Factors associated with rural practice among Australian-trained general practitioners

Gillian A Laven, Justin J Beilby, David Wilkinson and Heather J McElroy

ABSTRACT

Objective: To determine the factors associated with general practitioners' current practice location, with particular emphasis on rural location.

Design: Observational, retrospective, case–control study using a self-administered questionnaire.

Setting: Australian general practices in December 2000.

Participants: 2414 Australian-trained rural and urban GPs.

Main outcome measure: Current urban or rural practice location.

Results: For Australia as a whole, rural GPs were more likely to be male (odds ratio [OR], 1.42; 95% CI, 1.17–1.73), Australian-born (OR, 1.95; 95% CI, 1.55–2.45), and to report attending a rural primary school for "some" (OR, 2.21; 95% CI, 1.69–2.89) or "all" (OR, 2.79; 95% CI, 1.94–4.00) of their primary schooling. Rural GPs' partners or spouses were also more likely to report "some" (OR, 2.75; 95% CI, 2.07–3.66) or "all" (OR, 2.86; 95% CI, 2.02–4.05) rural primary schooling. A rural background in both GP and partner produced the highest likelihood of rural practice (OR, 6.28; 95% CI, 4.26–9.25). For individual jurisdictions, a trend towards more rural GPs being men was only significant in Tasmania. In all jurisdictions except Tasmania and the Northern Territory, rural GPs were more likely to be Australian-born.

Conclusions: GPs' and their partners' rural background (residence and primary and secondary schooling) influences choice of practice location, with partners' background appearing to exert more influence.

MJA 2003; 179: 75–79

RELATIVE TO URBAN CENTRES, rural and remote communities in Australia have access to fewer general practitioners. The Australian Institute of Health and Welfare has estimated that, in 1998, there were 75.3 vocationally registered GPs per 100 000 population in rural and remote areas, compared with 103.0 in metropolitan areas.[1] Analysis of census data[2] suggests that this discrepancy increased between 1986 and 1996.[3] Policy initiatives to redress this imbalance have included increasing the number of medical students with a rural background, increasing the opportunities for both undergraduate and postgraduate rural training, and providing financial incentives for rural doctors. There is evidence that workforce differences exist between individual states and territories, with Tasmania having the highest number of vocationally registered GPs (per 100 000 population) and Western Australia the lowest (Box 1).[1] If these differences are influenced by local factors then regional policy initiatives may also be required.

We have completed a national study to provide rigorous quantitative data on the factors influencing where GPs work, with particular emphasis on rural location. Here, we focus on demographic factors, in particular the influence of GPs' and partners' rural background (residence and primary and secondary schooling) on choice of current medical practice location, and how these factors vary across states and the Northern Territory.

METHODS

Design and participants

We obtained data for this national observational, retrospective, case–control study from self-administered questionnaires distributed by mail. "Cases" were GPs in rural practice and "controls" were GPs in urban practice, at the time of the mail out. We developed a national sample stratified by state and territory (excluding the Australian Capital Territory, as it has no rural areas in which GPs work). We also excluded GPs working in the armed forces.

We defined a "GP" as a non-specialist and vocationally registered general practitioner whose non-referred attendance items (using Health Insurance Commission [HIC] criteria) made up at least half the schedule fee value of Medicare billing in the last or most recently available quarter. We limited our analysis to graduates of Australian medical schools, because the definition and schooling experience of rurality varies greatly between countries.

At the time of the study, the Health Information Section of the HIC defined rurality using the Rural and Remote Metropolitan Areas classification (RRMA).[4] The seven RRMA zones were collapsed into two groups — urban (RRMAs 1–2) and rural (RRMAs 3–7) — as there are insufficient numbers of GPs in each of the seven RRMA zones in each state and the Northern Territory to allow meaningful comparisons. The GPs in our study were asked if they had a spouse or partner, but to simplify discussion we use the term "partner" for both.

"Rural background" is defined as any rural experience or rural exposure (eg, residing in, or attending primary school or secondary school in rural areas).

Department of General Practice, The University of Adelaide, Adelaide, SA.

Gillian A Laven, BHSc, Research Associate; **Justin J Beilby,** MB BS, MD, Professor of General Practice; **Heather J McElroy,** BSc(Hons), Statistician.

