








BMJ Open Prevalence and associations of rural practice location in early-career general practitioners in Australia: a cross-sectional analysis

Alison Fielding ^{1,2}, Dominica Moad ^{1,2}, Amanda Tapley ^{1,2}, Andrew Davey ^{1,2}, Elizabeth Holliday ², Jean Ball,³ Michael Bentley,⁴ Kristen FitzGerald,^{4,5} Catherine Kirby,⁶ Allison Turnock,^{5,7} Neil Spike,^{6,8} Mieke L van Driel ⁹, Parker Magin ^{1,2}

To cite: Fielding A, Moad D, Tapley A, *et al*. Prevalence and associations of rural practice location in early-career general practitioners in Australia: a cross-sectional analysis. *BMJ Open* 2022;**12**:e058892. doi:10.1136/bmjopen-2021-058892

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-058892>).

Received 04 November 2021
Accepted 30 March 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Parker Magin;
parker.magin@newcastle.edu.au

ABSTRACT

Objectives To: (1) establish the prevalence of urban, regional, rural and remote practice location of early-career general practitioners (GPs); and (2) examine demographic and training-related characteristics associated with working in regional, rural or remote areas post attainment of vocational general practice qualifications.

Design Cross-sectional, questionnaire-based study, combined with contemporaneously collected data from participants' prior vocational training.

Setting Australian general practice.

Participants Newly vocationally qualified GPs (ie, within 6 months–2 years post fellowship) who had completed vocational training with regional training organisations in New South Wales, Australian Capital Territory, eastern Victoria, and Tasmania between January 2016 and July 2018.

Primary outcome measure Rurality of post-fellowship practice location, as defined by Modified Monash Model (MMM) geographical classifications, based on current practice postcode. Prevalence of regional/rural/remote ('rural') practice was described using frequencies, and associations of rural practice were established using multivariable logistic regression, considering a range of demographic factors and training characteristics as independent variables.

Results A total of 354 participants completed the questionnaire (response rate 28%) with 319 providing information for their current practice location. Of these, 100 (31.4%) reported currently practising in a rural area (MMM2-7). Factors most strongly associated with practising in a rural area included having undertaken vocational GP training in a rural location OR 16.0 (95% CI 6.79 to 37.9); $p < 0.001$; and undertaking schooling in rural area prior to university OR 4.21 (1.98, 8.94); $p < 0.001$.

Conclusions The findings suggest that vocational training experience may have a role in rural general practice location post fellowship, attenuating the previously demonstrated 'leakage' from the rural practice pipeline.

INTRODUCTION

Medical workforce shortages in rural areas are a longstanding issue for primary

Strengths and limitations of this study

- The cross-sectional questionnaire-based study was augmented with contemporaneously collected training data.
- The sample frame reflects a large and geographically diverse population of early-career vocationally qualified general practitioners in Australia.
- The cross-sectional design precludes inferences of causality.

healthcare delivery in Australia and internationally.^{1 2} An adequate distribution of general practitioners (GPs) is vital for effectively meeting the primary healthcare needs of rural communities.² Despite ongoing efforts to improve rural general practice workforce distribution, imbalances remain pervasive in rural and remote Australia.¹ In 2019, per 100 000 population, there were 121 GP fulltime equivalents (FTEs) in major cities compared with 101–115 GP FTEs in regional areas and 69–83 GP FTEs in remote and very remote areas.³ Compounding this inequity is the greater health need of rural and remote communities, who experience disproportionately higher rates of morbidity, mortality and socioeconomic disadvantage than their urban counterparts, and have greater reliance on GP services due to lower availability of specialist care.⁴

There is a broad body of Australian and international research examining strategies to attract and retain medical practitioners (including GPs) in regional, rural and remote areas.^{2 5–8} A model central to recruitment and retention in rural practice is that of the 'rural pipeline', which conceptualises the flow from school to undergraduate studies to hospital doctor to vocational trainee to

rural practitioner, and proposes that rural immersion across the pipeline is contributory to the production of rural practitioners.^{9 10} Within this framework, compelling evidence shows rural childhood/upbringing is a key predictor of practising rurally.^{2 5-7 11 12} Similarly, existing evidence suggests that exposure to rural practice during undergraduate/primary medical training is an important part of the rural pipeline.^{2 5 7 8 12-15} While fewer studies have focused on postgraduate rural training exposure, this has also been identified as a factor associated with rural practice.^{2 5 11}

