Title: How do rural GPs' workload and work activities differ with community size compared with metropolitan practice?

Abstract

Rural communities continue to experience shortages of doctors, placing increased work demands on the existing rural medical workforce. This paper investigates patterns of geographical variation in the workload and work activities of general practitioners (GPs) by community size. Our data comes from wave 1 of the MABEL longitudinal study, a national study of Australian doctors. Self-reported hours worked per usual week across eight workplace settings and on-call / after-hours workload per usual week were analysed, against seven community size categories. Our results showed that GP's total hours worked per week consistently increases as community size decreases, ranging from 38.6 up to 45.6 hours in small communities, with most differences attributable to work activities of rural GPs in public hospitals. Higher on-call workload is also significantly associated with smaller rural communities, with the likelihood of GPs attending more than one callout per week ranging from 9% for metropolitan GPs up to 48-58% in small rural communities. Our study is the first to separate hours worked into different work activities, whilst adjusting for community size and demographics, providing significantly greater insight to the increased hours worked, more diverse activities, and significant after-hours demands experienced by current rural GPs.

Background

Successful achievement of work-life balance is important for most doctors. Working fewer hours and minimising on-call workload has been linked by many studies to increased professional satisfaction of doctors, a key indicator of work-life balance and increased workforce retention (Lepnurm et al., 2007, Groenewegen and Hutten, 1991, Van Ham et al., 2006, O'Brien et al., 2005, Shanafelt et al., 2009). However, with the international chronic shortage of doctors practising in rural areas (World Health Organisation, 2006), it is not surprising that the majority of rural doctors continue to report working more hours (Slade and Busing, 2002, Weeks and Wallace, 2008, Australian Institute of Health and Welfare, 2010b, Raymont et al., 2005) than their metropolitan peers, presenting a significant threat to their retention.

Despite more doctors in training in Australia than ever before, the number of full-time equivalent general practitioners (GPs) practising in rural areas has not increased significantly (Australian Government Department of Health and Ageing, 2008, Australian Medical Workforce Advisory Committee, 2005). This reflects the fact that fewer recent graduates are choosing general practice (Joyce and McNeil, 2006), more graduates are female and more likely to work part-time (Wainer, 2004) or work fewer "full-time" hours (Gravelle and Hole, 2007), and many new graduates seek to work fewer hours than existing GPs (Wordsworth et al., 2004), with the result that there is no net gain to the overall rural GP workforce supply (Australian Institute of Health and Welfare, 2010b). Given

the ongoing reports of chronic shortages of rural GPs (Australian Medical Workforce Advisory Committee, 2005, Pegram et al., 2006, Australian Government Department of Health and Ageing, 2008), and evidence that GPs working in smaller communities are less satisfied with their higher hours of work (McGrail et al., 2010), many younger doctors will continue to be swayed against undertaking rural practice.

Several Government reports have monitored the hours worked by Australian doctors (Australian Institute of Health and Welfare, 2010a, Australian Government Department of Health and Ageing, 2008, Australian Medical Workforce Advisory Committee, 2005, Australian Government Department of Health and Ageing, 2005), but there is little evidence showing how hours of work or workload activity vary by any meaningful measure of rurality. One recent report details many aspects of the Australian medical labour force using the Australian Standard Geographical Classification - Remoteness Area (ASGC-RA) classification (Australian Institute of Health and Welfare, 2010b). Unfortunately, however, the ASGC-RA (Australian Bureau of Statistics, 2003) lacks sufficient geographical granulation because it groups together communities that differ greatly in size and composition (McGrail and Humphreys, 2009). Furthermore, all of these studies fail to differentiate hours of work activities outside of the private consultation room. Internationally, “little is systematically known about what the rural physician does that is different from what the urban physician does” (Ricketts, 2000).

This article aims to investigate patterns of geographical variation in the workload and work activities of GPs across rural and remote Australia, specifically examining their relationship with community size and the implications for rural medical workforce policies. In providing for the first time a detailed analysis of the nature and magnitude of variation in GP workload by workplace activities and size of community, while at the same time controlling for characteristics of the GP, the results provide a stronger evidence-base to inform workforce planning for rural and remote GPs.

Methods

Our data come from the *Medicine in Australia: Balancing Employment and Life* (MABEL) project, a large prospective cohort (longitudinal) study of Australian doctors (see <https://mabel.org.au/>). The first wave of data (n=10,498; response rate 19.4%), used here, was self-selected from the entire Australian medical workforce between June and November 2008. Further details of the baseline data and study protocol have been reported elsewhere (Joyce et al., 2010). Here we report results for GPs only, excluding registrars, specialists and other doctor types. GP Registrars were considered not autonomous in their choice of hours worked and different work activities. MABEL was approved by the University of Melbourne Faculty of Economics and Commerce Human Ethics Advisory Group (Ref. 0709559) and the Monash University Standing Committee on Ethics in Research Involving Humans (Ref. CF07/1102 - 2007000291).

