Title

Australia's rural medical workforce: Supply from its medical schools against career stage, gender and rural-origin

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We used data from the Medicine in Australia: Balancing Employment and Life (MABEL) longitudinal survey of doctors conducted by the University of Melbourne and Monash University. Funding for MABEL comes from the National Health and Medical Research Council (Health Services Research Grant, 2008–2011; and Centre for Research Excellence in Medical Workforce Dynamics, 2012–2016) with additional support from the Department of Health (in 2008). We especially thank the doctors who gave their valuable time to participate in the MABEL survey.

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Title

Australia's rural medical workforce: Supply from its medical schools against career stage, gender and rural-origin

Abstract

Objective: To explore the association between career stage and rural medical workforce supply amongst Australian-trained medical graduates

Design and Setting: Descriptive analysis using the national Medicine in Australia: Balancing Employment and Life (MABEL) longitudinal study

Participants: Australian-trained GPs and other specialists who participated in the MABEL study, 2008-2013

Main outcome measure(s): Proportions of GPs and specialists working in rural locations, according to career stage (establishing, early, mid and late), gender and childhood origin type (rural versus metropolitan)

Results: Logistic regression models revealed that establishing- and early-career GPs had significantly higher likelihood (OR 1.67 and 1.38, respectively) of working rurally, but establishing and early career doctors were significantly less likely (OR 0.34 and 0.43, respectively) to choose general practice, contributing proportionally fewer rural GPs overall (OR 0.77 and 0.75, respectively) compared to late-career doctors. For specialists, there were no significant associations between career cohorts and rural practice. Overall there was a significantly lower likelihood (OR 0.83) of establishing-career doctors practising rurally. Females were similarly likely to be rural GPs but less

likely to be rural specialists, while rural origin was consistently associated with higher odds of rural practice.

Conclusions: The supply of Australia's rural medical workforce from its medical schools continues to be challenging, with these data highlighting both their source and associations with doctors at different career stages. Despite large investments through rural medical training and rural workforce recruitment and retention policies, these data confirm continued reliance on internationally-trained medical graduates for large proportions of rural supply is likely.

Keywords

Doctor, health service, policy, practice location, rural GP background

What is already known on this subject?

- Shortages and maldistribution of the rural medical workforce persist in Australia
- The makeup of domestic medical students now includes equal representation of female doctors and minimum 25% quotas on students of rural-origin
- Difficulties continue in producing sufficient GPs from within Australian-trained doctors
- Australia's rural medical workforce remains heavily reliant on supply from internationally-trained medical graduates

What this paper adds

- Estimation that only 26-30% of establishing- and early-career rural-origin medical graduates practise in rural locations, in contrast to 33-36% of mid- and late-career rural-origin graduates, contributing around 35% of Australia's domestically-trained rural GPs and rural specialists
- Significantly fewer Australian-trained doctors at early and establishing-career stages (8.6%-9.3% compared with 13.7% - 12.1% of mid- and late-career doctors) worked as rural GPs. Increased feminisation has no overall association with rural GP proportions, a combination of more working as GPs but fewer choosing to work rurally.
- Early-career GPs are more likely to work in rural areas, however early-career doctors are also less likely to choose general practice as their specialty compared to late-career doctors. Improving overall rural GP supply is likely to require attracting more young Australian-

trained doctors of both rural- and metropolitan-origin into general practice, while simultaneously maintaining or even improving the attractiveness of rural practice.

Introduction

Rural medical workforce maldistribution and undersupply remain key problems for Australia¹ and other similarly large countries with dispersed populations.^{2, 3} These problems persist despite substantial Australian government efforts to stimulate improved rural practice uptake and retention of its medical graduates in rural areas,⁴ though conclusive evidence of the effectiveness of political interventions remains limited.⁵

Existing evidence suggests that individuals have varying propensity to practise rurally, either as a general practitioner (GP) or in other specialties. For example, rural upbringing ('rural-origin') has long been associated with subsequent choice of rural work location.^{6, 7} In addition, feminisation of the medical workforce is changing rural supply dynamics. Females tend to choose more family-friendly specialties, such as general practice, and more balanced working hours.^{8, 9} However, work-life balance issues are likely to increasingly impede their choice of a rural practice location.^{10, 11} While GPs are more likely to practice rurally compared to other specialists,¹² low proportions of doctors of both genders are choosing to practise as GPs which adversely impacts on rural medical supply.^{13, 14}

