRIP, and its predecessor, the Rural Retention Program, were implemented without any initial measurement of baseline rural and remote retention patterns prior to the intervention. Nor has there been ongoing monitoring of changes to rural or remote retention patterns. Consequently, despite substantial and perhaps unsustainable growth in the funding of this program – especially in areas where it may not be needed as much, such as in inner regional Australia (Mason, 2013) – it is not well understood how effective (or ineffective) this key, but expensive, policy has been.

The implications for policymakers are clear: prior to implementing new retention interventions, or modifying existing retention interventions, it is critical to measure and understand existing retention patterns at the level (or profile) at which the intervention is directed, to establish some baseline from which any changes can be monitored. For example, if GPRIP is to be modified in the near-future, as was recommended by the recent review of Australian Government health workforce programs (Mason, 2013), it is important to determine beforehand what the existing Australia-wide patterns of GP retention are (for example, according to ASGC-RA and population size), so that it is possible to evaluate whether the policy modification has been effective. The suite of metrics identified in this thesis are likely to be exceedingly useful for this purpose (crude turnover (separation) rates, stability rates, median survival, survival probabilities and Cox proportional hazards), particularly the latter three metrics, which are derived using survival analysis.

Knowledge of which metrics are appropriate to use for the measurement of retention also informs the type and characteristics of data worth collecting: longitudinal, individual-level PHC workforce data are required for calculation of the retention metrics based on survival analysis. Currently, in Australia, data meeting these criteria are collected for workforce planning purposes for rural and remote GPs by the RWAs, but not for other cadres of PHC workers. This is despite evidence that PHC workforce distributional and retention issues are not confined to the medical profession. Problems of limited availability and accessibility to data for other types of rural and remote PHC workers in Australia hamper development of an evidence-base to inform their retention. Currently, analysis of the retention of rural AHPs, for example, is still very much reliant on one-off surveys, with associated problems, for example, of poor response and response biases. A gradual increase in the breadth of health professions that are required to register through a single, national registration authority, such as the Australian Health Practitioner Regulation Agency (AHPRA) may lead to increased accessibility of longitudinal health workforce data, however AHPRA data currently are not collected for the express purpose of informing rural and remote health workforce planning, and so the range of variables relevant to the rural and remote retention of PHC workers is limited. In many cases, data that are collected for the express purpose of workforce planning, for example the annual labour force surveys of health professionals administered by AHPRA, are not currently made available in a de-identified form for research purposes.

Clearly, if health workforce planning authorities are to adhere to the professed principle of promoting evidence-based workforce reforms that support workforce retention, further support is required to ensure that relevant and appropriate longitudinal data are collected on rural, remote and metropolitan PHC workers and made accessible for the purposes of developing the current limited evidence-base informing policy-making.

8.4.2 Implications of differences in retention according to geographical location and profession

Whilst the current Australian rural and remote workforce strategy acknowledges that there are a number of differences between rural and remote environments which affect policy and planning (Health Workforce Australia, 2013b), strategies relating to PHC worker retention are yet to fully and appropriately take these differences into account. Currently, the Australian Commonwealth Government provides retention incentives for rural and remote medical practitioners that differ according to remoteness, but not according to population size or other differences in their working environments (McGrail, Humphreys, et al., 2011b).

Consequently, it is unlikely that current retention incentives for medical practitioners are sufficiently well targeted to where they are needed most. So, too, it is unlikely that current retention incentives for rural and remote Australian GPs are optimally cost-effective. We can only surmise that this is the case, however, as high quality evaluations of rural and remote PHC worker retention policies are scant in general (Grobler et al., 2009), and lacking for this national retention strategy in particular (Dolea et al., 2009; Gibbon & Hales, 2006).

In contrast, the incentives for Australian remote nurses are highly targeted. Retention incentives for remote nurses are provided by some, though not all, State and Territory health authorities. Queensland Health, for example, pays annual isolation bonuses to Queensland Health nurses and midwives employed in designated remote locations (Remote Area Nurse Incentive Packages). Criteria for qualifying as 'designated remote' relate to a range of indicators of the working environment, including the presence of other PHC workers, requirements for on-call duties, travel time by road to nearest medical back-up, seasonal inaccessibility, availability of power, telephone and reticulated water services, public transport, employment opportunities for spouse, community facilities etc., though not specifically to community population size or remoteness as measured by a standard classification. It is likely, however, that the criteria already in use by Queensland Health reflect both geographical location and population size, albeit indirectly. However, there is a lack of uniformity across jurisdictions in the criteria used to allocate rural and remote retention incentives to nurses, which makes comparisons, and learning about what is effective that much more difficult.

The work of this thesis, which has elucidated differences in PHC worker retention (especially for doctors and AHPs) according to geographical location and population size, has the potential to greatly assist effective rural workforce planning and policy-making. For example, in highlighting the enormous differences in GP retention related to population size and remoteness (despite existing retention programs such as GPRIP being in place during the study period) this research provides powerful empirical evidence to support further differentiation or 'scaling' of retention incentives according to both population size and remoteness. This may require policymakers to make adjustments to how limited existing resources are allocated, so that they can be directed towards PHC workers working in environments where retention is most problematic.

The findings of substantial differences in PHC worker retention according to geographical location and population size also has broader policy implications, which extend beyond the allocation of specific retention incentives to PHC workers. Knowledge of the magnitude of differences in PHC worker retention according to geographical remoteness and population size can inform a range of other policies designed to influence the geographical distribution of PHC workers in rural and remote Australia.

An example of such an application is seen in the scaling of return-of-service obligations for PHC workers in rural and remote Australia. Whilst a range of different national, jurisdictional and regional schemes have been implemented which require PHC worker return-of-service in rural and remote locations, the scaling of the periods of required service has not been based on any empirical evidence related to their recruitment or retention. The current scaling ratio of return-of-service obligations for the BMP scheme is inner regional 1.0: outer regional 1.3: remote 1.5: very remote 1.8. Again, return-of-service obligations are linked only to remoteness as measured by ASGC-RA, whereas the work of this thesis indicates that differentiation according to population size as well as remoteness could be fairer, and that ratios for remote and very remote locations could be higher still (given the 2.65 fold difference in retention between inner regional and remote/very remote NSW GPs working in small communities) (Russell, Humphreys, McGrail, et al., 2013).

This research could also potentially be applied to a current medical workforce distribution policy which places geographical restrictions on the Medicare provider numbers of doctors trained overseas who wish to practise in Australia. Restrictions apply for the first 10 years following registration as a medical practitioner in Australia. A moratorium reduction scheme reduces the 10-years of restrictions, with reductions scaled according to ASGC-RA classifications. The current scaling ratio for this scheme is inner regional 1.0: outer regional 1.3: remote 1.5: very remote 1.8, which is identical to the scaling ratio for BMPs (above).

Similarly, the research of this thesis could be used to inform the geographical scaling of payments made under the HECS Reimbursement Scheme, which reimburses the HECS debts of doctors. The current scaling ratio for this debt reduction scheme is inner regional 1.0: outer regional 1.25: remote 1.7: very remote 2.5. The scaling ratio for this scheme is similar to what the research of this thesis suggests, although the research of this thesis would additionally suggest that town population size could also be taken into account.

The research of this thesis also reveals that differences in rural retention patterns according to geographic location may not be immediately apparent upon PHC worker commencement but may take time to emerge, and be most evident for the first few years after commencement. This finding is highly relevant to the timing of retention interventions, indicating that retention interventions may best be implemented soon after commencement and for the first 3 or 4 years' of practice, but thereafter may not be required to the same degree. This is an important consideration for policymakers wishing to ensure that retention interventions are optimally cost-effective.

The finding that both AHPs and doctors experience lower retention than nurses, AHWs and health service managers, and that there are also considerable differences in the retention of AHPs according to their profession, has implications for current retention strategies. Until now, nationally implemented retention strategies have largely focussed on the rural or remote retention of GPs, with little attention being given to the retention of AHPs. However, as indicated in Chapter 2, geographical distributional issues (rural shortages) affect not just GPs but also AHPs (Australian Government Department of Health and Ageing, 2008; Keane, Smith, Lincoln, Wagner, & Lowe, 2008; Lowe & O'Kane, 2004), and the PHC services provided by AHPs are no less important if rural and remote Australians are to have access to truly comprehensive, multi-disciplinary PHC. The findings of this research therefore implies that for those allied health professions with the greatest rural shortages and poorest rural and remote retention, further (targeted) policy attention is required to enhance rural retention. Policies will need to be tailored to the specific profession targeted, as the factors associated with rural retention are also likely to differ across professions. Nevertheless, if it is possible to demonstrate the effectiveness of some of the existing national rural retention strategies for doctors, such as the HECS reimbursement scheme, policymakers would be in a better position to consider extending such a scheme to include other health professions.