Several survey questions measured workload (full questionnaire available at <https://mabel.org.au/mabelq.htm>). First, GPs were asked their usual number of work hours per week in eight different settings (full list in Table 2). Secondly, GPs were asked their usual number of work hours per week across five different broad activities (direct patient care; indirect patient care – e.g. phone calls, reports, notes; education activities – e.g. teaching, research, continuing medical education; management and administration; and other). Thirdly, GPs were asked to estimate the total on-call load in their usual week, separated by rostered hours, actual direct-care hours and callout frequency.

Sensitivity to geographical differences was a key aspect of this study. Our research has found that community population size provides a more appropriate geographic granulation than ASGC-RA, which is characterised by considerable heterogeneity within categories (McGrail and Humphreys, 2009, McGrail et al., 2010). We chose a seven-level population scale, which aligns closely with natural break points of different sized communities in Australia : (1) very small rural: <1,500 residents; (2) small rural: 1,500-4,999 residents; (3) medium rural: 5,000 – 9,999 residents; (4) large rural: 10,000 – 24,999 residents; (5) medium regional: 25,000 – 49,999 residents; (6) large regional: 50,000 – 99,999 residents; (7) metropolitan: $\geq 100,000$ residents.

Mean hours were calculated for each workload activity against community size, and Kruskal-Wallis one-way ANOVA was used to test statistical association between hours and community size.

Sampling weights were used to adjust for survey response bias with respect to age, gender, geographic location, State and whether they received an up-front payment (independent of actual participation) to induce participation (remote locations only) (Kuehnle et al., 2010). Logistic regression models were used to test the association between GPs undertaking work activities outside of the consultation room and community size, after adjusting for age groupings (<40, 40-49, 50-59, 60+), gender and International Medical Graduate (IMG) status (identified by any of: country in which completed medical degree, currently subject to location restrictions applicable only to IMGs, visa residency status or having passed Australian Medical Council accreditation). Following a log transformation of total hours to approximate a normal distribution, multiple linear regression models were used to measure the association between total workload hours and community size. Covariates included were four age groupings and gender (Model 1), the addition of all interactions between age, gender and community size (Model 2), and the addition of IMG status, business relationship in practice (principal, associate, salaried, contract, locums excluded for this item) and practice size (1, 2-3, 4-5, 6-9, 10+ GPs) (Model 3). Interaction effects were separated by gender for ease of interpretation. Weights were used for all regression models (Magee et al., 1998), though testing of models without weights found only slight differences of parameter estimates. All calculations were performed using StataSE 10 (StataCorp, Texas, USA) and a significance level of 5% was used throughout.

Results

Responses were received from 3906 GPs (response rate 17.7%), which reduced to 3636 after removing registrars (n=241) and those with missing geographical data (n=29). Selected characteristics of the GP cohort by community size are shown in Table 1. Approximately 30% of the GP cohort work in rural and regional communities of <50,000 residents, whilst there is a strong association between smaller communities and increased number of male GPs and IMG GPs.

[Table 1 here]

Table 2 shows the average hours worked by GPs across eight different work activities by community size. There is a consistent association between increasing total hours worked and decreasing community size ($p<0.001$). Most GPs' working hours occur in their private consultation rooms (72%-85%), with the number of hours rising only slightly for small rural and medium communities ($p=0.222$). Hours worked in public hospitals increased significantly for smaller communities, accounting for most of the difference in the total hours worked. Community health centre hours also increased slightly for smaller communities, whilst private hospital and tertiary education hours are slightly higher in regional and large rural communities. Although not shown in Table 1, hours worked were also split by direct patient care hours and four non-direct patient care activities, but revealed no association with community size.

[Table 2 here]

Table 3 shows a highly significant association between on-call workload and community size. The number of hours rostered for on-call is much higher for GPs in communities of <10,000 residents (2-3 times, $p<0.001$). Similarly, the actual number of patient-contact hours whilst on-call is significantly higher for GPs in smaller rural communities ($p<0.001$). The frequency of call-outs is also higher in rural communities, with GPs in communities of <25,000 residents doing 3-4 times more after-hours call-outs per week compared with metropolitan GPs ($p<0.001$). Alternatively, the proportion of doctors who have more than one callout per week is also much higher for the smaller communities (48-58%) than for metropolitan areas (9-11%).

