CSIRO PUBLISHING

RESEARCH PAPER
https://doi.org/10.1071/PY23100

Australian Journal of Primary Health

LA TROBE UNIVERSITY

General practice registrars' practice in outer metropolitan Australia: a cross-sectional comparison with rural and inner metropolitan areas

Michael Tran[A], Anna Ralston[B,C], Elizabeth Holliday[B], Amanda Tapley[B,C], Alison Fielding[B,C], Dominica Moad[B,C], Jocelyn Ledger[B,C], Susan Wearne[D,E], Andrew Davey[B,C], Mieke van Driel[F], Jean Ball[G], Vanessa Moran[C], Jason Dizon[G] and Parker Magin[B,C,*]

For full list of author affiliations and declarations see end of paper

***Correspondence to:**
Parker Magin
School of Medicine and Public Health, University of Newcastle, University Drive, Callaghan, Newcastle, NSW 2308, Australia
Email: Parker.Magin@newcastle.edu.au

Received: 16 February 2023
Accepted: 27 August 2024
Published: 13 September 2024

Cite this: Tran M *et al.* (2024) General practice registrars' practice in outer metropolitan Australia: a cross-sectional comparison with rural and inner metropolitan areas. *Australian Journal of Primary Health* **30**, PY23100. doi:10.1071/PY23100

ABSTRACT

Background. General practice training in outer metropolitan (OM) areas contributes to patients' access to care. Differences in clinical practice and training in rural versus urban areas have been established, but less is known about OM versus inner metropolitan (IM) differences – whether they offer a trainee learning experience of populations with distinct demographics and healthcare characteristics. This study sought to identify the characteristics and associations of general practice training in New South Wales and Australian Capital Territory OM areas, compared to IM and rural areas. **Methods.** Cross-sectional analyses of data (2016–2020) from the Registrar Clinical Encounters in Training (ReCEnT) study, an ongoing cohort study of Australian GP registrars' in-consultation clinical and educational experience and behaviours, were performed. Multinomial logistic regression assessed associations of rural/OM/IM practice location with registrar and practice factors, patient factors, consultation content factors and consultation action factors. **Results.** Overall, 1308 registrars provided data from 177,026 consultations. For several variables, there was a pattern in the differences of associations across rural/OM/IM areas. Experience of care of older patients and Aboriginal and/or Torres Strait Islander health were more likely in OM than IM areas. Care of patients from non-English speaking background was more likely in OM than in rural areas. Possible markers of healthcare access (specialist referrals, and pathology and imaging requests) were less likely in OM than in both IM and rural areas. **Conclusions.** OM areas are distinct (and educationally rich) clinical learning environments, with distinct demographic characteristics and seeming healthcare access limitations. This finding has implications for workforce support and health resource allocation.

Keywords: continuity of patient care, family practice, general practice, graduate medical education, health services accessibility, physicians' practice, suburban population, urban population.

Introduction

Primary health care is fundamental to the overall performance of health systems, providing an effective and efficient means to improve health outcomes (Starfield *et al.* 2005). However, shortages and maldistribution of the general practice workforce, and the subsequent impact on healthcare access and delivery, are long-standing impediments to equitable patient health outcomes. Existing general practitioners (GPs) are maldistributed across inner metropolitan (IM), outer metropolitan (OM), rural and remote populations (Health Workforce Australia 2012; Australian Government Department of Health and Aged Care 2022*a*). There is a high dependence on recruitment of overseas-trained GPs, especially in rural areas, from where most will eventually move to cities (Moynihan 2022).

Prior research has focused on the difficulties associated with recruiting and retaining GPs in rural areas. Underpinning this research is the recognition that workforce maldistribution perpetuates the health and access inequalities experienced by underserved areas (McGrail *et al.* 2016). General practice training in areas of need, including in both rural areas and in regions of lower socioeconomic status, fulfils both workforce imperatives

and offers registrars a rich learning environment, with valuable learning experiences and increased scope of practice (Tapley *et al.* 2020; Moad *et al.* 2022*a*). Other underserved regions also exist, including OM areas, which have distinct socioeconomic and healthcare provision concerns. The Australian Urban Observatory has demonstrated that OM areas in Australia often have reduced access to social infrastructure such as education, transport, community and sporting facilities and medical services, which often only become available after a population has been established in these areas (Gunn *et al.* 2020). Coupled with socioeconomic disadvantage (McGaw *et al.* 2006), reduced health literacy, reduced general practice access (Roeger *et al.* 2010) and an increase in all-cause mortality and suicide when compared with IM areas (Dixon and Welch 2000), health inequities can be reinforced in growing OM areas (Gunn *et al.* 2020).

Previously explored examples of distinct requirements, access issues and healthcare costs in OM areas include non-uniform access to general practice services within metropolitan South Australia (Roeger *et al.* 2010), and increased out-of-pocket expenses for OM patients receiving cancer care in Western Australia when compared with rural patients (Slavova-Azmanova *et al.* 2021).