Individual demographic characteristics, personal attributes and circumstantial factors (eg, gender and family needs including spousal employment, age and number of children)^{6 16} as well as availability of professional and academic support, nature of work (eg, variety, demand for procedural work), access to educational, recreational and social opportunities and remuneration,¹⁷ and considerations of work–life balance¹⁸ may have further influence on rural GP career pathways. These factors have an apparent cumulative effect on the propensity to choose and remain in rural practice.²

Vocational GP training provides an opportunity for registrars (general practice/family medicine trainees) to experience a comprehensive patient case-mix and wide scope of practice. It may be hypothesised that this training experience will influence the future work practices of GPs, including vocation for rural practice.¹⁹ Findings from the ongoing Registrars Clinical Encounters in Training cohort study suggest that registrars training in rural/remote areas are exposed to a particularly rich and challenging training environment, as reflected by a greater exposure to older patients, Aboriginal and/or Torres Strait Island patients, procedural experience and continuity of patient care.²⁰ The richness and diversity of learning environments within rural general practice training settings have been similarly identified in qualitative analyses of GP perceptions and experiences of rural vocational training.^{18 21 22}

Within the Australian context, substantial resources have been invested in the provision of regionalised medical and vocational GP training aimed at recruiting and retaining rural GPs.^{23 24} Vocational GP training is a longstanding feature within Australia's rural GP workforce distribution policy, where registrars are required to train via a general or rural pathway as part of the Australian General Practice Training Program (AGPT).²⁵ Australian medical graduates (AMGs) can elect to undertake training via either the general or rural pathway.²⁵ General pathway registrars, usually AMGs,¹² must complete 12 months of training time in a prescribed location, for which training in non-major cities and/or regional/rural areas are key options for fulfilment of training location obligations (TLOs).²⁵ The general pathway also allows AMGs to undertake training beyond that of their TLO in non-major cities and/or regional/rural areas.²⁵ International medical graduates (IMGs) must train via the rural pathway (unless exempted), which requires all general

practice training time to be undertaken in a non-major city.²⁵

Despite the emphasis on vocational general practice training within rural medical workforce policy, relatively little research has specifically examined the GP-training/early-career workforce nexus. While some previous studies have established a relationship between rural vocational training location and later rural practice, which is synergistic with rural origin,^{2 11} there has been limited granular exploration of the relationship between training-related factors and post-training locality of practice. Developing a more nuanced understanding of vocational training-related factors associated with early-career rural practice will help to further inform workforce distribution policy alongside tailored rural retention and strategies at the vocational training level.

The aims of this study were to: (1) establish the prevalence of urban, regional, rural and remote practice location of early-career GPs; and (2) examine demographic and training-related characteristics associated with working in regional, rural and remote areas post attainment of vocational general practice qualifications.

METHODS

Study design

New alumni EXperiences of Training and independent Unsupervised Practice (NEXT-UP) was a cross-sectional, questionnaire-based study. Full methodology is described in the published protocol.¹⁹

Participants were early-career GPs who had achieved their vocational general practice qualification ('Fellowship'), either via the Royal Australian College of General Practitioners (RACGP) and/or the Australian College of Rural and Remote Medicine (ACRRM), between January 2016 and July 2018 from one of three participating Australian regional training organisations (RTOs). In Australia, fellowship of one of the two colleges (FRACGP or FACRRM) is the basic qualification required to practice independently as a vocationally qualified GP, equivalent to Membership of the Royal College of Physicians in the UK.

At the time of participation in the research, participants were 6 months to 2 years post attainment of fellowship qualifications. Participating RTOs included GP Synergy (covering all of NSW and the ACT), General Practice Training Tasmania and Eastern Victorian General Practice Training. Collectively, these RTOs are responsible for delivering the AGPT to approximately 44% of Australia's GP trainee population (see [box 1](#) for further description of the structure of vocational GP training in Australia). The sample frame included GPs who had completed all or part of their training with former training providers within the geographical footprint of the participating RTOs prior to the substantial restructure of Australian GP training providers in 2016.

The questionnaire was distributed to participants ('alumni') of each RTO via an online survey link using

Box 1 Structure of general practice training in Australia

In Australia, the majority of general practitioners achieve vocational general practice qualification ('Fellowship') via the Australian General Practice Training Program (AGPT). The AGPT is organised and delivered by nine geographically defined regional training organisations (RTOs). RTOs are not-for-profit, funded by the Australian government. RTOs are responsible for delivering 'away from practice' educational content (aligning with Australian general practice College curriculums) and for coordinating in-practice clinical training. In-practice clinical training operates in an apprenticeship-like model, where registrars complete a minimum of 18 fulltime equivalent months in general practice-based training terms under the supervision of an experienced general practitioner supervisor.