Division of Health Sciences, City East Campus, University of South Australia, Adelaide, SA.

David Wilkinson, MB ChB, MD, PhD, Pro Vice Chancellor and Vice-President.

Reprints will not be available from the authors. Correspondence: Professor J Beilby, Head, Department of General Practice, The University of Adelaide, Adelaide, SA 5005. justin.beilby@adelaide.edu.au

Sample size and selection

With α set at 5% and power at 80%, assuming that 5% of urban GPs have a rural background, we sought to have the power to show that 13% or more of rural GPs in each state and territory are of rural background. The required sample size for each state and territory to achieve this was calculated at 400 rural and 400 urban GPs (or as many as possible in jurisdictions with less than 400 GPs). Using this study definition, the HIC randomly selected 4513 GPs from the 17 182 eligible GPs across Australia in 2000.

Questionnaire design and survey methods

Our questionnaire was based on previously used surveys[5-7] and piloted with 10 rural and urban GPs in South Australia. All correspondence was sent from the HIC on HIC stationery, and included a letter from the HIC explaining how the GPs had been selected. The research team had access to de-identified data only. The questionnaire was first mailed in December 2000 and was re-sent twice to non-responders.

Ethical approval

The University of South Australia Ethics Committee provided ethical approval for the study.

Statistical analysis

Our analyses took account of our survey design (ie, stratification by state and territory and a fixed sample size in each jurisdiction). Survey logistic regression using Stata 7.0[8,9] was used to examine associations (odds ratio) between current place of work (rural or urban) and other categorical variables, with current state or territory as the strata variable, the GP as the primary sampling unit, and weights as the reciprocal of the probability of a particular GP participating in the study. Post-stratification adjustment was not applied to groups according to age and sex within each state, as the distribution of our sample reflected the overall population.

All proportions, odds ratios (ORs) and associated 95% confidence intervals reported here are weighted to reflect the estimate of the proportions in the underlying Australian population of GPs. Because of the weighting used in the study design, the row and column percentages in Boxes 2–4 cannot be calculated from the absolute numbers. The relevance of the odds ratios given is supplemented by providing absolute numbers.

1: Number of vocationally registered GPs (per 100 000 population) Australia, 1998*

Tasmania	111.2
Australian Capital Territory	109.2
South Australia	105.0
Victoria	98.0
New South Wales	95.5
Northern Territory	90.7
Queensland	88.5
Western Australia	84.1

*Source: Australian Institute of Health and Welfare.[1]

RESULTS

Sample

Of the 4513 surveys mailed, 137 were excluded (not able to be delivered or the GP had retired, or died, or was not currently in Australia), and 1263 GPs did not respond, leaving 3113 valid responses (response rate, 71.1% [3113/4376]). Of the GPs who responded, 30 declined to participate, leaving us with usable data for 3083 GPs. Of these, 2414 (78%) were graduates of Australian medical schools and are analysed here. A subgroup of GPs with partners (2164) were then analysed for the association between partners' background and current practice location.

Data on unavailable or non-responding GPs

The GPs removed from the original sample (change of address, not in the country, or deceased) cannot be accounted for in the states and the Northern Territory numbers because of privacy constraints within the HIC. Privacy constraints also meant that we were unable to obtain useful demographic data on non-responding GPs. A comparison of male and female responders with the eligible population of GPs from which our sample was drawn indicated that there was no difference between the two groups.

Factors associated with rural practice

Rural GPs were significantly more likely to be men (OR, 1.42; 95% CI, 1.17–1.73), with this being a non-significant trend in all jurisdictions except Tasmania, where the association was significant (data not shown).

Rural GPs in all jurisdictions except Tasmania and the Northern Territory were more likely to have been born in Australia (OR, 1.95; 95% CI, 1.55–2.45).

Age and age at graduation were not significantly associated with rural practice (Box 2). Across jurisdictions we found that in South Australia, Victoria, Western Australia and Queensland rural GPs were significantly younger, but in Tasmania they were on average 3.5 years older (95% CI, 1.10–5.81 years).