General practice registrars are an important health-provider population in the wider context of understanding OM general practice. Current general practice registrars comprise 14.7% of the Australian general practice workforce by headcount (Department of Health and Aged Care 2022) and recent graduates of the training program comprise a further sizable proportion of the general practice workforce. Registrar contributions to the general practice workforce increased from 2015 to 2019 (Australian Government Department of Health 2021). Registrars also constitute a higher proportion of the general practice workforce in regional and rural areas. The number of general practice full-time equivalents (FTE) per 100,000 people is higher in major cities (117.3) than in outer regional areas (99.2) and very remote areas (66.4) (Australian Government Productivity Commission 2022). General practice registrars constitute a greater proportion of the regional workforce when compared to metropolitan areas, by FTE (12.1% of the workforce in Modified Monash Model (MMM)1 areas, 23.0% in MMM2 areas, 22.5% in MMM3 areas and 22.7% in MMM4 areas) (Australian Government Department of Health 2021). The MMM defines whether a location is metropolitan, rural, remote or very remote, with MM category 1 representing metropolitan areas, MM2 regional centres, MM3–5 rural towns of decreasing size, MM6 remote communities and MM7 very remote communities. Although data are not available, it is likely that registrars are also over-represented in the OM general practice workforce, compared to the IM workforce, given practice allocation policies in general practice training. A further consideration is that location of general practice training is strongly predictive of post-training practice location in rural (Fielding *et al.* 2022) and lower socioeconomic status areas (Moad *et al.* 2022*b*).

Current workforce issues of low general practice trainee recruitment and retention are thus more likely to impact OM and rural areas. Training experiences and educational value of training in these areas are important. Clinical learning environments that support individual learning and provide rich educational experiences contribute to general practice registrar retention in rural and remote regions in Australia (Malau-Aduli *et al.* 2021). In a study of career choices, demographic variables, lifestyle orientation and the opportunities for learning and educational development were determinants of choices (Shadbolt and Bunker 2009) suggesting that medical graduates look for a career that is stimulating and interesting. Providing supportive and rich learning environments in OM areas may encourage general practice registrars to choose these areas to eventually practice in long term and, thus, enhance patient access to care.

What is not yet well-understood are the characteristics of general practice training in the distinct OM environment in Australia, and how the personal and professional impact of this learning environment on general practice registrars may potentially affect recruitment and retention.

In this study, we sought to establish the demographic, practice and educational characteristics of general practice registrars training in OM practice compared to IM and rural/remote practice. We hypothesised that there exists a distinct difference in the characteristics of, and clinical behaviours exhibited by, general practice registrars working in OM areas compared to IM and rural areas, reinforcing the distinct nature of work and training in the OM environment.

Methods

This cross-sectional analysis was conducted within the Registrar Clinical Encounters in Training (ReCEnT) project.

ReCEnT

ReCEnT is an ongoing inception cohort study of general practice registrars' in-consultation clinical and educational experience, and behaviours. From 2016, the study has been conducted in three training organisations in three states and one territory. Data included in this analysis were confined to registrars training in New South Wales (NSW) and the Australian Capital Territory (ACT). The study participants are registrars in general practice training terms.

The detailed methodology is presented elsewhere (Davey *et al.* 2022). Briefly, registrars record details of 60 consecutive clinical consultations, with data collection representing approximately 1 week of a registrar's clinical work. This is repeated in each of three terms of training for each registrar. Data, collected through an online portal, includes patient demographics, diagnoses and problems managed,

investigations, management, and educational training aspects including use of resources and supervisor assistance.

Outcome factor

The outcome factor was a measure of practice geographic location: rural, outer metropolitan (OM) and inner metropolitan (IM). We used the Australian Government Department of Health Inner and Outer Metropolitan (IOM) classification to identify regions of training by geographical location (Australian Government Department of Health and Aged Care 2022*b*). In the IOM, only the Sydney and Canberra regions are classified as OM or IM in NSW and ACT, respectively. This does not reflect the registrar experience of GP vocational training undertaken in Newcastle and Wollongong (large cities to the north and south of Sydney) training practices, which is not consistent with rural training experience. Thus, for our main analysis, we omitted data from Newcastle and Wollongong practices. In a sensitivity analysis, we included these practices as additional OM practices, as the judgement of Medical Education members of our team is that the training experience is more consistent with outer- than with inner metropolitan-defined locations. These are also areas of relative workforce need, similar to OM areas. Both the Newcastle and Wollongong regions are identified as locations with a shortage of medical practitioners by the Distribution Priority Area (DPA) classification. All inner metropolitan areas are automatically classified as non-DPA areas, regardless of relative workforce need (Australian Government Department of Health and Aged Care 2022*c*).

Independent variables

Independent variables were related to registrar, practice, patient, consultation content and consultation action (see Table 1).

Statistical methods

This was a cross-sectional analysis of NSW and ACT registrar data from 2016 to 2020. Analysis was at the level of individual consultation.

Descriptive statistics included frequencies with percent for categorical variables and mean with standard deviation (s.d.) for continuous variables.

Multinomial logistic regression was used within the generalised estimating equations framework to account for repeated measures within registrars, assuming an exchangeable working correlation structure. Multinomial logistic regression for a nominal outcome with three (non-ordered) levels produces two sets of explanatory variable effect estimates, one for each outcome level compared to the reference level. In this analysis, 'OM' was used as the reference level. The model thus estimated odds ratios with 95% confidence intervals for the two comparisons, 'IM vs OM' and 'Rural vs OM'. For ease of interpretation of estimates in the models, beta-coefficients have been multiplied by −1 and then exponentiated (with the result that odds ratios have been inverted).

Univariable analyses were conducted to assess the association of each covariate with the outcome. Covariates with a univariable P-value < 0.20 were considered for inclusion in the multivariable regression model.