Survey Monkey and hardcopy mailout (participants could choose either mode of completion), using practice details held by each RTO and publicly available sources (including the Australian Health Practitioner Regulation Agency website, GP search engines and individual practice websites).

The questionnaire elicited information about participants' post-fellowship practice location, characteristics of their current practice, demographic details and perceptions of their training experience. Permission was sought from participants to access routinely collected training data from their RTO, providing contemporaneously collected training-related variables. Where consent was not given, these variables were provided by participants via an additional demographics section at the end of the questionnaire.

Analysis

Primary outcome

The primary outcome for the analysis reported in this paper is rurality of post-fellowship practice location.

Participants were asked to provide the postcode of their current practice, which was used to define the rurality of their post-fellowship practice using the Modified Monash Model (MMM) classification system.²⁶

Rurality of post-fellowship practice was dichotomised as: non-rural (MMM1; metropolitan); or regional/rural/remote/very remote (MMM 2–7)²⁶ (from here on referred to as 'rural'). Due to a limited sample size of participants classified as practising in MMM2-7 areas, it was not possible to further delineate these MMM classifications for our analyses.

Independent variables

Variables considered for inclusion in analyses were: gender, age, relationship/spouse employment status, dependent children, regional/remote schooling prior to attending university, country of primary medical qualification, years of postgraduate experience in an Australian hospital prior to vocational GP training, RTO of vocational GP training, having practised rurally during vocational GP training (defined as completing ≥ 13 FTE weeks of training in practice locations classified as MMM

2–7), having undertaken any vocational GP training part-time, having worked in a region of relatively high socioeconomic disadvantage during training, having worked at their current practice during training, having failed any fellowship exam component on first attempt, and year of fellowship attainment.¹⁹

Statistical analysis

Descriptive analyses included means and SD for continuous measures and frequencies with percentages for categorical measures. The frequencies of categorical variables were compared between outcome categories using χ^2 tests for all variables, except when Fisher's exact test was used (due to an expected count less than 5 in 25% or more cells). For continuous variables, means were compared using a t-test.

Univariate and multivariable logistic regressions were undertaken to examine relationships between rurality of post-fellowship practice and independent variables of interest, using Firth's penalised maximum likelihood estimation,²⁷ to reduce bias and variance in parameter estimates given the modest sample size. No imputation was performed. Covariates were considered for inclusion in multivariable models if they were univariately associated with the outcome of interest ($p \leq 0.2$). Once the model with all significant covariates was fitted, model reduction was assessed. Covariates which 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 (defined as a change in the effect size (OR or coefficient of less than 10%), the covariate was removed from the final model. Statistical significance was set as $p < 0.05$ for all analyses. STATA V.14.2 and SAS V.9.4 were used to prepare and analyse data.

Patient and public involvement

No patients were involved in the design, conduct or interpretation of the study. Summary NEXT-UP study findings have been provided to GP Synergy practices via newsletter article, which has also been provided to other participating RTOs. NEXT-UP summary findings are also included in GP Synergy's publicly available Annual Research Reports.

RESULTS

A total of 354 alumni completed the questionnaire (response rate 28%). For 264 (75%), during-training variables were sourced from RTO-held training data rather than questionnaire responses. Participant characteristics are provided in [table 1](#). There were 319 observations available for the current analysis (35 observations were excluded due to current practice postcode not having been reported).

Of the available observations, 100 participants (31.4%) reported currently practising in a rural area (MMM2-7) ([figure 1](#)).

Table 1 Participant characteristics

| Characteristic | Class | N* (%) |
|--|-----------------------------|------------|
| Gender | Female | 221 (67.4) |
| Currently working as a GP | Yes | 337 (95.2) |
| Country of primary medical qualification | Australia | 256 (77.3) |
| Age | Years (mean±SD) | 36.4 (6.3) |
| Aboriginal and/or Torres Strait Islander | No | 327 (100) |
| Marital status/ employment status of spouse | No spouse | 44 (13.2) |
| | Spouse employed full time | 188 (56.8) |
| | Spouse employed part time | 61 (18.4) |
| | Spouse not in the workforce | 38 (11.5) |
| Rural secondary schooling | Metro/major city | 240 (73) |
| | Regional | 64 (19) |
| | Rural/small town | 27 (8) |
| Dependent children | Yes | 193 (58) |
| Regional training organisation | RTO 1 | 235 (66.4) |
| | RTO 2 | 85 (24.0) |
| | RTO 3 | 34 (9.6) |
| Vocational GP training Fellowship | RACGP | 320 (98) |
| | ACRRM | 4 (1) |
| Training pathway | General | 198 (60) |
| | Rural | 130 (40) |
| Year of fellowship | 2016 | 110 (33.8) |
| | 2017 | 125 (38.3) |
| | 2018 | 91 (27.9) |
| Rural vocational training experience† | Yes | 153 (50) |
| Any part-time during training | Yes | 101 (31) |

*N does not add to 354 for all items to due missing data within each variable.