The policy context in which Australia's rural medical workforce training and workforce support has occurred has undergone substantial changes since the early 1970s (Table 1).¹⁵ Many training policies and targets introduced since then have been specifically designed to improve rural workforce supply and distribution of newer doctors.¹⁶ These include selection quotas for the proportion of domestic medical students of rural-origin (above 25%), increasing rural undergraduate training exposure through the Rural Clinical Schools (RCS) program and increasing rural prevocational and vocational training pathway positions.^{4, 17}

Table 1

This study explores associations between career stage and rural medical workforce supply in 2008 - 2013 amongst Australian medical school graduands. Rural supply is assessed against three key medical workforce trends – the decreasing proportion of doctors working as GPs, the increasing proportion of female doctors and the increased proportion of rural-origin students.

Methods

This study uses data from the *Medicine in Australia: Balancing Employment and Life* (MABEL) survey, conducted by the Centre for Research Excellence in Medical Workforce Dynamics. MABEL is Australia's national longitudinal study of doctors, which conducts annual surveys from mostly the same panel of doctors (<https://mabel.org.au/>). MABEL was approved by the University of Melbourne Faculty of Business and Economics Human Ethics Advisory Group and the Monash University Standing Committee on Ethics in Research Involving Humans.

In 2008 the entire medical workforce was invited to participate in MABEL, with 10,498 doctors (19.4% of Australia's medical population) completing the initial survey. Subsequent participation has seen an annual 70-80% retention rate of previous respondents, with the addition each year of new doctors to the dataset and returning participants who have missed a survey response for one or more years. This study uses MABEL data from 2008-2013; however international medical graduates (IMGs), non-specialist hospital doctors, pre-1970 graduates and non-clinically active respondents were excluded. A detailed assessment of selection (non-response) bias was undertaken for 2008 and 2009 waves,^{18, 19} with the most notable observable bias being more remote area participants, and slightly more female doctors and specialists.

Career stages

This study includes doctors who are at different stages of their career.²⁰ Four groupings are defined for analyses:

- (1) Late career = graduated during 1970s (mostly 55-70);
- (2) Mid career = graduated during 1980s (mostly 45-60);
- (3) Early career = graduated during 1990s (mostly 35-50);
- (4) Establishing career = graduated during 2000s (mostly 25-40).

Rural-origin

Rural-origin is defined as having spent at least 6 years of their childhood living in a rural area. Rural areas are defined as those locations in Australian Standard Geographic Classification Remoteness Areas (ASGC-RA) 2-5. Rural-origin data were missing for 8% of eligible respondents.

Specialty choice

Specialty was divided into two groups, firstly GPs (including GP registrars) and secondly all other specialties combined (including those enrolled in vocational training), hereafter termed GPs and specialists, respectively.

Work location

Self-reported work locations were classified as metropolitan or rural (defined, respectively, as ASGC-RA 1 or ASGC-RA 2-5). Each doctor responded to between one and six surveys, thus contributing up to six aggregate person-years of work location data.

Statistical analysis

Firstly, descriptive statistics were used to analyse each cohort and subgroup; the outcome is reported as a percentage (of the aggregate person-years) to enable direct comparisons. Secondly, multivariate logistic regression models (adjusted for clustering on the same doctor) were used to measure associations between key characteristics (career cohort, gender, origin) and main workforce outcomes (working as a GP, rural GP and rural specialist). Sampling weights were used to adjust for survey non-response bias associated with respondents' age, gender, geographic location, jurisdiction and participation payments.

Results

In total, there were 9187 eligible doctors who contributed a total of 32339 responses (average 3.52 per doctor). Table 2 summarises the total eligible person-years per cohort.