After an initial multivariable model with all significant covariates fitted, the potential for model reduction was assessed. Covariates that were no longer significant (at $P < 0.2$) in the multivariable model were tested for removal from the model. If the covariate's removal did not substantively change the resulting model, the covariate was removed from the final model. A substantive change to the model was defined as any covariate in the model having a change in the effect size (odds ratio) of greater than 10%.

To examine different facets of our research question, four sequential models were built, with each OM/IM/Rural location as the dependent variable.

The four models, each sequentially including an extra factor group included: (a) registrar and practice factors, before (b) patient factors, then (c) consultation content factors, and then (d) consultation 'action' factors were added

The rationale for building four models was that associations of a registrar's consultation being in an OM, IM or rural area will include registrar and practice factors, but estimates of these associations may be attenuated by inclusion of patient factors, if the latter lay on the causal pathway from registrar and practice factors to the outcome. Similar reasoning applied to the sequential addition of consultation content, before consultation 'action' factors were added

Analyses were programmed using STATA (ver. 16.0, StataCorp, College Station, TX, USA) and SAS (ver. 9.4, SAS Institute Inc., Cary, NC, USA).

Ethics approval

Ethics approval was obtained from the University of Newcastle Human Research Ethics Committee (H-2009-0323).

Results

For the primary analysis, 1308 registrars (response rate 85% of registrars eligible for inclusion) provided data from 177,026 consultations. Of these consultations, 21% were in OM areas, 44% were in Rural areas and 35% were in IM areas. For the sensitivity analysis, 1553 registrars (response rate 87%) provided data from 211,776 consultations. Of these consultations, 34% were in OM areas, 37% were in Rural areas and 29% were in IM areas. See Table 2 for the characteristics of registrars and registrar/terms for the main and sensitivity analyses.

See Supplementary Table S1 for characteristics associated with OM-, IM-, and rural-located terms.

See Table 3 for the univariable and multinomial logistic regression models with outcome Rural, OM, or IM practice.

Table 1. Independent variables.

Registrar variables	Age (continuous)
	Gender (categorical)
	Part-time/full-time (dichotomous)
	Worked at practice before (dichotomous)
	Qualified as a doctor in Australia (dichotomous)
	Pathway (dichotomous)
	Previous health qualifications (dichotomous)
	Postgraduate training (dichotomous)
	Years of work in a hospital (continuous)
	Does other regular medical work (dichotomous)
Practice variables	Practice size (Small = 5 or fewer FTE GPs, Large = 6 or more FTE GPs)
	Practice routinely bulk bills all patients (dichotomous)
	Socio-Economic Indexes for Areas (SEIFA) (deciles)
	Training region (categorical)
Patient variables	Age (categorical)
	Gender (categorical)
	Identifies as Aboriginal and/or Torres Strait Islander (dichotomous)
	Non-English-speaking background (dichotomous)
	Patient new to practice or registrar (categorical, new to practice and registrar, new to registrar but returning to practice, returning to both practice and registrar)
Consultation variables	Duration of consultation (continuous)
	Number of problems addressed in consultation (continuous)
	Sources of assistance used in consultation (categorical, no sources, supervisor called, other source used)
	Chronic disease managed in consultation (dichotomous)
	Procedures performed in consultation (dichotomous)
Consultation action variables	Imaging ordered (dichotomous)
	Follow-up for the consultation (categorical, no follow-up, follow-up with registrar, follow-up with someone else)
	Learning goals generated (dichotomous)
	Referrals made (dichotomous)
	Pathology ordered (dichotomous)
	Medications prescribed (dichotomous)

Main analysis

In multivariable analysis, regarding 'registrar and practice factors', registrars in OM practices were more likely to have worked at the practice previously than those in IM practices, but less likely than those in a rural setting (adjusted odds ratio, aOR = 1.62 [95% CI:1.19, 2.21], $P = 0.002$; and aOR = 0.32 [95% CI:0.23, 0.44], $P < 0.001$, respectively). Registrars in OM practices were less likely to work in a bulk-billing practice than those in IM practices, but more likely than those in rural areas (aOR = 0.71 [95% CI:0.55, 0.91], $P = 0.008$; and aOR = 14.95 [95% CI:10.26, 21.77], $P < 0.001$). Registrars in OM, compared to those in rural areas, were more likely to be in Term 2 or Term 3 of training, respectively, than in Term 1 (aORs = 2.00 [95% CI:1.53, 2.61], $P < 0.001$; and aOR = 1.52 [95% CI:1.10, 2.11], $P = 0.011$).

Regarding 'patient factors', there was greatest exposure for trainees in the care of older (>65 years) patients in rural areas, followed by OM area and then those in IM areas (aOR = 0.47 [95% CI:0.41, 0.53], $P < 0.001$ and aOR = 1.18 [95% CI:1.05, 1.31], $P = 0.004$). Management of Aboriginal and/or Torres Strait Islander patients also displayed a similar difference, with exposure greatest for registrars working in rural areas, and lowest for those in IM areas (aOR = 0.71 [95% CI:0.57, 0.88] and aOR = 1.93; [95% CI:1.47, 2.54]; $P < 0.001$ and $P = 0.002$, respectively). Conversely, highest exposure to non-English speaking background (NESB) patients was to registrars in IM practices, declining to OM and least in rural practices (aOR = 0.43 [95% CI:0.36, 0.52], $P < 0.001$; and aOR = 7.60 [95% CI:5.85, 9.88], $P < 0.001$). Patients were less likely to be new to OM practices than to IM and rural practices (aOR = 0.68

Table 2. Characteristics of registrars and registrar practice (main and sensitivity analyses).