†Defined as ≥13 full-time equivalent weeks in a full-time equivalent weeks in a Modified Monash Model 2–7 location.²⁶

ACRRM, Australian College of Rural and Remote Medicine; GP, general practice; RACGP, Royal Australian College of General Practitioners; RTO, regional training organisation.

Only 6% of alumni who had trained entirely in MMM1 areas were working in MMM2–7 areas, compared with 58% of those who had completed some MMM2–7 training. Of alumni working in MMM2–7, only 10% had trained entirely in MMM1 areas.

Univariate associations of currently practising in a rural location are presented in [table 2](#).

Univariate regression analyses identified statistically significant associations between current rural practice and: male gender, having children, having a spouse

employed part time or not in the workforce compared with no spouse, schooling in a regional/rural/remote location, having worked at the practice previously, RTO and having undertaken vocational GP training in a rural location ([table 3](#)).

In multivariable regression analyses, undertaking schooling in a rural area prior to university (OR (95% CI): 4.21 (1.98 to 8.94); $p<0.001$), having a spouse not in the workforce compared with no spouse (OR 5.43 (1.13 to 26.1); $p=0.035$), having worked at the practice previously (OR 3.01 (1.42 to 6.39); $p=0.004$), training with one particular RTO (OR 4.17 (1.20 to 14.5); $p=0.018$) and having undertaken vocational GP training in a rural location (OR 16.0 (6.79 to 37.9); $p<0.001$) remained statistically significant ([table 3](#)).

DISCUSSION

Main findings

We found a relatively small proportion of early post-fellowship GPs to be practising rurally, particularly in areas of increasing remoteness.

The most striking finding from this study is the magnitude (OR 16.0) of the association between having undertaken at least a proportion of vocational GP training in a rural location and practising rurally in the early years post fellowship. Although the sample size was modest and the 95% CI relatively wide, the lower CI endpoint (6.8) still supports the presence of a large effect. This association remained after adjusting for other important factors, including rural schooling. This finding is particularly salient given that as little as 13 weeks spent training in a rural area was classified as ‘rurally trained’. Other findings also relevant to the rural pipeline, including having worked previously at the practice and training in an exclusively regional/rural training organisation, were also identified.

Comparison with previous studies

The results of this study regarding rural training exposure are consistent with previous studies that have identified a relationship between rural training exposure and subsequent rural practice; however, we identified a much larger effect size for this relationship when compared with most previous studies.² Our findings are broadly similar to those of McGrail *et al* who also found a very strong relationship between rural vocational training experience and later rural practice.¹¹ Our findings, however, are not directly comparable as McGrail *et al* categorised rural training exposure by rural/metropolitan training pathways rather than categorisation based on weeks spent in rural vocational training locations. Further, McGrail *et al* analysed Australian and IMGs separately.

While positive associations for rural training exposure may reflect a pre-existing intention to practise rurally,⁶ the strong relationship (adjusted for multiple variables, including rural origin) observed in the present study, considered together with the findings of previous