Table 2

Figure 1 maps trends in rural background, gender, and work as a GP according to career stage. Female doctors increase steadily through the career cohorts from below 20% to above 50%, whilst the proportion of rural-origin doctors is higher amongst more recent graduates. In contrast, the proportion practising as GPs is markedly lower (by 15-20% in absolute terms) in more recent career cohorts.

Figure 1

Figure 2 highlights striking differences according to doctor career stage in the ratio of metropolitan-origin doctors who work as either metropolitan-based specialists or GPs: the ratio is approximately 1:1 amongst late-career doctors while it is 3:1 amongst establishing-career doctors. Other differences according to career stage are evident for rural-origin metropolitan-based specialists (proportionally more in establishing-career cohorts) and for metropolitan-origin rural GPs (proportionally more in late-career cohorts).

Figure 2

Table 3 further summarises percentages of Australian-trained rural doctors taking various supply pathways, highlighting differences according to career stage. The proportion of doctors working as

rural GPs (and as GPs) is lower in the early- and establishing-career stages (8.6% and 9.3%) compared to those in mid- and late-career stages (13.7% and 12.1%) and consistent by gender, while the proportion of establishing-career doctors working as rural specialists (7.5%) is slightly higher than late-career specialists (6.8%).

The minority of Australian-trained rural GPs and rural specialists are rural-origin (within 27-40%, by career stage), while greater proportions of early- and establishing-career rural GPs and rural specialists are female. Only 15-17% of the early- and establishing-career cohorts with rural-origin work as rural GPs and 11-13% work as rural specialists. Thus amongst these cohorts 70-74% of rural-origin doctors are working in metropolitan locations.

Table 3

Table 4 measures the statistical significance and strength of associations between different supply pathways and gender, origin and career cohort. A significantly decreased propensity to work as a GP is demonstrated amongst establishing-career doctors (OR 0.34, 0.29-0.39). Overall, there was no significant association between gender and likelihood of working as a rural GP; however amongst graduates who are GPs, females are significantly less likely to work rurally (OR 0.63, 0.54-0.74). Establishing- and early-career doctors were significantly less likely to be working as a rural GP (OR 0.77, 0.63-0.93 and OR 0.75, 0.62-0.91, respectively). However for those doctors who were GPs, the opposite association is observed: GPs from either the establishing- or early-career cohorts were significantly more likely to be working rurally (OR 1.67, 1.32-2.12 and OR 1.38, 1.10-1.72, respectively). Rural specialists were significantly less likely to be female and overall there were no significant associations according to career cohort. However, for those doctors who were specialists, both the establishing- or early-career cohorts were significantly less likely to be working rurally (OR 0.61, 0.49-0.76 and OR 0.77, 0.62-0.97, respectively).

Table 4

Discussion

This paper presents important empirical evidence about the supply of Australia's domestically-trained rural medical workforce. Critically, it separates establishing- and early-career doctors from mid- and late-career to assess career stage differences in the supply of rural doctors, both in terms of background characteristics (childhood origin and gender) and doctor type (GPs versus specialists). This is important information which has implications for workforce planning and policymaking when viewed through the prism of the changes in policy context for Australian rural workforce development that was occurring when these doctors were graduating.

The study's main finding was that proportionally fewer Australian-trained doctors at early- and establishing- career stages worked as rural GPs compared with the late-career doctors.²¹ This is of considerable concern given that most medical workforce rural migration occurs early in their career.²¹ Overall, 16.1-16.8% of early and establishing-career doctors worked rurally, compared with 20.5% of late-career doctors, whereas 30% of the population live in rural Australia. These figures suggest ongoing difficulties in ensuring adequate rural supply of Australian-trained GPs, falling well short of aspirations for significant reductions in current reliance on IMGs.¹ Of great concern is the low proportion of establishing- and early-career doctors choosing general practice, leading to an overall decreased proportion of younger doctors working as rural GPs despite the promising result of increased proportions of establishing- and early-career GPs working rurally. Whilst Australia's number of graduating doctors has increased, the overall lower odds of working as a GP and as a rural GP for establishing-career cohorts foreshadows the possibility that recent graduates are unable to replace older rural GPs and rural IMG GPs at a sufficient rate for Australia to become self-sufficient in doctor supply. Conversely, the overall odds of becoming a rural specialist is no different according to cohort.