Variables	Class	Main analysis *n* (%)	Sensitivity analysis *n* (%)
Registrar characteristics		*n* = 1308	*n* = 1553
Gender	Female	782 (59.9)	939 (60.5)
Country of primary medical qualification	Australia	960 (75.4)	1183 (78.1)
Training pathway	Rural	503 (39.5)	510 (33.7)
Registrar-term characteristics		*n* = 2977	*n* = 3562
Age	Mean (s.d.)	33.2 (6.5)	33.1 (6.5)
Term	1	1197 (40.2)	1408 (39.5)
	2	1060 (35.6)	1263 (35.5)
	3	720 (24.2)	891 (25.0)
Part-time or full-time	Part-time	612 (22.6)	742 (22.9)
Practice size	Large (6 or more FTE GPs)	1412 (51.8)	1724 (53.1)
Practice rurality[A]	Major city	1656 (55.6)	2241 (62.9)
	Inner regional	1080 (36.3)	1080 (30.3)
	Outer regional, remote, very remote	241 (8.1)	241 (6.8)
Practice SEIFA[B] decile	Mean (s.d.)	5.0 (2.8)	5.1 (2.7)
Practice routinely bulk bills all patients	Yes	1314 (47.8)	1421 (34.4)
Registrar worked at practice before	Yes	643 (23.6)	829 (25.4)

[A]Defined by Australian Standard Geographical Classification (ASGC).
[B]Socio-Economic Indexes for Area Relative Index of Disadvantage (by decile).

[95% CI: 0.61, 0.76], $P < 0.001$; and aOR = 0.76 [95% CI:0.66, 0.87], $P < 0.001$).

Regarding 'consultation' and 'consultation action' factors, chronic problems were managed less often by trainees in OM than those in rural practices (aOR = 0.84 [95% CI:0.77, 0.92], $P = 0.001$). Imaging was less likely to be ordered by trainees in OM practice than in rural practice (aOR = 0.82 [95% CI:0.75, 0.89], $P < 0.001$). Referrals ordered by trainees working in OM areas were less than those working in IM and rural areas (aOR = 0.80 [95% CI:0.74, 0.86], $P < 0.001$; and aOR = 0.84 [95% CI:0.77, 0.91], $P < 0.001$). Pathology was less likely to be ordered by trainees in OM areas compared with those in IM and rural areas (aOR = 0.89 [95% CI:0.83, 0.95], $P = 0.001$; and aOR = 0.75 [95% CI:0.69, 0.82], $P < 0.001$).

Sensitivity analysis

The sensitivity analysis (see Supplementary Tables S1 and S2) produced similar results to the main analysis.

Discussion

Summary and interpretation of main findings

The salient findings of this study centre around the distribution of the training workforce, their experiences while working in OM practices, and the evidence this provides regarding patient access to health services in OM areas. There are also implications for trainee education and support in OM practices, inferred from observed referrals for pathology, imaging and specialist support.

Location of training

Training in Terms 2 and 3 was significantly more likely to occur in OM areas than in rural areas. This aligns with previous findings of an overall shift towards less rural location for training the later the training term (Tapley *et al.* 2020). Previous studies have noted the increased numbers of trainees in metropolitan areas with a multitude of reasons including clinical facilities, information technology infrastructure and appropriate supervision likely to be limiting factors for greater uptake of regional and rural training (Russell *et al.* 2022). Despite this migration of the training workforce, registrars in an OM practice were more likely to have worked at their current practice previously than those in an IM practice, and patients were less likely to be new to an OM practice than patients in both IM and rural settings. There is a suggestion hence of stability and continuing of care, with established registrars treating existing patients known to OM practices. Exposing trainees to the benefits of continued patient care is important as continuity of care is considered a core feature of both primary care and high-performing primary healthcare systems (Wright and Mainous 2018).

Table 3. Outer metropolitan, inner metropolitan, and regional/remote practice location: univariable and multinomial logistic regression: main analysis.