GPs with a partner (OR, 1.55; 95% CI, 1.14–2.11) were more likely to be in rural practice. This trend applied to all jurisdictions except Tasmania, but was only significant in Western Australia (OR, 2.49; 95% CI, 1.21–5.15). For the whole of Australia, rural GPs were more likely to have children under 18 years of age (OR, 1.55; 95% CI, 1.29–1.87); this trend was significant in New South Wales (OR, 1.79; 95% CI, 1.20–2.68), Queensland (OR, 1.50; 95% CI, 1.02–2.22), South Australia (OR, 1.53; 95% CI, 1.05–2.23) and Victoria (OR, 1.54; 95% CI, 1.06–2.24).

GPs' background (Box 3)

Rural GPs were more likely to report having had a rural home and attending a rural primary and secondary school than were urban GPs. As would be expected, results for rural residence and rural schooling are very similar. For rural GPs reporting "all" rural residence, rural primary or rural secondary schooling, the odds ratio was consistently around 2.8. Across jurisdictions, rural GPs were between 1.85 times (Western Australia) and 3.32 times (Victoria) more likely to have spent "some" time in a rural primary school, except those in Queensland and the Northern Territory. Rural GPs in Queensland (2.64 times), South Australia (2.10 times) and Western Australia (2.83 times) were more likely to have completed "all" their primary schooling in rural areas. Likewise, secondary schooling had a similar influence, with rural GPs in Victoria being more likely to have spent "some" time in rural secondary schools (OR, 3.2; 95% CI, 1.15–8.89), and, for all jurisdictions except the Northern Territory, rural GPs were more likely to have spent "all" of their

2: Univariate analysis of association between selected variables and medical practice location

Variable	Urban GPs: No. of GPs	Urban GPs: Weighted column percentage*	Urban GPs: Weighted row percentage*	Rural GPs: No. of GPs	Rural GPs: Weighted column percentage*	Rural GPs: Weighted row percentage*	Total no. of GPs	Odds ratio (95% CI)
Age group								
⩽34	111	8.4%	73.7%	120	8.8%	26.3%	231	1.00
35–44	371	30.2%	71.3%	450	35.7%	28.7%	821	1.13 (0.80–1.58)
45–54	401	34.0%	73.5%	439	36.2%	26.5%	840	1.03 (0.74–1.44)
55–64	167	15.3%	77.6%	154	13.0%	22.4%	321	0.84 (0.57–1.24)
65–74	82	8.1%	82.2%	68	5.2%	17.8%	150	0.63 (0.40–1.01)
⩾75	33	4.1%	90.8%	14	1.2%	9.2%	47	0.33 (0.15–0.70)
Sex								
Female	439	36.6%	73.4%	363	29.8%	26.6%	802	1.00
Male	720	63.4%	72.7%	874	70.2%	27.3%	1594	1.42 (1.17–1.73)
Country of birth								
Other	303	28.5%	83.7%	202	16.3%	16.3%	505	1.00
Australia	860	71.5%	71.6%	1040	83.7%	28.4%	1900	1.95 (1.55–2.45)
Partner								
No	140	11.6%	81.1%	100	8.0%	19.0%	240	1.00
Yes	1023	88.5%	74.0%	1141	92.0%	26.1%	2164	1.55 (1.14–2.11)
Children								
No	524	47.0%	79.5%	457	35.9%	20.6%	981	1.00
Yes	644	53.0%	70.9%	789	64.2%	29.1%	1433	1.55 (1.29–1.87)
Age at graduation								
⩽24	681	58.1%	73.1%	740	62.5%	26.9%	1421	1.00
25–34	433	40.2%	77.2%	450	34.8%	22.9%	883	0.85 (0.70–1.03)
⩾35	22	1.8%	65.1%	32	2.8%	34.9%	54	1.45 (0.74–2.83)

*Weighted percentages reflect estimates of the proportions in the underlying Australian population of GPs.

secondary school years in a rural secondary school.

Interestingly, although "some" and "all" rural primary schooling and having a rural home during primary school years had similar odds ratios, for secondary schooling and residence during secondary school years "all" was more influential than "some".