Evidence of strong associations between rural-origin and an increased likelihood of working as a rural GP has informed Australia's current selection quota for entry into medical school. However, a significant proportion (64-74%) of rural-origin Australian trained doctors worked in a metropolitan location, highest in the establishing-career cohort. Observable differences between cohorts in the proportion of doctors working rurally may be attributable to a range of factors including career stage, doctor age and life course aspects, generational shifts in preferences for rural practice, specialty choice and work-life balance, exposure through the RCS program, and government incentives including rural recruitment and retention. Metropolitan-origin doctors remain the major source of Australian-trained rural doctors but rural migration behaviour is complex,²² and what attracts some metropolitan-origin doctors to rural practice is poorly understood. However, most doctors are metropolitan-origin thus small reductions in the proportion of establishing- and early-career metropolitan-origin doctors working rurally will have a substantial adverse impact on rural GP supply.

Overall, similar proportions of Australian-trained male and female doctors contribute to the rural workforce, with a higher proportion of establishing-career females observed working in rural locations. The pathway to becoming a rural GP has two linked decision points – choosing to work as a GP, and choosing to practise in a rural location. Previously reported odds ratios by McGrail et al.⁷ favouring male rural GPs compared to females only considered the second decision point, whereas this study considers both decision points. Females are more likely to work as GPs, providing a larger pool of potential rural GPs, despite their lower odds of choosing rural practice. It is important for

future rural workforce planning that these gender differences at both decision points are considered in combination.

This study is characterised by methodological strengths, including its large cohort size and national representativeness across key demographical characteristics. Evidence is strengthened by separating results into key subgroups including career stage, gender, rural-origin and doctor type. A limitation of this study is that observed work location is restricted to the period of this study (2008-2013), though six years' data help stabilise observed proportions. It is unknown how the observed proportions would change if all years of a doctor's working life were available, or if missing location data were imputed in non-response years. Secondly, it is difficult to interpret whether observed differences are true changes in workforce preferences, or relate to career stage, generational effects or some other aspect. Similarly, it is not known whether these results relate to the Government's efforts to improve rural supply, or reflect the general population's rural migration preferences. Non-response bias was addressed with the use of response weights on observed characteristics; however, additional unobservable bias may have impacted the results. Finally, supply in this study was determined according to doctor headcount, rather than workloads.

Conclusion

Rural doctor supply remains a large focus of government policy, with this study providing important empirical evidence of the overall supply of Australian-trained doctors into the rural medical workforce. Despite very large government investments in rural medical training and rural workforce recruitment and retention policies, these results highlight that proportionally fewer establishing- and early-career doctors work in rural locations compared with late-career doctors. While increased selection of rural-origin students remains a key part of increased rural supply, this group remains the minority source, with significant improvements of rural supply unlikely without attracting more Australian-trained doctors of both rural- and metropolitan-origin into general practice.

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Table 1: Summary of key elements of Commonwealth government rural workforce policy context

The 1970s and 1980s

- Expansion of university medical training places, hoping for flow on effect to rural areas (1970s)
- Maldistribution first noted, but concerns about oversupply led to reductions in numbers of both domestic and international medical graduates (1980s – 1990s)
- Introduction of universal health insurance
- Responsibility for PHC largely with States and Territories (not Commonwealth)
- Introduction of vocational registration for GPs
- Negligible specific rural health workforce government policy responses

The 1990s

- Rural health emerged as an important issue in its own right, development of a national rural health strategy
- Development of comprehensive rural health training programs that were often embedded within universities, especially for doctors
- An increasing range of national rural and remote stakeholder organisations and supports for students with interest in rural health career
- Rural issues became established as a real political 'thorn'
- Significant changes in policies and management of inflows to Australia's PHC workforce from overseas health professionals
- Better targeted Commonwealth recruitment and retention initiatives to rural and remote PHC providers