[Table 3 here]

Table 4 shows the strength of association between community size and GPs undertaking activities outside of their consultation rooms (controlling for age, gender and IMG status). The strongest association is the increased odds of doing work in public hospitals which are 12-20 times higher for GPs in communities of <25,000 residents compared to metropolitan based GPs. GPs working in similar sized communities are also 6-9 times more likely to be called out more than once after hours than metropolitan GPs. Other significant associations by community size include rural GPs being twice as likely to work in community health settings and residential / aged care facilities, whilst GPs in larger rural and regional communities (>10,000 residents) are more likely to work in deputising / after-hours services and private hospitals.

[Table 4 here]

Table 5 shows the association between total working hours and community size, controlling for a range of covariates and related interactions. Model 1 shows that hours worked are significantly higher for GPs in communities of <50,000 residents, compared to those in metropolitan areas, after accounting for gender and age differences. Model 2 introduces interaction terms of gender with age and community size. Despite many changes to parameter estimates, it remains that female GPs in communities of <50,000 residents work significantly more hours than female metropolitan GPs, whilst males work significantly more hours in communities of <25,000 residents (though not for <1,500 communities) compared to metropolitan located males GPs. Notably, the variance captured has only marginally increased to 23.1% from 21.4%. Model 3, with the addition of IMG status, business ownership status and practice size has captured significantly more variation of work hours ($R^2 = 29.9\%$). Once again, female GPs in communities of <50,000 residents work significantly more hours than female metropolitan GPs. However, the distinction for males is less clear with statistically significant increased hours compared to metropolitan based GPs now only for those working in 1,500-5,000 and 10,000-25,000 communities. Principal and associate business relationships of GPs are strongly associated with increased hours, whilst IMGs and GPs in small practices of 2-3 GPs, but not solo GPs, are also associated with increased working hours.

[Table 5 here]

Discussion

This study of the geographical variation in the workload and activities of GPs confirms a significant and consistent association between increased work hours and smaller community size, ranging from an average of 38.6 hours for metropolitan GPs to >45 hours for GPs in smaller rural communities (<10,000). This difference is not due to increased private consultation hours, but comes through work undertaken in other settings such as public hospitals. For the most part, after controlling for demographics and practice setting characteristics, total work hours are significantly higher for both male and female GPs in communities of <50,000 but not those in regional centres of >50,000 residents when compared to their metropolitan counterparts.

On-call is a significant component of rural general practice, and our study confirms its increasing frequency with decreasing community size. While the average GP is rostered on-call for 24-36 hours per week, this figure increases to 50-75 hours for GPs in communities of <10,000 residents. Actual on-call hours worked and the number of call-outs per week is also significantly higher for GPs in all rural communities. Previous studies have found that on-call work can increase GP stress (French et al., 2006), is often not financially rewarding for rural GPs (Murdoch, 2006), is disliked by many doctors' spouses (O'Brien et al., 2005) and is a major deterrent to 'new generation' doctors seeking a more balanced work-life combination (Laurence et al., 2010). In short, on-call represents a significant additional workload for rural GPs, and a key deterrent for new medical graduates in their career choice.

Excluding on-call, most differences in total work hours relate to activities undertaken in settings outside of the private consultation room. This is most apparent for GPs undertaking work in public hospitals in communities of <25,000 (12-20 times increased odds) and to a lesser extent for GPs undertaking work in community health and residential / aged care facilities. Many rural GPs are expected to be integral members of the local hospital's medical team, but this is rare in urban settings. Some studies report that these external activities are an attraction of rural practice to some (Laurence et al., 2010, Wordsworth et al., 2004, Robinson et al., 2010). However, for most rural GPs there is no corresponding reduction in private consultation hours or on-call responsibilities. Similarly, GPs who undertake work in a public hospital do an average 10-12 hours (Table 2 data), usually in addition to their 'normal' consultation hours.

Understanding patterns of geographical variation in GP work hours and activities has important implications for remuneration and providing the necessary support for GPs— both in terms of human resources and infrastructure. It is clear that rural practice is characterised by longer hours spread across more diverse activities (Humphreys et al., 2003). While a comprehensive 'cradle-to-grave' care of patients is an important factor contributing to high professional satisfaction among rural GPs (McGrail et al., 2010), these findings also support previous studies highlighting the need for appropriate recognition and remuneration for rural doctors relative to practice activity (Humphreys et al., 2003), something advocated strongly by the Rural Doctors Association of Australia (2010). Additionally, it is important that rural GPs are appropriately skilled such as through Queensland Health's Rural Generalist Pathway (2010) or continue to be supported in maintaining their wider skills set (Australian Government Department of Health and Ageing, 2011).