8.4.3 Implications of differences in retention according to other factors

The research of this thesis found that a broad range of different professional and organisational factors, financial and economic factors, and educational and regulatory factors had strong associations with PHC worker retention. This finding is consistent with widespread acceptance in the literature of the necessity for multi-pronged retention strategies to influence PHC worker rural retention (Buykx et al., 2010; Geyman, Hart, Norris, Coombs, & Lishner, 2000; Jaskiewicz, Deussom, Wurts, & Mgomella, 2012; Lehmann et al., 2008; Pong, 2008). It is also in keeping with the principles underlying current approaches to rural and remote health workforce retention, as outlined by the current national strategic framework policy document (Standing Council on Health, 2012) and the national rural and remote health workforce innovation and reform strategy document (Health Workforce Australia, 2013b).

However, the research of this thesis also suggests that current national rural and remote PHC worker retention strategies could be further improved. To date strategies have largely been directed towards GPs and have mainly targeted financial and economic factors (for example, through provision of financial incentives to GPs based on geographical remoteness) and educational and regulatory factors (for example, through regulating where overseas trained doctors can work, through introducing BMPs at universities, and through increasing rural clinical training exposures, and introducing rural student selection quotas). Improvements could include better targeting of professional and organisational factors, which were found to have particularly strong associations with PHC worker retention. Of particular note, hospital work and procedural work were both associated with substantially longer GP retention in rural and remote NSW. These findings have implications for ensuring provision of adequate hospital infrastructure in small rural and remote communities so that extended scopes of practice for GPs are also supported, and GP retention thereby enhanced. There are also policy implications related to scaling up of rural and remote advanced training pathways, as currently supported by the Rural Doctors' Association of Australia, so that sufficient numbers of GPs have the broad generalist training necessary for procedural and hospital clinical activity, and so that existing rural and remote GPs are able to further develop and maintain their skills (Rural Doctors Association of Australia, 2013). This is an urgent issue, given the current influx of recent graduates and the importance of channelling a sizable proportion of these graduates into rural practice through supported rural generalist training pathways in order to mitigate problems associated with future metropolitan oversupply of GPs.

A further policy implication relates to finding a small to moderate association between each week of annual leave taken and GP retention. This finding underscores the importance of rural and remote GPs being able to access adequate locum support when they need it, and highlights the importance of strengthening current programs. The existing Rural GP Locum Program, for example, could provide expanded locum coverage – especially targeting GPs working in small outer regional and remote communities – so that barriers to taking annual leave are minimised and retention support provided where it is most needed.

This thesis additionally demonstrates that the rural retention of government salaried or contracted GPs is about half that of GPs paid mainly by fee-for-service payments or who own their practice, after adjusting for the effects of geographical location and multiple other factors. Whilst this may reflect the need of government to move GPs from an existing position to fill another position where the need for PHC services is considered more urgent, nevertheless there is an undeniably large impact of reduced interpersonal continuity of care for patients in those communities serviced by government salaried or contracted GPs. Identifying sub-populations of rural PHC workers with substantially poorer retention, such as government salaried and contracted GPs, is an important first step towards improving their rural retention. However, it is only a first step pointing to where further research is required, in this case to review the experiences and preferences of government salaried GPs, in an effort to pinpoint the strategies that are most likely to effectively improve their retention. Recent work has indicated that discrete choice experiments may be especially useful in this regard (Jaskiewicz et al., 2012).

The research of this thesis indicates that current models of GP service delivery used in rural and remote Australia – including the business structure and the PHC worker payment mechanisms – must continue to evolve to ensure that the changing needs of both the community and current and newer generations of PHC workers are well met. The extant literature indicates that generational changes in attitudes towards professional life, including practice ownership, are emerging as Generation X and Y health workers rebalance the perceived benefits of maintaining the flexibility to change jobs (manifesting as a reduced inclination towards practice ownership) with a strong preference for professional autonomy (Sherman, 2006; Watson, 2002). Already, policies have evolved to counter the unwillingness of Generation Y health professionals to buy into practices. One such example is the *'Easy Entry, Gracious Exit'* model of medical service provision developed by NSW Rural Doctors Network and administered through Rural and Remote Medical Services (New South Wales Rural Doctors Network, 2003). In the context of increasing reluctance towards practice ownership, policymakers must be aware that the importance of practice ownership which has functioned as a strong and effective retention factor for GPs may diminish over time, as fewer GPs choose to buy into practices.

This thesis highlights important retention patterns relevant to GPs with return-of-service obligations or restrictions imposed on their access to provider numbers based on geographical location. The research suggests that the coercive policy (conditional registration) is effective in retaining IMGs in a rural or remote community in the short term, but that there is a higher risk of leaving once the effect of conditional registration is removed. Whilst this finding relates directly to IMGs, it is consistent with international evidence about the negative effect of obligated service on the retention of both internationally and locally trained medical graduates once obligations cease or restrictions are lifted (Crouse & Munson, 2006; Pathman et al., 1992; Rosenblatt et al., 1996; Singer et al., 1998). This is an important finding given the current Australian workforce distribution policy arena, which is already heavily reliant on internationally trained GPs, and in the future will have an increasing reliance on graduating PHC workers domestically with rural or remote return-of-service obligations.

These include holders of BMPs, MRBSs as well as other Australian trained PHC workers who are obligated to work in rural and remote Australia for a period of time following qualification. The research of this thesis, and other similar research indicates that policymakers would be well advised to develop and expand policies to ensure that obligated PHC workers have sufficient choice and are initially well matched to the communities they serve if their period of obligated service is to translate into longer term rural retention. The international literature (Matsumoto et al., 2008a; Pathman, Konrad, et al., 1994b) indicates that this can be facilitated by placing obligants in areas close to where they grew up, close to extended family, and/or close to where they were vocationally trained. This suggests that long-term retention success of policies requiring return-of-service may be fostered by increased support, in terms of increased bonded university places, for ‘grow-your-own’ PHC worker initiatives emanating from rural and remote communities which have historically struggled to retain PHC workers.

It will also be important to ensure that obligated PHC workers receive the undergraduate and postgraduate training that they need to work safely and effectively in rural and remote locations. Processes must also be in place to ensure that PHC workers fulfilling obligated service are well supported in the rural and remote underserved communities that they choose, as they will mostly be younger, relatively inexperienced PHC professionals in need of substantial professional and educational assistance, and positive rural experiences in their early professional careers will be critical to their long term retention. This includes recognising the preferences of younger generations of PHC workers to work shorter hours and to have adequate leave, two factors also found by this body of research to be independently associated with PHC worker rural retention.

The research of this thesis also underscores the critical importance of improving IMG retention. Given the aforementioned current heavy reliance of rural and remote Australian populations on care provided by IMGs, and the poor retention of IMGS, it is likely that even small improvements in IMG retention could have important long-term consequences for PHC workforce distribution. Other studies have highlighted some of the underpinning reasons why IMGs have shorter rural retention, including their higher dissatisfaction with a range of personal and family factors, community and location factors, and professional and organisational factors (McGrail, Humphreys, Joyce, & Scott, 2012). IMGs (and perhaps internationally trained PHC workers of all professions) restricted to practise in rural and remote Australia are likely to require far more substantial support, in both professional and non-professional areas, than what is currently being received. High levels of support are likely to be particularly important in the earliest stages of rural and remote appointments. Policymakers should bear in mind that the costs of having a geographically maldistributed PHC workforce are enormous, and that failure to provide sufficient well-targeted retention support to these workers may well exacerbate future geographic maldistribution of the PHC workforce.

Whilst much of the research undertaken in this thesis was necessarily conducted on the retention of GPs (due to the lack of availability of adequate national datasets for other PHC worker professions), the findings of the Victorian study of AHPs has particularly important policy implications for developing career structures for rural and remote AHPs (Chisholm et al., 2011). This paper identified that lack of opportunity for grade advancement is an issue for the retention of AHPs in rural and remote health services. AHPs at the lowest grade of employment are 1.75 times more likely to leave than AHPs at grade 3 or higher, even after adjusting for their age. This is a substantial effect and points to the necessity, at least within Victoria, for policymakers to develop career pathways that don't necessitate that AHPs must leave a rural or remote health service in order to progress their career, similar to the redesign of AHP rural career structures that has recently occurred in South Australia (Lehmann, 2013).

8.4.4 Implications of rural retention benchmarks that differ by profession and geographical location

The benchmarks for reasonable length of stay in a rural or remote health service of GPs, nurses, AHPs, AHWs and health service managers identified by the research of this thesis provide useful points of comparison for policymakers wishing to evaluate and improve PHC worker retention at a particular health service. Never before has it been known how long, on average, different cadres of PHC workers stay in rural and remote Australia. Nor has there been peer-reviewed, published evidence to inform health service managers or other policymakers about the proportion of nurses, AHPs, or other types of Australian PHC workers who were likely to remain in a rural or remote health service after 12 or 24 months. Knowledge of anticipated PHC worker length of stay can assist health service managers forward plan for replacement of staff. This is likely to be particularly helpful in larger, more remote health services, because larger services operating in remote contexts are likely to experience more frequent staff turnover and will also face substantially higher costs associated with their replacement that are closely related to the direct costs of vacancies. Thus the benchmarking findings can assist with succession planning, development of cost-effective retention strategies and minimising vacancy costs.