The 2000s - current

- Continuation of previous health workforce analysis and planning which focused on the numbers and distribution of specific health professionals, especially doctors
- Shift to a substantial expansionary phase of trained doctors in an attempt to increase overall supply and improve distribution
- Increased use of Australian Commonwealth Government funded financial incentives for health students aimed at improving the geographical distribution of health workers
- Rural workforce distribution policies increasingly relied on coercion and regulations forcing health workers to work in rural or underserved areas
- Ongoing major expansion in the role of the Commonwealth Government in funding rural educational initiatives (e.g. Rural Clinical Schools) and introduction of rural origin targets for medical school entry
- Funding of a broader range of professional and organisational initiatives to support the recruitment and retention of rural and remote GPs

(Adapted from Russell, 2014¹⁵)

Table 2: Total (un-weighted) observed response-years per cohort

	Late career	Mid career	Early career	Establishing career †	Total
Rural-origin	1561	1995	1560	1669	6785 (21%)
Female	2150	3975	4194	4110	14429 (45%)
GP	3437	4319	2642	2285	12683 (39%)
Total	7464	9784	7929	7162	32339 (100%)

† Additional 46% of establishing-career respondents were excluded as non-specialist hospital doctors; this doctor type excluded only 2% of respondents in each of the other three career stage cohorts

Table 3: Summary of the supply of Australian-trained rural doctors by origin location, doctor specialty and career stage cohort

	Late career	Mid career	Early career	Establishing career
Proportion working as GPs	52.2%	49.6%	36.4%	30.3%
Proportion working as rural GPs	13.7%	12.1%	8.6%	9.3%
Proportion working as rural specialists	6.8%	6.6%	7.5%	7.5%
Proportion of rural GPs who are rural-origin	27.1%	39.6%	35.0%	37.4%
Proportion of rural specialists who are rural-origin	39.8%	35.1%	32.0%	34.7%
Proportion of rural GPs who are female	24.0%	35.1%	47.7%	58.4%
Proportion of rural specialists who are female	13.5%	17.6%	30.3%	47.7%
Proportion with rural-origin working as rural GPs	18.8%	24.4%	16.7%	15.0%
Proportion with metro-origin working as rural GPs	12.4%	9.1%	6.8%	7.6%
Proportion males working as rural GPs	13.6%	12.1%	8.4%	8.6%
Proportion females working as rural GPs	14.0%	12.1%	8.7%	10.0%

Table 4: Summary of multivariate logistic regression model† for six key workforce outcomes

		Work as a rural doctor	Work as a GP	Rural GP (overall workforce)	Rural GP (within GPs)	Rural Specialist (overall workforce)	Rural Specialist (within Specialists)
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Ref: Male	Female	0.80 (0.71,0.89) **	2.10 (1.90,2.33) **	1.07 (0.93,1.22)	0.63 (0.54,0.74) **	0.51 (0.44,0.60) **	0.70 (0.60,0.83)* *
Ref: Metro origin	Rural origin	2.57 (2.26,2.92) **	1.14 (1.00,1.30)	2.44 (2.09,2.85) **	2.80 (2.33,3.38) **	1.95 (1.64,2.31) **	2.33 (1.94,2.80)* *
Ref: Late career cohort	Establishing career	0.83 (0.71, 0.97)*	0.34 (0.29,0.39) **	0.77 (0.63,0.93) **	1.67 (1.32,2.12) **	1.00 (0.81,1.23)	0.61 (0.49,0.76)* *
	Early career	0.88 (0.75,1.03)	0.43 (0.37,0.50) **	0.75 (0.62,0.91) **	1.38 (1.10,1.72) **	1.19 (0.96,1.47)	0.77 (0.62,0.97)*
	Mid career	0.91 (0.78,1.06)	0.81 (0.71,0.93) **	0.85 (0.71,1.02)	0.94 (0.76,1.17)	1.04 (0.84,1.29)	0.95 (0.76,1.19)

OR = Odds Ratio; CI = Confidence Interval; *p-value <0.05; **p-value<0.01; †Models accounted for clustering of repeated measures on individual doctors, other covariate included was graduation State

Figure legends

Figure 1: Characteristics of the Australian-trained medical workforce responding to MABEL 2008-2013

Figure 2: Overall supply of Australia's medical workforce by career stage cohort and childhood-origin

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