Undoubtedly the need to improve doctor:patient ratios in rural communities will remain a priority issue for governments and workforce agencies in their recruitment and retention programs. Effective workforce policies and incentives will need to maximise the attractiveness of comprehensive patient care activities within a reasonable workload regime. Current initiatives to attract graduates to rural practice (such as through increased rural exposure during training (Australian Government Department of Health and Ageing, 2010)) will fail unless the nature of practice activity accords with graduates' aspirations for professional work-life balance, something known to differ from those of established rural practitioners (Gravelle and Hole, 2007, Wordsworth et al., 2004).

A strength of our study is its large cohort size containing 18% of the total Australian GP population. However, being a self-selected group of doctors, the generalisability of our results may be of some concern. One hypothesis is that doctors with higher workloads would be less likely to participate. However, representativeness of our cohort has been detailed elsewhere (Joyce et al., 2010), including hours worked per week closely matching the national population (Australian Institute of Health and Welfare, 2008). Generalisability of our findings is further improved by the use of survey weights throughout our analysis. Another possible concern is an under-representation of IMG doctors in our cohort, though this is difficult to measure. IMGs comprise about 41% (Australian Government

Department of Health and Ageing, 2008) of Australia's practising rural GPs, with the MABEL study cohort containing approximately 30% of rural GPs who identified themselves as IMGs.

Most other comparable studies of work hours have highlighted strong gender differences and increased hours by remoteness (Australian Institute of Health and Welfare, 2010b, Australian Medical Workforce Advisory Committee, 2005). However, our use of community size strengthens our ability to demonstrate more effectively the patterns of geographical variation in work hours. Furthermore, hours worked were separated into different work activities, providing a much clearer understanding of the composition of the workload of rural GPs. Finally, our large cohort size has enabled us to adjust all results by key demographic groupings. These three key points of difference provide significantly greater insight into how the work hours and activities of GPs vary by geography.

In summary, the average rural GP works more hours than their metropolitan colleagues, but private consultation hours are unchanged by geography. Our separation by work activities provides a more informative picture of the differences by geography with most increases in work hours emanating from two activities outside of standard private consultations – on-call /after-hours work and public hospital work. This suggests that rural GPs may warrant better recognition and remuneration, and improved support (or different types of support compared with their city counterparts) to facilitate recruitment and retention of the rural GP workforce.

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Conflicts of Interests

None identified

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Table 1: Selected characteristics of study cohort GPs, by community size

	Metro- politan (>100K)	Large regional (50- 100K)	Medium regional (25-50K)	Large rural (10-25K)	Medium rural (5-10K)	Small rural (1.5-5K)	Very small rural (<1.5K)
N (%) *	2341 (64%)	214 (6%)	184 (5%)	281 (8%)	170 (5%)	271 (7%)	175 (5%)
Age, mean (SD)	51.1 (10.5)	50.1 (10.6)	50.1 (9.5)	49.0 (9.0)	49.4 (9.2)	49.1 (9.2)	51.0 (10.9)
Gender, male (%)	51.3%	55.6%	64.7%	62.9%	70.6%	62.4%	66.9%
IMG (%)	18.7%	26.1%	26.9%	30.0%	32.0%	28.1%	32.2%
<i>* Location data were missing for 29 respondents; IMG = International Medical Graduate</i>							

Table 2: Average hours worked (usual week) of GPs in each work setting, by community size

	Metro- politan (>100K)	Large regional (50- 100K)	Medium regional (25-50K)	Large rural (10- 25K)	Medium rural (5-10K)	Small rural (1.5-5K)	Very small rural (<1.5K)
Private consultation rooms	32.8	32.6	35.7	32.9	33.9	34.2	32.4
Community health centre	0.6	1.0	1.2	1.3	1.1	1.1	2.1
Deputising / after- hours service	0.4	1.0	0.5	1.0	0.7	0.7	0.8
Public hospital	0.5	1.1	1.7	4.6	5.1	6.4	5.2
Private hospital	0.7	1.8	0.7	0.7	0.3	0.3	0.6
Residential / aged care facility	1.4	1.4	1.4	1.1	1.5	1.8	1.3
Tertiary education institution	0.7	0.9	1.4	0.7	0.4	0.5	0.9
Other settings	1.8	2.3	1.8	2.5	1.9	1.6	2.7
Total hours worked	38.6	41.2	44.0	44.6	45.1	45.6	45.0

Table 3: Average after-hours and on-call load (usual week) of GPs, by community size