For example, this research shows that doctors cost rural and remote health services between $66,000 and $111,000 to replace (less in rural, more in remote locations), and they stay on average two years in remote health services. This enables managers to justify diverting some of the money spent on replacement costs towards addressing some of the more modifiable factors, perhaps especially professional and organisational factors, that this research has identified for their strong association with the risk of doctors leaving prematurely (as discussed in Sub-section 8.2.3). Investing some of the health resources that would otherwise be spent on replacement of health workers into strengthening PHC worker retention strategies could be done in an overall cost-neutral manner, assuming that the retention strategies are effective, and result in increased average lengths of stay of PHC workers. Clearly it is important to monitor the effectiveness of such strategies to establish that they are effective, and to assess for ongoing incremental improvements in PHC worker rural and remote retention.

Whilst the *new knowledge* of actual retention benchmarks proposed in this thesis is useful for informing retention strategies developed at a health service level that relate to improving rural and remote PHC worker retention (as described above), the research also has *methodological* merit that is of significance for workforce policymakers at higher levels of the health system. The research of this thesis demonstrates to policymakers how they can develop rural and remote PHC workforce retention benchmarks which differ according to profession and geographical location (or other important factors such as country of training or VMO status and procedural activity) using empirical data. The tentative benchmarks proposed in this thesis were limited by the completeness and quality of data used in their development. However, policymakers at regional, state and national levels of the health system can draw on complete and higher quality rural and remote PHC workforce data to further develop PHC worker retention benchmarks that differ according to profession and geographical location, or other contextual factors demonstrated to be important, and thus enhance their usefulness for workforce planners in rural and remote health services.

8.4.5 Summary table

In recognition of the differing needs of readers of this thesis, and the time constraints under which many of them may work, this sub-section provides a table designed to succinctly summarise the main policy implications of the research of this thesis, so that they can be accessed in an efficient manner (see Table 8.4).

As with the previous sub-sections, the main policy implications are presented according to how they fit within the four Research Questions guiding the research of this thesis.

Table 8.4 Main policy implications of the research of this thesis

1. Implications relating to the measurement of retention
i. The use of a suite of metrics, rather than reliance on a single metric such as annual turnover, is recommended as it provides more comprehensive and useful information to policymakers. ii. The use of the full suite of metrics requires high quality individual-level data on rural and remote PHC workers. National data collection is currently inadequate for many cadres of health workers (for example, AHWs, most allied health worker professions) and requires development beyond the current reliance on jurisdictional surveys and 5 yearly ABS census data. Further investment in health workforce registries and facilitation of the use of these data for research purposes is recommended. iii. Collection and management of PHC workforce data at rural and remote health services requires adequate resourcing. iv. Calculation of the retention metrics likely to be most useful for informing policy-making requires appropriately skilled personnel, which may be facilitated by strengthening partnerships between the tertiary education sector and workforce planning units within the health sector. Further investment in the strengthening of national and jurisdictional retention analytic capacity is indicated. v. Compilation of workforce data at a centralised level enables appropriate comparisons of retention to be made. This can help identify underperformers and outperformers with respect to retention, and is recommended as part of health service quality improvement processes. vi. The requisite data should be collected and retention baselines established (using the recommended suite of metrics) *prior* to implementing or changing retention strategies. vii. Once retention strategies are implemented, this suite of metrics can be used to monitor and evaluate the effectiveness of the intervention/s, making comparisons with retention prior to implementation of the intervention. This would represent a significant advance on how retention interventions have been evaluated in many instances thus far.

2. Implications relating to new empirical knowledge of the factors associated with retention
i. Retention of PHC workers varies with remoteness and population size, and *both* factors should be taken into account when devising retention strategies. ii. Retention differences according to geographical location and population size are mostly not immediately apparent, but may take some months after PHC worker commencement to become evident and may thereafter be sustained. This suggests that retention interventions should be timed to have maximum impact soon after commencement. iii. It may also be appropriate to take both remoteness and population size into account when scaling return-of-service obligations for locally trained PHC workers, scaling reductions in the 10 year moratorium on provider number access for internationally trained PHC workers, and scaling the period of time over which HECS reimbursements are made to PHC workers. iv. The retention of many AHPs in small rural and remote locations is similarly short to that of doctors. Policymakers trying to improve equity of access to comprehensive PHC services for rural and remote Australians would be well advised to pay increased attention to strengthening the retention of AHPs, for example through development of rural and remote career pathways that don't require an AHP to leave a rural or remote health service in order for career progression to occur. v. Some allied health professions are more maldistributed and have poorer retention than other allied health professions. It is important to recognise this and to tailor retention interventions to those professions where maldistribution and retention are most problematic. vi. A broad range of professional and organisational, financial and economic, and educational and regulatory factors are *strongly* associated with PHC worker retention. This suggests that retention strategies should be multi-faceted, addressing the combination of modifiable factors most important for rural and remote PHC workers. vii. Professional and organisational factors have very important associations with PHC worker retention. For GPs, procedural work and hospital work are important, and can be supported amongst future generations of GPs by supporting up-skilling for existing rural and remote GPs, as well as by scaling up rural generalist pathways and supporting hospital infrastructure in rural and remote communities, where feasible. viii. The small to moderate association between having taken annual leave and subsequent GP retention suggests that being able to take sufficient annual leave remains an issue for

rural and remote GPs. Further strengthening and increasing the coverage of GP locum support programs, such as the Rural GP Locum Program, may improve rural and remote GP retention, especially if it is well targeted to where the need is greatest.

ix. GPs working in salaried or contract positions have poorer retention than GPs who own their own practice or who are paid mainly by fee-for-service payments. Further research is required to identify how the retention of salaried or contracted PHC workers can be optimised. This may include exploring new and alternative payment mechanisms and business models better suited for the delivery of GP and other PHC services in small rural and remote communities.

x. Retention is, on balance, poorer amongst IMGs once the coercive effect of conditional registration is taken into account. Additional support to help with professional and community integration may help optimise the retention of this important group of rural and remote PHC workers.

xi. The future retention of bonded medical (or other) students can be expected to be lower than for PHC workers choosing freely to work in rural and remote Australia. It will be important that new, relatively inexperienced graduates fulfilling obligated service requirements are well matched to the communities in which they work, and are sufficiently trained and well supported, especially professionally, in rural and remote practice early in their careers.

3. Implications relating to the development of retention benchmarks

i. Tentative benchmarks for retention in a health service which differ according to PHC worker profession and geographic remoteness provide a useful comparison point for assessing health service retention performance, and commencing quality improvement processes for workforce planning.

ii. Knowledge of how long, on average, different cadres of PHC workers are likely to stay in a health service (given the geographical context) can inform succession planning. Given the high cost of vacancies, especially in remote health services, it is important that health service managers use this information to optimise replacement of PHC workers.

iii. Empirical workforce data can be used to develop benchmarks for average length of stay of different types of PHC workers in rural and remote Australia. It is recommended that national and jurisdictional workforce planners undertake similar analyses (on different rural and remote PHC worker datasets) to produce more robust benchmarks to inform future workforce planning.

8.5 Workforce planning framework

As indicated earlier in this chapter, two of the key principles that should inform workforce planning are to base the choice of intervention on an in-depth understanding of the workforce problem, and to commit to monitoring, evaluating and to operational research. This thesis has provided analyses of factors that are associated with the decisions of various types of PHC workers to stay in or leave rural and remote areas of Australia, thereby increasing the depth of the current evidence to inform policy-making. The thesis has also provided an evaluation of various metrics that could be used to monitor and evaluate retention, and demonstrated their use, thereby informing policymakers how monitoring and evaluation might best be undertaken.

Improving PHC worker retention, however, requires systematic application of this information with adaption to suit the policy problem at hand. The following framework (Table 8.5) is provided to help policymakers take a more systematised approach to improving rural and remote PHC worker retention.

8.6 Future research

The research of this thesis highlights considerable remaining gaps in our knowledge and understanding of the patterns and determinants of rural and remote Australian PHC worker retention. The literature review in Chapter 3 revealed a relatively small number of studies of actual retention of PHC workers relevant to the Australian context exist in the current international literature, and of these, few used sophisticated analytical approaches which enabled the role of a range of different factors to be teased out. The research of this thesis therefore represents a substantial addition to what was already known, and is particularly informative for Australian policymakers because, until now, there have been no comparable rural and remote PHC worker retention studies in Australia. It is important that further research is undertaken specifically in the Australian rural and remote PHC context.