Partners' background (Box 3)

Partners of rural GPs were more likely to report having a rural childhood home and attending a rural primary or secondary school than were partners of urban GPs. The magnitude of the effect for partners was similar to that of GPs reporting rural primary school or rural residence during primary school years (2.86 and 2.92). However, for partners of rural GPs reporting rural secondary school or rural residence during secondary school years, the odds ratios (3.45 and 3.23, respectively) were higher than those for GPs (2.87 and 2.86, respectively).

In contrast to the results for GPs, "some" rural background for partners seemed to exert much the same influence as "all".

Combination of GPs' and partners' background (Box 4)

The combination of a GP with any school or home rural background and a partner with an urban background was more than twice as likely to be associated with rural medical practice (OR, 2.21; 95% CI, 1.56–3.12), while the combination of a GP with an urban background and a partner with a rural background was almost three times as likely to be associated with rural practice (OR, 2.95; 95% CI, 2.20–3.96). The combination most favourable for rural practice was when both GP and partner had rural backgrounds (OR, 5.10; 95% CI, 3.51–7.41).

When the combination of GPs' and partners' background was adjusted for the variables given in Box 2, the likelihood of a GP practising in a rural area increased if the GP or his or her partner had rural backgrounds (adjusted ORs, 2.45 and 3.21, respectively). Again, the most favourable combination for rural practice was when both GP and partner had rural backgrounds (adjusted OR, 6.28; 95% CI, 4.26–9.25).

DISCUSSION

Our study provides evidence that GPs who have spent any time living and studying in a rural location are more likely to be practising in a rural location. Those whose partners have also lived and studied for any period of time in a rural location are six times as likely to become rural GPs than those with no rural background. Importantly, our findings indicate that partners' background exerts an even greater influence, especially secondary school years spent in a rural area (Box 3). Furthermore, the combination of a "rural background

3: Univariate analysis of association between practice location and (A) GP's background, (B) partner's background (school and residence)

Rural background	Urban GPs: No. of GPs	Urban GPs: Weighted column percentage*	Urban GPs: Weighted row percentage*	Rural GPs: No. of GPs	Rural GPs: Weighted column percentage*	Rural GPs: Weighted row percentage*	Total no. of GPs	Odds ratio (95% CI)
(A) GP's background								
Rural primary schooling								
None	801	82.0%	77.4%	737	64.4%	22.6%	1538	1.00
Some	150	13.0%	59.8%	272	23.5%	40.2%	422	2.21 (1.69–2.89)
All	65	5.0%	52.6%	148	12.2%	47.4%	213	2.79 (1.94–4.00)
Rural residence during primary schooling								
None	791	81.0%	77.8%	713	62.2%	22.2%	1504	1.00
Some	152	13.5%	59.9%	276	24.4%	40.2%	428	2.27 (1.74–2.96)
All	73	5.5%	52.4%	168	13.4%	47.6%	241	2.89 (2.05–4.09)
Rural secondary schooling								
None	927	87.4%	76.9%	884	73.6%	23.1%	1811	1.00
Some	70	5.7%	66.8%	100	8.0%	33.2%	170	1.53 (1.05–2.21)
All	86	6.9%	51.1%	219	18.5%	48.9%	305	2.87 (2.09–3.94)
Rural residence during secondary schooling								
None	895	85.1%	77.5%	830	69.3%	22.5%	1725	1.00
Some	62	5.0%	72.4%	67	5.3%	27.6%	129	1.22 (0.80–1.84)
All	126	10.0%	52.5%	306	25.4%	47.5%	432	2.86 (2.18–3.76)
(B) Partner's background								
Rural primary schooling								
None	612	77.6%	78.9%	532	53.9%	21.1%	1144	1.00
Some	130	15.7%	57.5%	282	30.1%	42.5%	412	2.75 (2.07–3.66)
All	75	6.7%	52.1%	171	16.1%	47.9%	246	2.86 (2.02–4.05)
Rural residence during primary schooling								
None	605	76.6%	79.6%	500	50.8%	20.4%	1105	1.00
Some	130	16.1%	56.6%	298	32.0%	43.4%	428	3.01 (2.27–3.99)
All	82	7.3%	52.5%	187	17.2%	47.6%	269	2.92 (2.08–4.10)
Rural secondary schooling								
None	658	83.7%	78.6%	594	60.0%	21.4%	1252	1.00
Some	57	6.1%	53.2%	133	14.2%	46.8%	190	3.06 (2.08–4.52)
All	96	10.1%	50.8%	230	25.9%	49.2%	326	3.45 (2.52–4.73)
Rural residence during secondary schooling								
None	635	81.3%	79.4%	541	55.6%	20.6%	1176	1.00
Some	45	4.6%	50.4%	112	11.9%	49.6%	157	3.56 (2.32–5.45)
All	131	14.1%	53.3%	304	32.6%	46.7%	435	3.23 (2.44–4.28)