			Univariable		Adjusted	
Variable	**Class**	**Referent**	**OR [95% CI]**	***P***	**OR [95% CI]**	***P***
Model 1 – registrar and practice level variables (registrar-term level)						
Registrar variables						
Term Referent: Term 1	2	Inner metropolitan	0.99 (0.81, 1.19)	0.89	0.88 (0.70, 1.12)	0.30
		Regional and remote	1.06 (0.93, 1.22)	0.39	2.00 (1.53, 2.61)	<0.001
	3	Inner metropolitan	0.98 (0.77, 1.24)	0.85	0.90 (0.68, 1.19)	0.45
		Regional and remote	1.25 (1.03, 1.51)	0.022	1.52 (1.10, 2.11)	0.011
Worked at practice previously	Yes	Inner metropolitan	1.51 (1.16, 1.96)	0.002	1.62 (1.19, 2.21)	0.002
		Regional and remote	0.40 (0.32, 0.49)	<0.001	0.32 (0.23, 0.44)	<0.001
Qualified as a doctor in Australia	Yes	Inner metropolitan	0.67 (0.42, 1.09)	0.11	0.56 (0.32, 0.98)	0.040
		Regional and remote	7.53 (4.93, 11.51)	<0.001	9.19 (4.90, 17.26)	<0.001
Registrar age		Inner metropolitan	1.01 (0.98, 1.03)	0.72	1.00 (0.97, 1.03)	0.98
		Regional and remote	0.91 (0.88, 0.93)	<0.001	0.96 (0.93, 0.99)	0.015
Years worked at a hospital		Inner metropolitan	0.99 (0.92, 1.06)	0.76	0.98 (0.91, 1.05)	0.55
		Regional and remote	0.85 (0.79, 0.91)	<0.001	0.99 (0.91, 1.08)	0.85
Practice variables						
Practice size	Small	Inner metropolitan	0.70 (0.55, 0.88)	0.002	0.74 (0.58, 0.93)	0.011
		Regional and remote	1.45 (1.15, 1.84)	0.002	1.16 (0.87, 1.55)	0.32
Practice routinely bulk bills	Yes	Inner metropolitan	0.73 (0.57, 0.93)	0.011	0.71 (0.55, 0.91)	0.008
		Regional and remote	7.03 (5.39, 9.17)	<0.001	14.95 (10.26, 21.77)	<0.001
Socio-Economic Indexes for Areas – index of relative social disadvantage (decile)		Inner metropolitan	0.98 (0.94, 1.03)	0.40	0.98 (0.94, 1.02)	0.37
		Regional and remote	1.35 (1.29, 1.41)	<0.001	1.50 (1.41, 1.60)	<0.001
Model 2 – all of the above + patient factors (consultation level)						
Patient variables						
Patient age group (years) Referent: 15–34 years	0–14	Inner metropolitan	1.36 (1.26, 1.46)	<0.001	1.39 (1.28, 1.50)	<0.001
		Regional and remote	1.15 (1.08, 1.22)	<0.001	1.32 (1.20, 1.45)	<0.001
	35–64	Inner metropolitan	1.22 (1.15, 1.28)	<0.001	1.23 (1.16, 1.30)	<0.001
		Regional and remote	0.78 (0.74, 0.82)	<0.001	0.84 (0.79, 0.90)	<0.001
	65+	Inner metropolitan	1.15 (1.03, 1.28)	0.01	1.18 (1.05, 1.31)	0.004
		Regional and remote	0.38 (0.34, 0.42)	<0.001	0.47 (0.41, 0.53)	<0.001
Patient gender Referent: male	Female	Inner metropolitan	1.01 (0.96, 1.06)	0.67	1.06 (1.00, 1.12)	0.038
		Regional and remote	0.96 (0.91, 1.01)	0.12	0.96 (0.89, 1.03)	0.22
	Non-binary	Inner metropolitan	1.42 (0.41, 4.94)	0.59	2.09 (0.38, 11.66)	0.40
		Regional and remote	0.65 (0.22, 1.88)	0.42	1.21 (0.29, 4.98)	0.79
Aboriginal or Torres Strait Islander	Yes	Inner metropolitan	2.52 (1.96, 3.25)	<0.001	1.93 (1.47, 2.54)	<0.001
		Regional and remote	0.56 (0.46, 0.68)	<0.001	0.71 (0.57, 0.88)	0.002
Non-English-speaking background	Yes	Inner metropolitan	0.44 (0.36, 0.53)	<0.001	0.43 (0.36, 0.52)	<0.001
		Regional and remote	5.85 (4.72, 7.25)	<0.001	7.60 (5.85, 9.88)	<0.001
Patient/practice status Referent: existing patient	New to registrar	Inner metropolitan	1.02 (0.94, 1.11)	0.68	1.06 (0.97, 1.15)	0.18
		Regional and remote	1.36 (1.25, 1.48)	<0.001	1.16 (1.05, 1.27)	0.003
	New to practice	Inner metropolitan	0.60 (0.54, 0.67)	<0.001	0.68 (0.61, 0.76)	<0.001
		Regional and remote	1.14 (1.03, 1.27)	0.015	0.76 (0.66, 0.87)	<0.001

(*Continued on next page*)

Table 3. (*Continued*).

Variable	Class	Referent	Univariable OR [95% CI]	Univariable *P*	Adjusted OR [95% CI]	Adjusted *P*
Model 3 – all of the above + consultation factors (consultation level)						
Consultation variables						
Chronic problem	Yes	Inner metropolitan	1.03 (0.96, 1.10)	0.38	0.98 (0.91, 1.06)	0.61
		Regional and remote	0.68 (0.63, 0.73)	<0.001	0.84 (0.77, 0.92)	0.001
Procedure performed	Yes	Inner metropolitan	0.90 (0.81, 1.01)	0.064	0.91 (0.81, 1.03)	0.15
		Regional and remote	1.14 (1.02, 1.27)	0.019	1.14 (0.99, 1.32)	0.078
Consultation duration		Inner metropolitan	1.00 (0.99, 1.00)	0.50	1.00 (1.00, 1.01)	0.33
		Regional and remote	0.99 (0.99, 1.00)	0.001	1.00 (0.99, 1.01)	0.89
Model 4 – all of the above variables + consultation outcome factors (consultation level)						
Consultation outcome variables						
Imaging ordered	Yes	Inner metropolitan	0.96 (0.90, 1.02)	0.21	0.95 (0.89, 1.03)	0.20
		Regional and remote	0.81 (0.76, 0.86)	<0.001	0.82 (0.75, 0.89)	<0.001
Follow-up ordered Referent: none	Other GP in the practice	Inner metropolitan	0.99 (0.85, 1.15)	0.89	0.91 (0.78, 1.06)	0.23
		Regional and remote	0.77 (0.66, 0.89)	0.001	1.01 (0.84, 1.22)	0.92
	With themselves	Inner metropolitan	0.91 (0.81, 1.02)	0.10	0.92 (0.80, 1.06)	0.23
		Regional and remote	0.87 (0.77, 0.98)	0.02	1.07 (0.91, 1.25)	0.42
Learning goals generated	Yes	Inner metropolitan	0.92 (0.80, 1.05)	0.20	0.93 (0.80, 1.09)	0.37
		Regional and remote	0.74 (0.64, 0.86)	<0.001	1.04 (0.87, 1.24)	0.70
Referral ordered	Yes	Inner metropolitan	0.88 (0.83, 0.94)	<0.001	0.80 (0.74, 0.86)	<0.001
		Regional and remote	0.77 (0.73, 0.82)	<0.001	0.84 (0.77, 0.91)	<0.001
Pathology ordered	Yes	Inner metropolitan	0.86 (0.82, 0.92)	<0.001	0.89 (0.83, 0.95)	0.001
		Regional and remote	0.80 (0.75, 0.85)	<0.001	0.75 (0.69, 0.82)	<0.001