The research of this thesis has additional significance though: there are few comparable studies in the international literature on cadres other than physicians. The new knowledge on the retention of rural and remote nurses, AHPs, AHWs and health service managers presented in this thesis is therefore of both national and international significance. It is also of particular importance given the importance of these health professionals as members of multi-disciplinary teams required to deliver comprehensive holistic PHC to populations with high morbidity related to chronic disease. These factors notwithstanding, research on the retention of rural and remote PHC workers in general remains in a relatively undeveloped state. This, in conjunction with the enormous global problems

Table 8.5 Framework for improving rural and remote PHC worker retention

1. Identify the population of rural or remote PHC workers for whom you want to improve retention, and the level (retention profile) that is of primary interest (for example, retention in the health service, retention in a rural community etc.) This step may be facilitated by comparison with any known, relevant retention benchmarks.
2. Measure baseline retention patterns using the retention profile identified in step 1. Choice of metrics (for example, Stability rates, Survival rates) will depend on: • what data are available • what analytical and other resources (for example, time) are available • what you need to know
3. Identify the factors associated with PHC worker retention in the context of interest, using available evidence, including actual workforce retention data and the extant literature.
4. Assess the potential effectiveness of different possible retention interventions that address the factors identified in step 3. If limited or insufficient evidence available, take steps to conduct further operational research to investigate the retention preferences of existing population of PHC workers (for example, conduct discrete choice experiment as per Jaskiewicz) (Jaskiewicz et al., 2012) so that health system policies and interventions can be closely tailored to respond to the factors influencing rural and remote PHC worker decision-making about staying or leaving.
5. Choose the retention strategies (which may well be multi-faceted) that are supported by the evidence as being likely to be effective and which also meet other important policy-making objectives. Give consideration to implementing strategies in a way which enables comparisons to be made. That is, structure the strategies so that not all groups of PHC workers get the same thing (whilst still maintaining fairness), so that evaluation of the effectiveness of retention strategies is facilitated rather than hindered.
6. Implement the retention strategies, and continue to monitor retention by collecting data on rural and remote PHC worker actual retention, for example through human resources records. Monitor the costs of different retention strategies.
7. Allow sufficient time for desired changes in retention to emerge, and then analyse collected data to evaluate if there are any significant changes in retention metrics compared to baseline data or whether one component of the retention strategies is more effective than another component. Establish which retention strategies are the most cost-effective. Feedback the information collected to step 4, so that retention strategies and their cost-effectiveness can be improved.

associated with the geographical maldistribution of the PHC workforce, ensures it is critical that further research, especially on non-physician PHC workers, is expedited so that more equitable health outcomes for rural and remote populations can be achieved.

Importantly, the research of this thesis, particularly the development of the retention metrics and indicators, provides methodological guidance for further research in this important field. For example, analysis revealed that differences according to geographical location and population size may not be immediately apparent (upon commencement of employment), but instead may take some months after employment commencement to emerge. This finding has implications for future research, in so far as it may be worthwhile undertaking separate investigations of the factors associated with rural and remote PHC worker retention prior to and after the first 6 to 12 months of employment as separate analyses. The scope of the research that can be undertaken in a thesis is necessarily restricted. As such, this research examined only a small number of rural retention profiles that are likely to be of interest to policymakers: retention in a rural community and retention in a rural health service. Future research is required to investigate the factors associated with retention in a rural area (for example, as defined by ASGC-RA). The research methodology is also suitable for adapting to investigate retention of PHC workers within a profession, a related workforce problem that is currently under-investigated.

However, whilst it is important to continue to develop an in-depth evidence-base based on analysis of the factors that are associated with PHC worker retention (as has been undertaken in this thesis), it is critical that future analyses specifically investigate the effect on PHC worker rural retention of specific retention interventions. Evaluations of retention interventions have the potential to help inform policymakers not just about what the factors associated with retention are, but about what works (or doesn't work) to modify those factors and improve retention, and in what circumstances. Up until now, evaluations of the effectiveness of retention interventions have rarely measured actual retention of PHC workers, and have been hampered by the use of a wide range of different retention outcome measures (Dolea et al., 2010).

From a national rural and remote PHC policy perspective, key Australian educational and regulatory retention interventions are at or will soon be reaching a stage where there ought to be sufficient retention data available to enable evaluation of their effectiveness. These include data from the HECS Reimbursement Scheme for doctors, the RCS program (training of medical students in rural areas), the MRBS program and the BMP initiatives. Should existing rural and remote GP financial incentive retention strategies be modified, for example to additionally take into account population size as per the Monash model (McGrail, Humphreys, et al., 2011b) and as recommended by the recent review of government workforce programs (Mason, 2013), opportunities for evaluating the effect of the changes on rural and remote GP retention will also present (comparing rural retention before and after implementation of the changes). Clearly there are numerous other examples of how future research could be undertaken on the effectiveness of rural retention interventions implemented at different levels of the Australian health system (for example, Jurisdictional, regional and local PHC worker retention strategies) using the metrics demonstrated in this thesis to assess retention outcomes, assuming that systems are in place to collect and manage the appropriate data.

In order to undertake research on the effectiveness of these retention interventions, however, it remains critical that existing high quality longitudinal health workforce databases are maintained and strengthened. This may include adaptation or modification of the specific variables captured in a database. For example, in Chapter 4 it was noted that existing rural health workforce databases do not routinely collect data on rural PHC worker personal and professional satisfaction, despite professional satisfaction being an important mediating variable in the pathway to actual turnover. It has also been noted for many years that the lack of accessible national data for many allied health professions severely limits workforce planning, and this remains the case (Allied Health Professions Australia, 2013; Health Workforce Australia, 2013b; Mason, 2013; O'Kane & Curry, 2003). A clear and urgent need remains to remedy this most fundamental gap and thereby facilitate future allied health workforce research.

Future research into the factors associated with PHC worker retention and the effectiveness of retention interventions is likely to require increasing sophistication, in order to adequately take into account the complexity of health systems and rural and remote health service delivery models. This includes taking into account rapidly evolving overlaps in the tasks undertaken by different cadres of PHC workers, and changes in how these tasks are allocated between different professions. However, it is also becoming increasingly important to take into account the complexities associated with new and changing service delivery models. For example, traditional reliance on face-to-face consultations with in-situ PHC providers is now increasingly supplemented with virtual consultations provided through telehealth services, or by intermittent services provided by Fly In-Fly Out (FIFO) or Drive In-Drive Out (DIDO) consultations or other forms of PHC outreach services (Raven, Butler, & Bywood, 2013; Wakerman et al., 2012). Just as it has been identified that there is a need for workforce planning modelling to transition from a focus on single professions, to simultaneous consideration of multiple professions especially in the PHC sector, research similarly needs to make the transition to increasingly integrated analyses of PHC service provision in rural and remote areas (Ono et al., 2013). Service delivery models and business structure were factors shown in the research of this thesis to be strongly associated with PHC worker retention in rural areas. Further work is required to ascertain how best to capture these types of factors when quantitatively modelling the retention of PHC workers.

8.7 Conclusion

The geographical maldistribution of PHC workers is a serious and ongoing global problem that demands urgent policy interventions. Optimising the retention of existing rural and remote PHC workers is a key strategy for ameliorating geographic distributional imbalances of PHC workers and improving health outcomes for rural and remote populations. As highlighted earlier in this chapter, knowing which retention strategies to implement requires that policymakers are well-informed and have a sound understanding of the factors that are associated with rural and remote PHC workers staying or leaving rural and remote clinical practice.

To this end, the research of this thesis has provided important new evidence about the patterns and determinants of rural and remote PHC worker turnover and retention. A range of professional and organisational, educational and regulatory and financial and economic factors were demonstrated to have strong associations with the rural or remote retention of Australian PHC workers. The research of this thesis has additionally made an important contribution to the ability to monitor and evaluate the effectiveness of retention strategies, by identifying a suite of metrics that are well suited for assessing PHC worker retention outcomes in rural and remote PHC settings.

Already a major attempt has been made to ensure comprehensive, targeted and effective knowledge translation occurs. The results of the research undertaken in this thesis have been published in both national and international peer-reviewed journals, including in an open access journal, where the research is highly visible and has already been widely accessed (3,455 accesses to 18 May 2014). The research of this thesis has also been presented at national conferences as well as to policymakers at a range of levels of the Australian health system, and has been referenced in a publication produced by HWA, the national health workforce reform and planning organisation (Health Workforce Australia, 2013a). From the outset, the work of this thesis has been undertaken in close collaboration with rural and remote PHC workforce leadership, especially at the NSW Rural Doctors Network. This approach has ensured that the research is both highly relevant to the GP workforce planning role of RWAs and directly feeds back into policy-making at this level. As a doctoral project supported by the Centre of Research Excellence for accessible and equitable primary health service provision in rural and remote Australia, which is funded through the Australian Primary Health Care Research Institute, the research specifically targets an area of research that has a high level of relevance to policy makers, and links between these organisations and the Department of Health are already being, and will continue to be, utilised to maximise knowledge translation.

As highlighted throughout this thesis, and especially in Chapter 3, only a small number of comparable studies are evident in the existing international literature. The work of this thesis therefore represents a valuable addition to the international extant literature. Further, this research is the first of its kind to be undertaken specifically in Australian rural and remote PHC settings, and therefore is of particular importance for informing national rural and remote retention policy development. A further feature of this research, which sets it apart from all else, is its investigation and comparison of the retention of cadres of PHC workers other than physicians. This is rare in the existing international literature, and this feature, too, renders this research of national and international significance.