* Weighted percentages reflect estimates of the proportions in the underlying Australian population of GPs.

partner and an urban background doctor" was more likely to be in rural medical practice than was the combination of a "rural background doctor and an urban background partner".

Despite this, most rural doctors did not spend their school years living or studying in a rural location — as indicated by the absolute numbers and column percentages. For example, 24% of rural GPs had a rural background and a partner with a rural background (Box 4), but this combination occurred in 9% of urban GPs, resulting in the larger adjusted odds ratio of 6. The decision of whether or not to work in a rural area is a multifactorial one and the influence of a multifaceted rural background is only one part of this complex decision-making process.

Financial support for university rural clubs, which aim to generate interest in rural medical practice by providing educational and social opportunities in rural medicine, and the implementation of the rural clinical schools, may increase the opportunities for future GPs to meet potential partners with rural backgrounds.

We have previously reported from the same study that rural undergraduate and postgraduate training influences practice location (rural undergraduate training: OR, 1.61 [95% CI, 1.32–1.95]; and postgraduate training: OR, 3.14 [95% CI, 2.57–3.83]).[10] Rural GPs in all jurisdictions except Tasmania and the Northern

4: Association (crude and adjusted*) between the combination of doctor's background and partner's background and practice location

GP/Partner background	Urban GPs: No. of GPs	Urban GPs: Weighted column percentage†	Urban GPs: Weighted row percentage†	Rural GPs: No. of GPs	Rural GPs: Weighted column percentage†	Rural GPs: Weighted row percentage†	Total no. of GPs	Crude odds ratio (95% CI)	Adjusted* odds ratio (95% CI)
Both urban	397	57.9%	83.0%	266	29.4%	17.1%	663	1.00	1.00
GP rural Partner urban	109	13.5%	67.5%	144	16.1%	32.5%	253	2.21 (1.56–3.12)	2.45 (1.70–3.53)
GP urban Partner rural	157	20.1%	61.6%	266	31.0%	38.5%	423	2.95 (2.20–3.96)	3.21 (2.35–4.37)
Both rural	69	8.5%	47.2%	278	23.5%	52.8%	347	5.10 (3.51–7.41)	6.28 (4.26–9.25)

* Adjusted for age group, sex, country of birth, children. † Weighted percentages reflect estimates of the proportions in the underlying Australian population of GPs.

Territory were more likely to have had rural undergraduate training, and rural GPs in all jurisdictions except the Northern Territory were more likely to have had some rural postgraduate training.[10]

These findings, and those reported here, suggest that Tasmania and the Northern Territory are unusual with regard to rural general practice. Further research is required among GPs in the Northern Territory and Tasmania to identify factors that predict a rural working location in these jurisdictions. These factors could include interest in Aboriginal health, or the remoteness of these jurisdictions from the rest of Australia. Significant factors should then be considered in choosing medical students and postgraduate general practice trainees.

Do these differences matter? The analysis of the distribution of GPs when adjusted for community need by crude mortality rates[11] shows that Tasmania, Queensland and Western Australia are all undersupplied when compared with South Australia and New South Wales. This undersupply is even greater in rural communities such as those in the Northern Territory.[3,11] Research may indicate whether regional policy solutions would be more appropriate for these jurisdictions.

Our sample includes Australian graduates only, as we aimed to inform medical education policy in Australia. Thus, our findings do not necessarily apply to all GPs in Australia. Overseas-trained doctors comprise about 25% of GPs in Australia,[1] and make up an important element of the workforce. Our sample also excludes non-vocationally registered doctors and salaried doctors, who otherwise provide general practice type services in a primary care setting, including those employed by state governments and those working in Aboriginal medical services. These exclusions may explain the slightly different results for the Northern Territory and Tasmania.