Having an increased proportion of care from one doctor (usually a GP) is associated with increased patient and GP satisfaction, and decreased patient mortality (Pereira Gray *et al.* 2018).

Training experiences and exposure

OM areas presented registrars with a more diverse training experience than IM areas. When considering population demographics, there was greater exposure to managing patients aged >65 years (this being an area of relative deficit in registrar training) (Bonney *et al.* 2017) and to providing care for patients of Aboriginal or Torres Strait Islander descent. For trainee exposure to patients of NESB, the change in association was in the opposite direction: IM (greatest) to OM, which was greater still than in rural practices. Providing care to these under-served populations is important for health equity reasons, but is also beneficial from an educational perspective; having a broad exposure to diverse clinical issues and patients enhances the educational and professional growth of junior doctors (Martin *et al.* 2007). Our findings suggest that OM training environments foster an exposure to diverse presentations and patients, a feature of the GP environment that is unparalleled by other medical specialties.

Service provision

Registrar clinical behaviours when working in OM areas included ordering imaging studies less often than those working in rural areas. There were also fewer referrals to other specialists generated, and pathology testing was less often requested when compared with registrars in both rural and IM areas. This could reflect a parsimonious approach with judicious use of healthcare resources on the part of OM registrars. Alternatively, and more likely, it may reflect difficulty of the population in OM areas in accessing these services. This may reflect a supply side issue with respect to provider availability, or it may represent issues with affordability in accessing services for patients. The precise cause is not able to be determined from the data; however, the reduction in service access is consistent with previous findings that OM areas are at a disadvantage with respect to access to health resources when compared with both IM and in some instances, rural areas (Roeger *et al.* 2010; Gunn *et al.* 2020; Slavova-Azmanova *et al.* 2021). A more nuanced view of the rural and metropolitan divide would acknowledge that a gradient exists with respect to shortfall in healthcare provision and access by location (Australian Institute of Health and Welfare 2022), with OM areas occupying a distinct

position within this. The findings regarding seemingly poorer access to imaging, pathology and specialist medical support argue for increased resourcing in OM areas. From an educational viewpoint, registrars in OM regions may require more support to practice and learn within this context.

Learning environment

Previously described indirect markers of the particular 'richness' of a rural learning environment included chronic disease management, after-hours care and management of patients of Aboriginal and Torres Strait Islander descent (Tapley *et al.* 2020; Morgan *et al.* 2022). OM practices provide a distinct and rich learning environment when considering the parameters of stability of the practice population, exposure to patients of Aboriginal and Torres Strait descent, and exposure to older patients and chronic health conditions. We found a 'gradient' of this richness of the learning environment and experience with respect to practice location, from rural (richest), to OM, to IM.

Using the framework of contextual learning, which is part of a constructivist theory, being in a distinct environment such as OM practice provides both personal and professional challenges. These challenges are imbued with the potential for the attainment of competence and autonomy in preparation for future independent specialist practice. Working in an environment with potentially less access to health resources may encourage clinicians (including registrars) and patients to evaluate medical testing, treatment and procedures that represent best value and best practice, and minimises low-value care with unnecessary tests and treatments. Being a distinct clinical and training environment, though, OM areas require distinct and targeted healthcare, resources and training support. Promoting OM practice as a positive and professionally rewarding learning environment may improve workforce retention in these areas.

Implications for practice and policy

OM areas are distinct from IM and rural regions. There is a difference in training experiences and service provision by GP registrars across these areas; some aspects of which highlight health inequality affecting OM areas. This study has demonstrated that with respect to training location of GP registrars, the patient populations seen, the types of healthcare issues managed and the types of services provided, that OM areas are distinct, with distinct demographics and healthcare needs. Discussions concerning medical workforce, health service provision and GP training location thus need to extend beyond the urban versus rural divide and include OM areas.

Encouraging and increasing GP registrar presence in OM areas would not be a 'zero-sum' initiative, where registrars are simply fulfilling a workforce need at the expense of educational utility. Registrars are not being disadvantaged from an educational perspective; in fact, our findings suggest the opposite. Effective and targeted policy is required to increase the OM registrar presence, fulfilling both a workforce and social imperative. Such policy could be improved by framing the need for an OM registrar workforce in the context of learning and educational advantages, where providing rich and supportive educational environments will help increase GP trainee numbers. If retained in OM areas (as previous research regarding rural and lower socioeconomic status location suggests is likely) (Moad *et al.* 2022*b*), these fellowed GPs will go some way to addressing the growing health inequality between OM and other regions. Currently, equity as well as workforce distribution considerations, are determinants of registrar distribution across training practices, with trainees required to work at least 12 months in an OM area or MM2–7 region. This socially responsible policy should be retained, if not strengthened, and, as our findings suggest, is educationally sound.