	Metro- politan (>100K)	Large regional (50- 100K)	Medium regional (25-50K)	Large rural (10-25K)	Medium rural (5-10K)	Small rural (1.5-5K)	Very small rural (<1.5K)
Hours rostered for after-hours / on- call	24.5	37.3	30.2	30.2	54.3	41.0	76.1
Hours (on-call) actually in direct patient care	4.3	5.7	3.5	5.2	8.3	7.8	9.0
Times (on-call) actually called out	1.5	3.1	2.1	3.5	3.9	4.5	5.3
>1 on-call callouts (%)	9.4%	19.2%	22.8%	35.9%	48.2%	50.2%	57.7%

Table 4: Logistic regression models of GPs undertaking work activities in settings outside of private consultation rooms*

	Community health		Public hospital		Private hospital		Residential care		Tertiary education		Deputising service		On-call (>1 callouts)	
	Odds	p	Odds	p	Odds	p	Odds	p	Odds	p	Odds	p	Odds	p
<1.5K	4.43	<0.001	15.06	<0.001	0.98	0.870	2.06	<0.001	0.87	0.399	1.17	0.272	9.45	<0.001
1.5-5K	1.92	<0.001	19.58	<0.001	0.43	<0.001	2.29	<0.001	1.05	0.658	0.95	0.681	8.81	<0.001
5-10K	2.10	<0.001	17.13	<0.001	0.76	0.064	2.53	<0.001	1.08	0.586	1.09	0.501	7.92	<0.001
10-25K	1.96	<0.001	12.43	<0.001	2.43	<0.001	1.89	<0.001	1.30	0.014	2.01	<0.001	5.51	<0.001
25-50K	1.89	<0.001	4.06	<0.001	3.14	<0.001	1.92	<0.001	1.78	<0.001	1.44	0.001	2.10	<0.001
50-100K	2.37	<0.001	1.70	<0.001	5.14	<0.001	1.81	<0.001	1.36	0.005	2.30	<0.001	2.39	<0.001
*Reference category is metropolitan (>100K, odds ratio 1.00). Covariates controlled for were: age, sex and international medical graduate														

Table 5: Multivariate linear regression models of total hours worked of GPs*

		Model 1		Model 2		Model 3	
		Beta	p-value	Beta	p-value	Beta	p-value
Ref: >100K	<1.5K	0.131	0.001				
	1.5-5K	0.137	<0.001				
	5-10K	0.103	0.001				
	10-25K	0.097	0.001				
	25-50K	0.087	0.006				
	50-100K	0.026	0.460				
Ref: 60+	<40	0.095	0.001				
	40-49	0.188	<0.001				
	50-59	0.285	<0.001				
	Male (ref: female)	0.378	<0.001	0.192	<0.001	0.143	0.005
Ref: 60+_male	<40_male			0.195	<0.001	0.222	<0.001
	40-49_male			0.276	<0.001	0.246	<0.001
	50-59_male			0.288	<0.001	0.239	<0.001
Ref: >100K_ male	<1.5K_male			0.079	0.083	0.045	0.328
	1.5-5K_male			0.115	0.001	0.074	0.027
	5-10K_male			0.071	0.042	0.017	0.627
	10-25K_male			0.083	0.014	0.095	<0.001
	25-50K_male			0.049	0.196	0.061	0.062
	50-100K_male			0.024	0.610	0.34	0.463
Ref: 60+_fem ale	<40_female			-0.130	0.017	-0.075	0.165
	40-49_female			-0.041	0.411	-0.043	0.372
	50-59_female			0.175	<0.001	0.144	0.002
Ref: >100K_f emale	<1.5K_female			0.218	0.002	0.179	0.010
	1.5-5K_female			0.181	0.001	0.159	0.003
	5-10K_female			0.189	0.004	0.163	0.011
	10-25K_female			0.121	0.016	0.116	0.023
	25-50K_female			0.164	0.003	0.141	0.015
	50-100K_female			0.035	0.495	0.027	0.588
	IMG (ref: non- IMG)					0.063	<0.001
Ref: Contract	Principal					0.265	<0.001
	Associate					0.155	<0.001
	Salaried					0.015	0.662

Ref: 10+ GPs	Solo GP			-0.034	0.268
	2-3 GPs			0.054	0.018
	4-5 GPs			-0.001	0.954
	6-9 GPs			-0.003	0.900
	Constant	3.173	3.333	3.246	
	R²	21.4%	23.1%	29.9%	
* Log transformation was used for normalisation of total hours worked. Interactions of age and IMG with community size were found to be not statistically significant.					

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