There remains, however, considerable ongoing need to further investigate the retention of rural and remote PHC workers, especially the effectiveness of retention strategies. The research of this thesis, however, has laid important foundation work for future evaluations of rural and remote PHC worker retention strategies.

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Appendix 1: Chronology of events and Government responses

Chronology of key events, organisations and sentinel publications and recommendations relevant to Australian rural and remote PHC workforce 1973-2013

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
1973	*"Expansion of Medical Education: Report of the Committee on Medical Schools to the Australian Universities Commission"* (Karmel, 1973)	Commonwealth Government commits to establishing new medical schools and expanding medical school places.
1974	Vocational training available through the Royal Australian College of General Practitioners Health Insurance Commission formed	Commonwealth Government regulation of the numbers of university places commences
1975	Medibank introduced (universal health insurance funded through the taxation system)	
1976	*"Rural Health in Australia"* report (Hospital and Health Services Commission, 1976)	
1977	Commonwealth Department of Health unpublished paper *"Revised Estimates of Production and Requirements for Medical Manpower"* cited in (Ganderton, 1983)	
1978	*"Country Towns, Country Doctors"* Royal Australian College of General Practitioners conference (Walpole, 1979)	
1979	*"Medical Manpower Supply: Report of the Committee of Officials. First Report"* (Sax, 1979)	Funding of university places is reduced in response to concerns of doctor oversupply.
1980	*"Medical Manpower Supply: Report of the Committee of Officials. Second Report" (Sax, 1980)*	
1981	Australia adopts World Health Organization global strategy *"Health for All by the Year 2000" (World Health Organization, 1981)*	
1982	Council of Remote Area Nurses of Australia formed	
1983	Health Commission of Victoria guidelines recommend disbanding of obstetric services with low throughput. Health Commission of Victoria report *"The Operation of Small Obstetric Hospitals"* finds no evidence to support this (Chater, 1991)	

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
1984	Medicare (universal health insurance): GP payment largely based on fee-for-service through the Medicare Benefits Schedule Australian Institute of Health and Welfare formed Many rural and regional hospitals close their schools of nursing	Legislation requires nursing training to move from the previous public hospital based apprenticeship model to university based. Funding of nursing education gradually transitions to Commonwealth Government responsibility (Mason, 2013).
1985	Australian Medical Council (AMC) established Better Health Commission established and tasked with reporting on Australian population health and recommending strategies to improve population health	Ongoing concerns about medical workforce oversupply. Numbers of domestic graduates and International Medical Graduates in Australia are reduced
1986	Better Health Commission report *"Looking Forward to Better Health"* reveals inequalities in health status among different groups of Australians	
1987	*"Ministerial Inquiry into the Recruitment and Retention of Country Doctors in Western Australia"* reports to WA Department of Health (Kamien, 1987) NSW rural doctors' dispute begins and Rural Doctors Association (NSW) formed *"Report of the Committee of Enquiry into Services Provided by General Medical Practitioners to Country Public Hospitals"* reports on NSW rural doctors' dispute to NSW Department of Health (Shehadie, 1987) Australian Institute of Health and Welfare established	Australian Commonwealth government announces the removal of after-hours GP attendance items (for services provided by Visiting Medical Officers to public hospital patients) from the Medicare Benefits Schedule
1988	*"Australian Medical Education and Medical Workforce into the 21st Century"* (Doherty, 1988)	NSW rural doctors' dispute concludes with Rural Doctors' Association Settlement Package and formation of NSW Rural Doctors Resource Network Many recommendations of Doherty report largely ignored. Recommendation to improve monitoring of Australian medical workforce taken up (Brooks, Doherty, & Donald, 2001).
1989	Senate Committee report: *"Vocational Registration of General Practitioners"* (Senate Select Committee on Health Legislation and Health Insurance, 1989) Medical Workforce Committee commences	Introduction of vocational registration for GPs

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
1990	*"Rural General Practice, Report to Health Ministers' Conference"* (Department of Community Services and Health, 1990) Australian Health Ministers' Advisory Committee formed Western Australian Centre for Rural and Remote Medicine formed as a response following recommendations from Kamien's 1987 inquiry First University Rural Health Clubs formed	Australian Commonwealth Budget 1990-91: Rural Health Support Education and Training Program (RHSET) funding announced – increasing support, education and training resources for rural health care workers to improve recruitment and retention
1991	*"A Fair Go For Rural Health. Draft National Rural Health Strategy"* (Agenda Forming Committee of the National Rural Health Conference, 1991) tabled at the inaugural National Rural Health Conference, leading to formation of National Rural Health Alliance. Rural Doctors Association of Australia formed	Australian Health Ministers' Conference supports *"A Fair Go For Rural Health"* as Australia's first national rural health strategy
1992	*"The Future of General Practice: A Strategy for the Nineties and Beyond"* report (General Practice Consultative Committee, 1992) (also known as the General Practice Strategy) Australian Journal of Rural Health formed Rural Health Training Units underway First university academic rural health research unit established Royal Australian College of General Practice establishes rural stream in its vocational training pathway National Health Strategy *"Improving Australia's Rural Health and Aged Care Services. Background Paper No. 11"* (Reid & Solomon, 1992)	1992-93 Australian Commonwealth Budget funds initiatives proposed in the General Practice strategy document, including Divisions of General Practice (which commence in 1994) and General Practice Rural Incentives Program (GPRIP) (which commences in 1993) Concerns of significant oversupply lead to quotas on Australian Medical College examination applications and point penalties for medical practitioners applying to migrate to Australia (House of Representatives Standing Committee on Health and Ageing, 2012) Rural Health Education Foundation is funded to provide professional education programs to rural doctors, nurses, Allied Health Practitioners using a satellite television network
1993	National Rural Health Unit established (later known as the Australian Rural Health Research Institute) National Rural Health Alliance established	1993-94 Australian Commonwealth Budget announces: Rural Undergraduate Support and Coordination (RUSC) Program funded

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
1994	*"National Rural Health Strategy"* (Australian Health Ministers' Conference, 1994) *"Report of the National Review of Nurse Education in the Higher Education Sector (1994 and Beyond)"* (Reid, 1994) Council of Australian Governments (COAG) formed	The revised "*National Rural Health Strategy"* is endorsed by the Australian Health Ministers' Advisory Council. Proposals include: • Develop models of service provision that are better suited to rural and remote communities • Establish a Commonwealth Office of Rural Health to co-ordinate and integrate funding and rural health service provision • Closer links between numbers of undergraduates trained in health sciences, the training curricula and workforce needs • Minimum quotas for rural students in health science tertiary courses • Increased undergraduate rural clinical placements Rural Undergraduate Support and Coordination program introduces 25% quota of rural students in medical courses and requirement for a minimum 4 week rural placement
1995	Australian Medical Workforce Advisory Committee (AMWAC) formed by the Australian Health Ministers' Advisory Committee as a Council of Australian Governments Committee	The Commonwealth Government announces reductions in the number of university places for medical students, in face of concerns about limiting Medicare expenditure growth, and a perception that medical workforce is oversupplied. Annual vocational training places for GPs limited to 400. Aboriginal Medical Services funded.
1996	Australian Medical Workforce Advisory Committee Report *"Australian Medical Workforce Benchmarks"* (Australian Medical Workforce Advisory Committee & Australian Institute of Health and Welfare, 1996) Australian Medical Workforce Advisory Committee Report *"The Medical Workforce in Rural and Remote Australia"* (Australian Medical Workforce Advisory Committee, 1996) *"National Rural Health Strategy Update"* (Australian Health Ministers' Conference, 1996) emphasises the importance of a Primary Health Care approach to improving rural health outcomes (Humphreys, Hegney, et al., 2002) Australian College of Rural and Remote Medicine established	Commonwealth Government attempts to constrain growth in health expenditure by targeting health workforce size and structure in 1996-97 budget: • a cap on medical school places introduced • Better Practice Program introduced, aiming to shift payment mechanisms away from fee-for-service towards blended payment linked to provision of comprehensive high quality care provision Other budget announcements: • $6.75m pa for University Departments of Rural Health (UDRH) program to establish 6 UDRHs • Funding for up to 150 scholarships in the John Flynn Placement Program for medical students • Funding for nurse practitioner training • Funding for improved rural locum services • Funding to rural hospitals and medical schools for rural undergraduate and post-graduate training of doctors • Ongoing support for General Practice Rural Incentives Program and review of the program Health Insurance Act 1973 is amended, and sections 19AA and 3GA introduced (Medicare Provider Number legislation): • 19AA: Access to Medicare Provider numbers requires