Part of the reason for the drift of GP trainees away from rural areas in which they may have trained and worked is that unless they had pre-existing rural connections, family and other commitments were more likely to be in metropolitan areas (Ogden *et al.* 2020). GPs and trainees could live in metropolitan areas and commute to outer metropolitan areas, if this was appropriately incentivised and their educational experiences in OM areas had given them the skills and confidence to work there effectively.

Strengths and limitations

This study is the first to identify the distinct general practice training and working environment presented by OM regions. The evidence presented is supported by a large sample size, high response rate for studies of GPs (85%) and a representation of practices across the Australian Statistical Geographical Classification – Remoteness Area (ASGC-RA) spectrum. This study is limited by using indirect markers of the 'richness' of the training environment, a concept which remains difficult to define.

Implications for future research

Further research would examine whether the distinct OM training environment presents challenges of its own that could prove to be opportunities for professional growth or potentially predispose to greater workload, responsibility and burnout. Now that a distinct training environment in OM areas has been identified, the exact nature of its impact on registrars and their subsequent retention in the workforce in this area needs to be explored to inform future planning and policy development.

Supplementary material

Supplementary material is available online.

References

Australian Government Department of Health (2021) National medical workforce strategy 2021–2031. Australian Government Department of Health.

Australian Government Department of Health and Aged Care (2022*a*) General practice workforce providing primary care services in Australia. Available at https://hwd.health.gov.au/resources/data/gp-primarycare.html [Accessed 30 January 2023]

Australian Government Department of Health and Aged Care (2022*b*) Health workforce locator. Available at https://www.health.gov.au/resources/apps-and-tools/health-workforce-locator/health-workforce-locator [Accessed 13 October 2022]

Australian Government Department of Health and Aged Care (2022*c*) Distribution priority area. Available at https://www.health.gov.au/topics/rural-health-workforce/classifications/dpa [Accessed 26 April 2023]

Australian Government Productivity Commission (2022) Report on Government Services 2022. Primary and community health. Available at https://www.pc.gov.au/ongoing/report-on-government-services/2022/health/primary-and-community-health [Accessed 07 April 2023]

Australian Institute of Health and Welfare (2022) Rural and remote health. Available at https://www.aihw.gov.au/reports/rural-remote-australians/rural-and-remote-health [Accessed 31 December 2022]

Bonney A, Morgan S, Tapley A, Henderson K, Holliday E, Davey A, van Driel M, Spike N, Regan C, Ball J, Magin P (2017) Older patients' consultations in an apprenticeship model-based general practice training program: a cross-sectional study. *Australasian Journal on Ageing* **36**, E1–E7. doi:10.1111/ajag.12364

Davey A, Tapley A, van Driel M, Holliday E, Fielding A, Ball J, Mulquiney K, Fisher K, Spike N, Clarke L, Moad D, Ralston A, Patsan I, Mundy B, Turner A, Tait J, Tuccitto L, Roberts S, Magin P (2022) The Registrar Clinical Encounters in Training (ReCEnT) cohort study: updated protocol. *BMC Primary Care* **23**, 328. doi:10.1186/s12875-022-01920-7

Department of Health and Aged Care (2022) General practice workforce providing primary care services in Australia. Available at https://hwd.health.gov.au/resources/data/gp-primarycare.html [Accessed 30 January 2023]

Dixon J, Welch N (2000) Researching the rural-metropolitan health differential using the 'social determinants of health'. *Australian Journal of Rural Health* **8**, 254–260.

Fielding A, Moad D, Tapley A, Davey A, Holliday E, Ball J, Bentley M, FitzGerald K, Kirby C, Turnock A, Spike N, van Driel ML, Magin P (2022) Prevalence and associations of rural practice location in early-career general practitioners in Australia: a cross-sectional analysis. *BMJ Open* **12**, e058892. doi:10.1136/bmjopen-2021-058892

Gunn LD, Davern M, Higgs C, Both A, Roberts R, Rozek J, Giles-Corti B (2020) Measuring liveability for the 21 largest cities in Australia: liveability report for Sydney. Centre for Urban Research, RMIT University, Melbourne.

Health Workforce Australia (2012) Health workforce 2025. Doctors, nurses and midwives. Volume 1. Health Workforce Australia.

Malau-Aduli BS, Alele FO, Heggarty P, Reeve C, Teague P-A (2021) Key elements of effective postgraduate GP educational environments: a mixed methods study. *BMJ Open* **11**, e041110. doi:10.1136/bmjopen-2020-041110

Martin AA, Laurence CO, Black LE, Mugford BV (2007) General practice placements for pre-registration junior doctors: adding value to intern education and training. *Medical Journal of Australia* **186**, 346–349. doi:10.5694/j.1326-5377.2007.tb00934.x

McGaw AJ, Jayasuriya P, Bulsara C, Thompson SC (2006) Accessing primary health care: a community survey of issues regarding general practice and emergency department services in an outer metropolitan area. *Australian Journal of Primary Health* **12**, 78–84. doi:10.1071/PY06049.