Our results support existing literature from Australia and other countries showing an association between rural background and rural medical practice.[5-7,10,12-18] The influence of partners' background has been less studied, although positive associations between partners' rural background and rural practice have been reported.[6,13,16] Policies to increase the number of rural GPs in Australia need to acknowledge the importance of the rural background of a GP's partner.

COMPETING INTERESTS

None identified.

ACKNOWLEDGEMENTS

This study was funded through the Rural Health Support, Education and Training (RHSET) Program of the Commonwealth Department of Health and Ageing. We would like to thank all the GPs who volunteered their time to participate and Nicole Pratt for her statistical advice.

REFERENCES

1. Australian Institute for Health and Welfare. Medical labour force 1998. Canberra: AIHW, 1998.
2. Wilkinson D, Symon B. Inequitable distribution of general practitioners in Australia: estimating need through the Robin Hood Index. *Aust N Z J Public Health* 2000; 24: 71-75.
3. Johnston G, Wilkinson D. Increasingly inequitable distribution of general practitioners in Australia, 1986-96. *Aust N Z J Public Health* 2001; 25: 66-70.
4. Department of Primary Industries and Energy, and Department of Human Services and Health. Rural, remote and metropolitan classification 1991 census edition. Canberra: AGPS, 1994.
5. Rolfe IE, Pearson SA, O'Connell DL, Dickinson JA. Finding solutions to the rural doctor shortage: the roles of selection versus undergraduate medical education at Newcastle. *Aust N Z J Med* 1995; 25: 512-517.
6. Wilkinson DW, Beilby JB, Thompson DJ, et al. Associations between rural background and where South Australian general practitioners work. *Med J Aust* 2000; 173: 137-140.
7. Rabinowitz HK, Diamond JJ, Markham FW, Paynter NP. Critical factors for designing programs to increase the supply and retention of rural primary care physicians. *JAMA* 2001; 286: 1041-1048.
8. Lemeshow S, Letenneur L, Dartigues JF, et al. Illustration of analysis taking into account complex survey considerations: the association between wine consumption and dementia in the PAQUID study. *Am J Epidemiol* 1998; 148: 298-306.
9. Stata statistical software, release 7.0. College Station, Tx: Stata Corporation, 2001.
10. Wilkinson D, Laven G, Pratt N, Beilby J. Impact of undergraduate and postgraduate rural training, and medical school entry criteria on rural practice among Australian general practitioners: national study of 2414 GPs. *Med Ed* 2003. In press.
11. Wilkinson D. Inequitable distribution of general practitioners in Australia: analysis by state and territory using census data. *Aust J Rural Health* 2000; 8: 87-93.
12. Strasser RP. Attitudes of Victorian rural GPs to country practice and training. *Aust Fam Physician* 1992; 21: 808-812.
13. Western J, Makkai T, McMillan J, Dwan K. Issues for rural practice in Australia. General Practice Evaluation Program. Canberra: Commonwealth Department of Health and Aged Care, 2000. (Report No. 535.)
14. Fryer GE, Stine C, Vojir C, Miller M. Predictors and profiles of rural versus urban family practice. *Fam Med* 1997; 29: 115-118.
15. Easterbrook M, Godwin M, Wilson R, et al. Rural background and clinical rural rotations during medical training: effect on practice location. *CMAJ* 1999; 160: 1159-1163.
16. Carter RG. The relation between personal characteristics of physicians and practice location in Manitoba. *CMAJ* 1987; 136: 366-368.
17. Becker P, Hartz A, Cutler J. Time trends in the association of a rural or urban background with physician location. *J Med Educ* 1979; 54: 544-550.
18. Rabinowitz HK, Diamond JJ, Hojat M, Hazelwood CE. Demographic, educational and economic factors related to recruitment and retention of physicians in rural Pennsylvania. *J Rural Health* 1999; 15: 212-218.

(Received 2 Oct 2002, accepted 22 May 2003) ❑