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
		vocational recognition (for example, Fellowship of the Royal Australian College of General Practitioners) or enrolment in vocational training program • 3GA: Access to Medicare Provider numbers can alternatively be gained through participation in specified rural workforce programs (for example, Rural Locum Relief Program) 457 visa sub-class enables skilled foreign workers to work for 4 years in Australia, leading to a large increase in numbers of overseas trained doctors.
1997	General Practice Strategy Review Group set up to review General Practice Reform Strategy Services for Australian Rural and Remote Allied Health established	1997-98 Commonwealth Budget's priority outcome for Medicare and General Practice was to constrain growth in Medicare outlays. State and national Rural Workforce Agencies established Section 19AB of the Health Insurance Act (Ten Year Moratorium) takes effect. International medical graduates who first registered in Australia after 1/1/1997 are restricted in accessing the Medicare Benefits Schedule for 10 years from when they register unless they work in a District of Workforce Shortage.
1998	General Practice Strategy Review Group Report *"General Practice: Changing the Future Through Partnerships"* (General Practice Strategy Review Group, 1998) *"General Practice Education: The Way Forward. Final Report of the Ministerial Review of General Practice Training"* (Australian Government Department of Health and Family Services, 1998) Australian Institute of Health and Welfare report *"Health in Rural and Remote Australia"* (Australian Institute of Health and Welfare, 1998) Australian Medical Workforce Advisory Committee and Australian Institute of Health and Welfare report *"Medical Workforce Supply and Demand in Australia: A Discussion Paper" (Australian Medical Workforce Advisory Committee & Australian Institute of Health and Welfare, 1998)*	The 1998-99 Commonwealth budget announces: • Additional funding for Rural Workforce Agencies • Incentives for GP practice restructuring/amalgamations • New Practice Incentives Program to replace Better Practice Program. Rural loadings introduced to support income of rural and remote GPs • Bonded University places offered for 100 international medical graduates as alternative to Australian Medical Council pathway to medical practice • Rural Multipurpose Services initiative (introduction of a more integrated model of PHC service delivery) Rural Locum Relief Program begins General Practice Rural Incentives Program becomes Rural and Remote General Practice Program

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
1999	*"Healthy Horizons – A Framework for Improving the Health of Rural, Regional and Remote Australians"* (National Rural Health Alliance, 1999) highlights the need for flexible and innovative approaches to Primary Health Care service delivery, and for a skilled and responsive workforce in rural and remote communities James Cook University established International students graduating from Australian universities and wishing to apply to migrate to Australia as General Skilled Migrants no longer have to wait 3 years to apply Deputy Prime Minister John Anderson calls the Regional Australia Summit	1999-00 Commonwealth Budget announces: • funding for a rural medical school at James Cook University, Townsville and a rural clinical school at Wagga Wagga $20m • funding to establish up to 100 Rural Australia Medical Undergraduate Scholarships (RAMUS) each year supporting rural origin students • Ongoing funding for Rural Health Support Education and Training Program (including Australian Remote and Rural Nursing Scholarship Scheme) • Rural pharmacy workforce development program • Regional Health Service Centres funded to build on Multipurpose Service delivery models • Further emergency care training for remote nurses • Rural Retention Program to offer further incentives for retaining rural GPs. Payments scaled according to remoteness and professional isolation • Funding for Rural Women's GP Service to rural underserved areas Rural and Remote Area Placement Program developed as a training program for recently graduated doctors fills a gap in the rural training pathway continuum 5-Year Overseas Trained Doctor Scheme commences
2000	Australian Medical Workforce Advisory Committee Report *"The General Practice Workforce in Australia: Supply and Requirements 1999 - 2010"* (Australian Medical Workforce Advisory Committee, 2000) *"Rural Health Stocktake. Advisory Paper to the Commonwealth Department of Health and Aged Care"* report (Best, 2000) Australian Rural and Remote Workforce Agencies Group formed RACGP establishes rural training pathway Commencement of medical students at James Cook University regionally located medical school in Townsville, Queensland	2000-01 Commonwealth Budget acknowledges undersupply of rural doctors and begins expanding medical workforce supply. The *"More Doctors, Better Services"* $562 million Regional Health Strategy includes: • Increased GP Registrar training places overall and rurally • Doubling of Rural Australia Medical Undergraduate Scholarships to 400 • Initial funding of Medical Rural Bonded Scholarships (MRBS) scheme • Funding for 9 new Rural Clinical Schools (RCSs) and 3 new University Departments of Rural Health • Higher Education Contribution Scheme reimbursement scheme for GPs willing to work in rural Australia • More Allied Health Services Program funded to increase rural allied health practitioner and nurse PHC services • Extra funding to Divisions of General Practice to support rural doctors • Greater financial incentives for rural pharmacists Amendment to section 19ABA of the Health Insurance Act 1973 disallows medical practitioners who have breached a contract with Commonwealth Government to work in rural and remote areas from accessing the Medicare Benefits Schedule for twice the length of the period that the return-of-service was for

Year	**Key events, organisations and publications relevant to Australian rural and remote PHC workforce**	**Key Australian Commonwealth Government rural and remote PHC workforce policies and programs**
2001	The Australian Rural Health Education Network (ARHEN) established	2001-02 Australian Commonwealth Budget continues "*More Doctors, Better Services*" Regional Health Strategy, adding funding for: • Practice Incentives Program payment for GPs to employ Practice Nurses • Re-entry training programs and re-entry scholarships for rural nurses • 110 scholarships for rural or Indigenous students to study nursing • Funding for RACGP vocational training program ceased; General Practice Education and Training (GPET) and devolved Regional Training Providers (RTPs) funded Regulations change so that full fee-paying international medical students can remain in Australia and apply for permanent residency.
2002	Access Economics Report *"Primary Health Care for all Australians: An Analysis of the Widening Gap Between Community Need and the Availability of GP Services. Report to the Australian Medical Association"* (Access Economics, 2002) *"National Review of Nursing Education 2002. Our Duty of Care"* (Heath, 2002) recommends increased Commonwealth funding for additional undergraduate university places and nationally consistent scopes of practice and national standards for nursing.	The 2002-03 Commonwealth Budget announces: • Funding for extra GP vocational training positions in outer metropolitan areas • Higher Medicare rebates available for non-vocationally registered doctors who work in underserved outer metro areas Puggy Hunter Memorial Scholarship Scheme to build Indigenous workforce capacity begins Australian Rotary Health Indigenous Health Scholarship Program commences Numbers of vocational trainees in General Practice in decline (about 500 or 25% fewer than in 1994) (Australian Medical Workforce Advisory Committee, 2002)
2003	Revision of the National Rural Health Strategy Healthy Horizons *"Healthy Horizons Framework: Outlook 2003-2007"* (Australian Health Ministers' Advisory Council & National Rural Health Alliance, 2002) identifies the need for better information to inform rural and remote health policy development	The 2003-04 Commonwealth budget: • Continuing funding of initiatives announced in 2000-01 Regional Health Strategy • Increased funding to support clinical training of nurses • Additional 210 nursing training places in regional areas • 234 Bonded Medical Places at universities funded • Additional 150 GP vocational training places targeted to rural and remote areas Medicare for Other Medical Practitioners program launched as part of MedicarePlus

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
2004	Australian Health Ministers' Conference *"National Health Workforce Strategic Framework"* (Australian Health Ministers' Conference, 2004) identifies 7 principles underpinning workforce policy and outlines a range of strategic directions to take	The 2004-05 Commonwealth budget announces: • Continuing funding of initiatives announced in 2000-01 Regional Health Strategy • Additional funding for bonded medical places at James Cook University. Return-of-service obligation for 6 years. Bonded medical places at universities begin Rural and Remote Area Placement Program replaced by Prevocational General Practice Placements Program (PGPPP) International Recruitment Strategy (IRS) commences to recruit international medical graduates to shortage areas Cap of 600 vocational training places for GPs. Not all places able to be filled.
2005	Productivity Commission Research Report *"Australia's Health Workforce"* (Productivity Commission, 2005) Australian Medical Workforce Advisory Committee Report *"The General Practice Workforce in Australia: Supply and Requirements to 2013"* (Australian Medical Workforce Advisory Committee, 2005)	2005-06 Commonwealth budget announces: • Increased access to Medicare Benefits Schedule items for Practice Nurses working under direction of GP (for example, Pap smears) • Additional funding for Rural Nursing Scholarship Program, diverted from National Rural and Remote Health Support Program and Additional Practice Nurses for Rural Australia program
2006	*"The World Health Report 2006: Working Together for Health"* (World Health Organization, 2006) highlights the global PHC workforce crisis and geographical maldistribution World Health Assembly resolution urging member states of the World Health Organization to rapidly scale up health workforce production (World Health Alliance, 2006) Global Health Workforce Alliance formed to take action on global health workforce crisis *"Review of the Rural Retention Program"* (Gibbon & Hales, 2006) reviews incentive payments paid to rural and remote GPs *"The Australian Allied Health Workforce: An Overview of Workforce Planning Issues"* (Australian Health Workforce Advisory Committee, 2006) National Health Workforce Taskforce established to report to the Australian Health Ministers' Advisory Council The Australian Medical Workforce Advisory Committee and the Australian Health Workforce Advisory Committee end	Council of Australian Governments endorses 2005 Productivity Commission report to improve supply and geographical distribution of health professionals and announces a move towards nationally consistent and simplified assessment processes for international medical graduates (competent authority pathway, standard pathway, specialist pathways), and improved training and support for international medical graduates. Increased Commonwealth Supported (medical) Places Increased investment in new Rural Clinical Schools The 2006-07 Commonwealth budget announces: • Commitment to 605 additional medical places and 1,000 new nursing places • Changes in ability of salaried medical officers to claim on Medicare Benefits Schedule for non-hospital services in small towns experiencing GP undersupply (Provider Population Ratio<1 FTE GP:1400) • Ability to claim Medicare Benefits Schedule items for services provided in public hospital emergency departments and outpatients in District of Workforce Shortage locations with population size<7,000 Rural Allied Health Undergraduate Scholarship Scheme commences