McGrail MR, Russell DJ, Campbell DG (2016) Vocational training of general practitioners in rural locations is critical for the Australian rural medical workforce. *Medical Journal of Australia* **205**, 216–221. doi:10.5694/mja16.00063

Moad D, Tapley A, Fielding A, van Driel ML, Holliday EG, Ball JI, Davey AR, FitzGerald K, Spike NA, Magin P (2022*a*) Socioeconomic status of practice location and Australian GP registrars' training: a cross-sectional analysis. *BMC Medical Education* **22**, 285. doi:10.1186/s12909-022-03359-x

Moad D, Fielding A, Tapley A, van Driel ML, Holliday EG, Ball JI, Davey AR, FitzGerald K, Bentley M, Spike NA, Kirby C, Turnock A, Magin P (2022*b*) Socioeconomic disadvantage and the practice location of recently Fellowed Australian GPs: a cross-sectional analysis. *Australian Journal of Primary Health* **28**, 104–109. doi:10.1071/PY21179

Morgan T, Tapley A, Davey A, Holliday E, Fielding A, van Driel M, Ball J, Spike N, FitzGerald K, Morgan S, Magin P (2022) Influence of rurality on general practitioner registrars' participation in their practice's after-hours roster: a cross-sectional study. *Australian Journal of Rural Health* **30**, 343–351. doi:10.1111/ajr.12850

Moynihan M (2022) The Australian Population Research Institute, Research Report, October 2022. The Australian Population Research Institute, Victoria, Australia.

Ogden J, Preston S, Partanen RL, Ostini R, Coxeter P (2020) Recruiting and retaining general practitioners in rural practice: systematic review and meta-analysis of rural pipeline effects. *Medical Journal of Australia* **213**, 228–236. doi:10.5694/mja2.50697

Pereira Gray DJ, Sidaway-Lee K, White E, Thorne A, Evans PH (2018) Continuity of care with doctors-a matter of life and death? A systematic review of continuity of care and mortality. *BMJ Open* **8**, e021161. doi:10.1136/bmjopen-2017-021161

Roeger LS, Reed RL, Smith BP (2010) Equity of access in the spatial distribution of GPs within an Australian metropolitan city. *Australian Journal of Primary Health* **16**, 284–290. doi:10.1071/PY10021

Russell DJ, Wilkinson E, Petterson S, Chen C, Bazemore A (2022) Family medicine residencies: how rural training exposure in GME is associated with subsequent rural practice. *Journal of Graduate Medical Education* **14**, 441–450. doi:10.4300/JGME-D-21-01143.1

Shadbolt N, Bunker J (2009) Choosing general practice – a review of career choice determinants. *Australian Family Physician* **38**, 53–55.

Slavova-Azmanova NS, Newton JC, Johnson CE, Hohnen H, Ives A, McKiernan S, Platt V, Bulsara M, Saunders C (2021) A cross-sectional analysis of out-of-pocket expenses for people living with a cancer in rural and outer metropolitan Western Australia. *Australian Health Review* **45**, 148–156. doi:10.1071/AH19265

Starfield B, Shi L, Macinko J (2005) Contribution of primary care to health systems and health. *The Milbank Quarterly* **83**, 457–502. doi:10.1111/j.1468-0009.2005.00409.x

Tapley A, Davey AR, van Driel ML, Holliday EG, Morgan S, Mulquiney K, Turnock A, Spike NA, Magin PJ (2020) General practice training in regional and rural Australia: a cross-sectional analysis of the registrar clinical encounters in training study. *Australian Health Review* **28**, 32–41. doi:10.1111/ajr.12591

Wright M, Mainous AG 3rd (2018) Can continuity of care in primary care be sustained in the modern health system? *Australian Journal of Rural Health* **47**, 667–669. doi:10.31128/AJGP-06-18-4618

Data availability. The data that support this study cannot be publicly shared due to ethical or privacy reasons.

Conflicts of interest. The authors declare no conflicts of interest. Susan Wearne is an employee of the Department of Health and Aged Care, Canberra, ACT. The views expressed in the paper are those of the authors and not necessarily those of the Department of Health and Aged Care.

Declaration of funding. The ReCEnT project was funded from 2016 to 2019 by an Australian Department of Health-commissioned research grant and supported by the GP Synergy Regional Training Organisation. From 2019, ReCEnT has been funded by GP Synergy and by the other participating Regional Training Organisations, General Practice Training Tasmania and Eastern Victoria General Practice Training. GP Synergy, General Practice Training Tasmania and Eastern Victoria General Practice Training are funded by the Australian Government.

Author affiliations

[A]Discipline of General Practice, University of New South Wales, Wallace Wurth Building (C27), Corner High Street and Botany Street, Kensington, NSW 2052, Australia.

[B]School of Medicine and Public Health, University of Newcastle, University Drive, Callaghan, Newcastle, NSW 2308, Australia.

[C]NSW and ACT Research and Evaluation Unit, GP Synergy, Regional Training Organisation (RTO), Level 1, 20 McIntosh Drive, Mayfield West, NSW 2304, Australia.

[D]Academic Unit of General Practice, Australian National University, The Canberra Hospital, Yamba Drive Garran, ACT 2605, Australia.

[E]Health Workforce Division, Australian Government Department of Health, Sirius Building, Furzer Street, Woden Town Centre, ACT 2606, Australia.

[F]General Practice Clinical Unit, Faculty of Medicine, University of Queensland, Level 8, Health Sciences Building, Royal Brisbane & Women's Hospital, Brisbane, Qld 4029, Australia.

[G]Clinical Research Design and Statistical Support Unit (CReDITSS), Hunter Medical Research Institute (HMRI), Lot 1 Kookaburra Circuit, New Lambton Heights, NSW 2305, Australia.