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
2007	The Australian College of Rural and Remote Medicine gains accreditation from the Australian Medical Council to provide vocational training and professional development for rural GPs Australian Nurse Practitioners Conference	Council of Australian Governments announces a national registration and accreditation scheme nursing and midwifery, medicine, pharmacy, physiotherapy, psychology, dental care, optometry, and osteopathy and chiropractors. The proportion of Bonded Medical Places increases to 25% of all commencing medical students (535 in 2007) The 2007-08 Commonwealth budget announces: • Funding for a new Rural Clinical School (University of Wollongong) • Funding for a new rural school of dentistry and oral health at Charles Sturt University • Funding of rural clinical placements for city dental students • Expansion of visiting optometrists scheme • Increased funding for GP Rural Retention program for 400 extra recruitment grants • Expansion of Rural Women's GP service
2008	"*Report on the Audit of Health Workforce in Rural and Regional Australia"* (Australian Government Department of Health and Ageing, 2008) finds insufficient overall supply of health professionals to meet current health needs, and very poor supply in many rural and regional areas. World Health Organization Report *"Primary Health Care: Now More Than Ever"* (World Health Organization, 2008) Office of Rural Health re-established in the Department of Health and Ageing Establishment of the National Health & Hospitals Reform Commission to develop long term plans for health system reform Remote Area Health Corps funded to support workforce needs in remote Aboriginal communities in the Northern Territory by recruiting urban-based primary health care professionals to provide short-term locums	Creation of the Office of Rural Health within the Department of Health and Ageing The 2008-09 Commonwealth budget provides substantial additional funding for the rural health workforce in line with the Council of Australian Governments' commitment of $1.6b to expand Australia's health workforce: • Funding for 31 GP Super Clinics to enhance multidisciplinary care • Extra funding for John Flynn Placement Program, increasing its capacity to 1200 places • Funding for rural clinical placement scholarships for allied health students • 100 postgraduate scholarships for rural mental health nurses and 200 for rural psychologists • Up to 50,000 additional health vocational training places targeting areas of chronic skills shortages (dentistry, nursing, Indigenous health) • Additional funding for nurses workforce re-entry • 1,260 extra university places for nurses • Extra funding for Rural Clinical Schools and University Departments of Rural Health to support rural placements for medical students • Funding for Health Workforce Australia (HWA), a national health workforce agency to drive long term strategic planning under direction of the Council of Australian Governments' Standing Council on Health • Limited Medicare and Pharmaceutical Benefits Scheme access enabled for Nurse Practitioners and Midwives 20 scholarships funded to support rural and remote nurses upgrade their qualifications to become Nurse Practitioners

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
2009	National Health and Hospitals Reform Commission (NHHRC) report *"A Healthier Future for all Australians. Final Report June 2009"* (National Health and Hospitals Reform Commission, 2009) Australian National Audit Office report *"Rural and Remote Health Workforce Capacity – The Contribution Made by Programs Administered by the Department of Health and Ageing"* (Australian National Audit Office, 2009)	2009-10 Commonwealth Budget announces the $134m Rural Health Workforce Strategy package, as a response to the 2008 "Report on the Audit of the Rural Health Workforce" and the review of rural workforce programs : • Rural Health Multidisciplinary Team (RHMT) Program to support rural training of medical, nursing and allied health students (captures former University Departments of Rural Health Program, John Flynn Placement Program, Rural Clinical Schools and Rural Undergraduate Support and Coordination Programs and Dental Training Expanding Rural Placements Program) • Funding to enable better access for Nurse Practitioners and midwives to Medicare Benefits Schedule and Pharmaceutical Benefit Scheme items • Funding for 800 additional GP training places, including Remote Vocational Training Scheme places • Additional funding for Prevocational General Practice Training Program • New funding for the first medical school in NT to increase training of Indigenous doctors • Additional funding to Divisions of General Practice for workforce support • Scaling introduced for retention incentive payments (GP Rural Retention Program, GP Registrar Rural Incentive Program) and obligated service programs (Bonded Medical Placements scheme, 5 Year Overseas Trained doctor scheme) Domestic undergraduate full fee paying university places for medical students phased out (no limits on university places for international medical students) Announcement of an easing in Commonwealth government regulation of the number of student university places (except for medicine)
2010	*"Building a 21st Century Primary Health Care System. Australia's First National Primary Health Care Strategy"* (Australian Government Department of Health and Ageing, 2010) World Health Assembly adopted the *"World Health Organization (WHO) Global Code of Practice on the International Recruitment of Health Personnel"* (World Health Organization, 2010b) National Health and Hospitals Network formed Health Workforce Australia commences, subsuming the work of the National Health Workforce Taskforce	The 2010-11 Commonwealth budget announces: • Funding for specific domestic violence training of Practice Nurses and Aboriginal Health Workers in rural and regional areas • Expansion of Multipurpose Services • 100 additional clinical placement scholarships for allied health students (Australian Allied Health Rural and Remote Clinical Placement Scholarship program) • Funding to explore regulation and scope of practice of assistants in nursing • Funding to establish a rural locum scheme for Allied Health Practitioners and nurses, providing 100 Allied Health Practitioner and 750 nursing locum placements annually: Nursing and Allied Health Rural Locum Scheme (NAHRLS)

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
		• Additional funding for GP Super Clinics and for primary care infrastructure upgrades announced Rural Allied Health Undergraduate Scholarship Scheme is rebadged as the Nursing and Allied Health Scholarship and Support Scheme National registration and accreditation commences for doctors, nurses, dentists and some allied health professions Rural Retentions Program and GP Registrars Rural Incentive Program are combined to form the General Practice Rural Incentives Program. Allocation of incentives shifts from being based on the General Practitioner Accessibility and Remoteness Index of Australia (GPARIA) to the Australian Standard Geographical Classification-Remoteness Areas classification.
2011	National Health Reform Agreement which changes funding arrangements for public hospitals and introduces Medicare Locals to co-ordinate primary health care delivery and address local service gaps Rural Clinical Schools program merges with Rural Undergraduate Support and Coordination program to form Rural Clinical Training and Support (RCTS) program	The 2011-12 Commonwealth budget announced as part of the Health and Hospitals Fund Regional Priority Round: • $1.8 billion investment in rural and regional health infrastructure providing Indirect support for rural health worker recruitment and retention via grants to assist communities build, expand and improve health facilities and improve clinical training • Funding to expand Access to Allied Psychological Services to provide more services to Indigenous people and people in hard to reach locations • Funding to fast track reforms to GP after hours care coordinated by Medicare Locals • Funding for a dedicated unit for Rural and Regional Health within the Department of Health and Ageing
2012	*"National Strategic Framework for Rural and Remote Health"* (Standing Council on Health, 2012) *"The Factors Affecting the Supply of Health Services and Medical Professionals in Rural Areas"* (The Senate Community Affairs References Committee, 2012) *"Lost in the Labyrinth. Report on the Inquiry into Registration Processes and Support for Overseas Trained Doctors"* (House of Representatives Standing Committee on Health and Ageing, 2012) Introduction of reporting of Government expenditure by geographical location Aboriginal Health Workers added to National Registration and Accreditation Scheme	The 2012-13 Commonwealth budget announced: • Funding to increase the capacity of the dental workforce includes increased training positions in areas of need and infrastructure and relocation incentives for dental workers moving to rural and remote areas • Reductions in funding for unspecified health workforce programs in anticipation of the review of Australian Government Health workforce programs and streamlining of programs (Mason, 2013) • Funding for primary health care services and allied health services to Indigenous Australians in the Northern Territory

Year	Key events, organisations and publications relevant to Australian rural and remote PHC workforce	Key Australian Commonwealth Government rural and remote PHC workforce policies and programs
2013	*"Review of Australian Government Health Workforce Programs"* (Mason, 2013) recommends reforming the classification system used to allocate GP recruitment and retention incentives	The 2013-14 Commonwealth budget announced: • Additional funding for the General Practice Rural Incentives Program provided by reallocation of funds from Health Workforce Australia and from reductions in other health workforce programs • Funding to implement and evaluate workforce redesign activities to overcome shortages by enhancing health workforce efficiencies and effectiveness • Reduced funding for Health Workforce Australia • Funding for International Health Professionals Program to provide streamlined and nationally coordinated recruitment • Reduced funding for National Rural and Remote Health Infrastructure Program, but increased focus on projects in remote and very remote Australia or Indigenous communities In response to the Mason review a technical advisory group is formed to advise policymakers on modifications to the geographical classification system used for allocation of GP retention incentives

Appendix 2: Data collection tools

AUSTRALIAN PRIMARY HEALTH CARE RESEARCH INSTITUTE

Rural and Remote Health Service Research

Improving workforce retention in small rural and remote health care services

This survey is being carried out in order to ascertain levels of workforce turnover in rural and remote communities and to identify how retention policies can improve the attractiveness of workplace environments and worker satisfaction so that health workforce retention is increased.

This research project is being conducted by staff from Monash University School of Rural Health in Bendigo, the Flinders and Charles Darwin Universities Centre for Remote Health in Alice Springs, and the Australian National University.

We are surveying a sample of rural and remote health services across Australia. Your participation in this survey is entirely voluntary, and you may withdraw your participation at any time. This questionnaire will take 20–30 minutes to complete.

All information will remain entirely confidential. The responses to this survey will be analysed and presented so that it will not be possible to identify any individual responses in the report. Please do not put your name or address on this questionnaire.

If you have any queries relating to this survey, please contact John Humphreys on [redacted]

Thank you for your time.

THE AUSTRALIAN NATIONAL UNIVERSITY

MONASH University
Medicine, Nursing and Health Sciences

Centre for Remote Health
A joint centre of Flinders University and Charles Darwin University

Health workforce retention in rural and remote health services

Section 1: Your health service

1. How many employees providing direct health care currently work in this health service?

☐ < 5
☐ 5-10
☐ > 10

2. What is the population of your service catchment area

☐ < 1000
☐ 1,000-2,500
☐ 2500-5000
☐ 5000-10,000
☐ >10,000

3. What is the distance from your service to the nearest centre with a population more than 10,000?

☐ <50km
☐ 50-100kms
☐ 100-200kms
☐ More than 200 kms

4. Indicate which of the following best describes the nature of your health service by placing a a tick (✓) in the appropriate box *(choose only one)*:

	MODEL TYPE	MODEL DESCRIPTION	Examples
☐	**A discrete health services**	Discrete health services exist where population catchments meet essential service requirements (although some supports may be needed to address workforce recruitment and retention).	• Walk-in/Walk-out model • General practice • University clinic
☐	**An integrated health services**	Service integration maximises access to locally available services. Local point-of-entry to the health system helps to co-ordinate patient care and reduces the need for travel.	• Multipurpose service • Shared care model • Co-ordinated Care Trial • PHC teams
☐	**A comprehensive primary health care service**	Access to services in small, isolated, high-need communities is critical where few alternative ways of delivering appropriate care exist. Community participation and service flexibility is essential to meet local needs and circumstances.	• Aboriginal Controlled Community Health Service
☐	**An outreach health services**	This model provides access through virtual or periodic visiting services to communities too small to support permanent local services.	• Hub-and-spoke model • Visiting service • Fly-in, fly-out service
☐	**Some other health service model**	**PLEASE PROVIDE A BRIEF DESCRIPTION**	

Health workforce retention in rural and remote health services

Section 2: Workforce retention

5. What would you consider to be a *reasonable* length of stay in this service for the following health workers. (*Please place a tick (✓) in the not applicable (n/a) box if your health service does not employ any of the following health workers.)*

	Months	n/a
• Doctor (GP)	☐	☐
• Nurse	☐	☐
• Physiotherapist	☐	☐
• Mental health worker/Psychologist	☐	☐
• Social Worker	☐	☐
• Podiatrist	☐	☐
• Indigenous Health Worker	☐	☐
• Health Service Manager	☐	☐

6. Please indicate the extent to which you agree or disagree with the following statements. (*Please circle the number for your response)*

   i. Staff turnover is a major problem for this health service:

1	2	3	4	5
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

   ii. Staff retention is a more pressing problem than recruitment:

1	2	3	4	5
Much more important	More important	Same	Less important	Much less important

   iii. Staff turnover in the health service can be reduced by retention incentives:

1	2	3	4	5
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Section 3: Workforce retention measures

7. Which **one** workforce retention measure would you consider to be the most effective in increasing the length of stay in this health service?

   ....

8. Does this health service pay financial retention allowances for a minimum period of service to any of its staff? ☐ Yes ☐ No

   If yes, provide details of the amount and time period.

   ....

9. How do you monitor the effectiveness of your workforce retention polices & incentives on length of stay?

   ....

   ....

   ....

Health workforce retention in rural and remote health services

10. What measures does your health service currently employ to encourage doctors and other health workers to stay longer in this health service? Tick all that apply.

Education and regulatory interventions	**Doctors**	**Other Health Workers**
• Recruitment of health workers from a rural/remote background	☐	☐
• Conditional licensing (license to practice in exchange of location in rural areas for overseas trained health workers)	☐	☐
• Loan repayment schemes (paid studies in exchange for service in rural area for a minimum period of time)	☐	☐
• Improved workplace infrastructure (eg telemedicine/telehealth)	☐	☐
• Flexible contracts and working arrangements	☐	☐
• Salary packaging arrangements	☐	☐
Monetary compensation		
• Higher salaries for rural/remote practice	☐	☐
• Retention incentives or allowances for minimum period of service	☐	☐
• Annual fares for family to nearest capital city	☐	☐
• Paid housing, vehicle	☐	☐
• Grants for school education	☐	☐
Management support		
• Supportive supervision/mentoring	☐	☐
• Guaranteed relief	☐	☐
• Support for continuous professional development, career paths	☐	☐
Environment and social support		
• Improved living conditions, including housing and child schooling	☐	☐
• Opportunities for spouse employment	☐	☐
Other (Please specify)	☐	☐

Section 4: Workforce turnover 2003-2008

11. Based on human resources data, please provide de-identified data for all employees providing direct health care in this health service 2003-2008.
(**TEMPLATE A** IS A GUIDE SHOWING THE FIELDS TO BE INCLUDED IN YOUR SPREADSHEET.)

Section 5: Costs of workforce replacement

12. Based on human resources data or your best estimates, please complete the **TEMPLATES B to F** for each of the following:
    - Nurse *(Template B)*
    - Allied Health professional *(Template C)*
    - Indigenous health worker *(Template D)*
    - Health service manager *(Template E)*
    - Doctor *(Template F)*

THANK YOU FOR YOUR PARTICIPATION IN THIS SURVEY

Please return to either:

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LISTING OF ALL ALLIED HEALTH PROFESSIONALS PROVIDING DIRECT HEALTH CARE IN THIS HEALTH SERVICE AT ANY TIME DURING 2004-2009

INCLUDE ALL CURRENT EMPLOYEES AND THOSE WHO MAY HAVE LEFT WITHIN THIS PERIOD

Type of Allied Health Professional	Classification level - at time of appointment (Grade)	Start date (Date when allied health professional was first employed)	Classification level - now or at time of exit (Grade)	Exit date (Leave blank if still employed)	Gender	Year/ Date of Birth	EFT (1.0=Full-time)	Locum or agency staff
EXAMPLE:								
Physiotherapist	1	9/07/2001	2	5/02/2003	F	30/06/1980	1.0	No
Physiotherapist	1	8/02/2003	1	8/05/2003	F	20/02/1984	1.0	Yes
Physiotherapist	2	26/07/2004	2	6/01/2006	F	17/03/1973	0.8	No
Physiotherapist	2	13/02/2006	2		M	5/11/1984	1.0	

Please photocopy as many of the following blank sheets as you need

ALLIED HEALTH PROFESSIONAL - CURRENT COST OF RECRUITMENT

Staff replacement costs			**Totals**
DIRECT COSTS OF RECRUITMENT OF NEW EMPLOYEE			
1. Vacancy costs per week per allied health position:	• Cost of temporary staffing per vacant position per week (ie: agency fees/locums) • Overtime or time in lieu costs for existing staff during period of staff vacancy • Cost to health service of patient transfer incurred as a direct result of staff vacancy • Loss of contractual work	\$ \$ \$ \$	\$
2. Recruitment costs per position	• Advertising • Search firm costs ○ Screening costs: - Reviewing resumes & responding to inquiries	\$ \$	
	• Interviewing costs ○ Staff time & salaries - Preparation and conducting of interview - Evaluating & negotiating with selected candidate - Background checks • Relocation expenses ○ Transportation & removal/storage ○ Temporary accommodation costs ○ Welcoming/Hosting costs	\$ \$	\$
3. Orientation and training costs per new recruit	• Staff time and salaries • Equipment • Up-skilling programs • Supervising/mentoring	\$ \$ \$ \$	\$
INDIRECT COSTS ASSOCIATED WITH RECRUITMENT OF NEW EMPLOYEE			
4. Decreased productivity resulting from loss of a staff member	Such as lost knowledge and training, loss of morale amongst remaining staff and increased workload leading to burnout which are not easily quantifiable (*Please provide estimate if possible*).		*\$
5. Cost of initial reduced productivity	Such as lower initial productivity of new employee, decreased supervisor/co-worker productivity which are not easily quantifiable (*Please provide an estimate if possible. For example, you may be able to estimate the new worker case-load as a fraction of what you would expect from an established staff member, and any time associated with additional supervision of the new health worker*).		*\$
	TOTAL COSTS:		\$