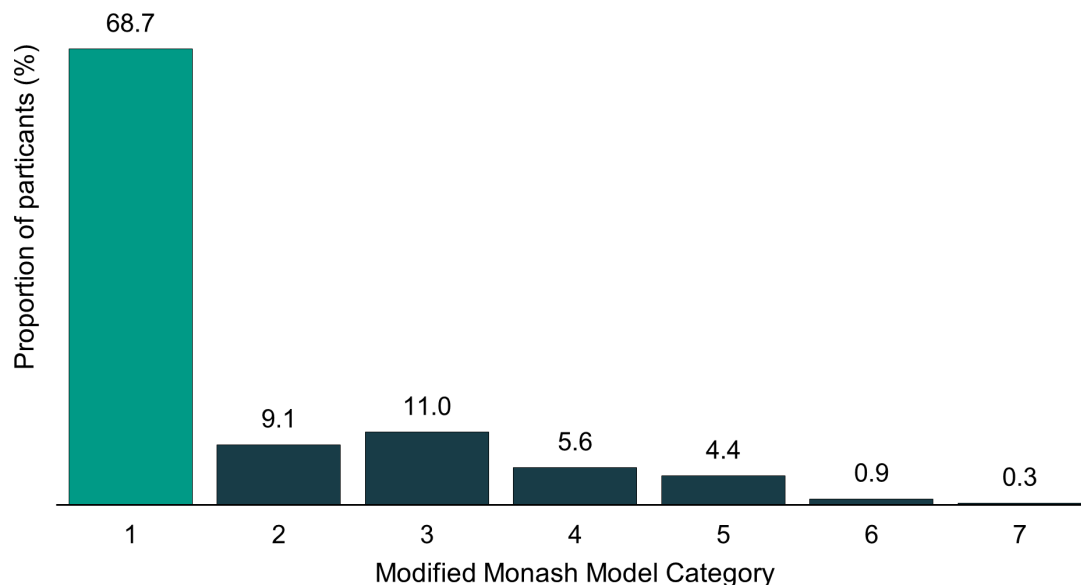


Figure 1 Alumni's current practice location by Modified Monash Model rurality classification (1=major city to 7=very remote)²⁶ (n=319).

studies, nevertheless supports the importance of vocational training maximising opportunities for registrars to complete at least part of their training rurally.

Other associations are also consistent with the existing evidence for associations of rural practice, including rural schooling/background and non-professional factors, such as gender and family circumstances.^{21 12} Notably our univariable results indicated that females were less likely to practise rurally, but when adjusted for other factors, the association was no longer statistically significant. While this contrasts with earlier Australian research,²⁸ similar findings have been reported more recently in Australian GPs¹¹ as well as in USA-based rural healthcare provision research.²⁹

We found, with adjusting for gender and other factors, that having a spouse not in the workforce was associated with a greater likelihood of practising rurally (when compared with no spouse). This offers a point of difference from McGrail *et al*'s previous analysis of family effects on rurality of practice. They found this relationship to be significant for female GPs, but not males.¹⁶ Despite some inconsistencies, most likely attributable to methodological differences, collectively our findings relating to gender, relationship and family factors concur with the assertion that non-professional factors are an essential consideration for rural GP workforce planning and policies.¹⁶

Finally, country of primary medical qualification was not significantly associated with post-fellowship practice location in the present study, with very similar proportions of AMGs and IMGs reporting practising in a rural location early post fellowship. It is difficult to compare this with previous studies that have analysed rural practice outcomes separately for AMGs and IMGs.^{11 30}

Implications for policy

Our findings can further inform rural recruitment and retention policy and strategies within vocational training in Australia (and in other countries with similar GP training and rural workforce needs).

Given evidence of migration back to metropolitan regions over time,^{1 11 20 31} the suggested low prevalence of early post-fellowship GPs practising rurally is of concern. Australia has long relied on IMGs for addressing rural workforce shortages.³² The present finding supports the recognised need to consider rural policy, training and support strategies for both Australian-trained and internationally trained medical graduates for sustainable rural medical workforce outcomes.^{1 30 32}

While a positive rural vocational training experience could possibly change rural intention, earlier research suggests that factors operating prior to prevocational training experience are the most important in eventual rural practice location.²² Our findings suggest there may also be a strong influence of vocational training location in later rural practice location. It may be that this strong influence operates particularly to support those trainees with an existing intent for rural practice—to prevent 'leakage' from the rural pipeline.

Rural exposure during training may have either negative or positive influences on future decisions to practise rurally.¹⁷ Therefore, offering positive, rich, well-supported rural vocational training experiences, that take into account the holistic needs of trainees (ie, individual preferences, educational needs and non-professional factors such as family) is critical for maintaining integrity of the rural pipeline. Training location policy needs to support training providers to achieve this goal.

Table 2 Characteristics associated with post-fellowship practice location

| Variable | Class | Current practice location (n=319)* | | P value |
|---|---------------------------|------------------------------------|----------|---------|
| | | MMM 1 | MMM 2–7 | |
| Gender | Male | 64 (30%) | 40 (42%) | 0.046 |
| | Female | 149 (70%) | 56 (58%) | |
| Age | Mean (SD) | 36 (6) | 37 (6) | 0.67 |
| Relationship status/spouse employment | No spouse | 34 (16%) | 7 (7%) | 0.005 |
| | Spouse employed full time | 127 (59%) | 47 (48%) | |
| | Spouse employed part time | 33 (15%) | 28 (29%) | |
| | Spouse not in workforce | 21 (10%) | 15 (15%) | |
| Dependent children | No | 99 (46%) | 32 (33%) | 0.031 |
| | Yes | 116 (54%) | 65 (67%) | |
| Country of primary medical qualification | International | 52 (24%) | 22 (23%) | 0.77 |
| | Australia | 163 (76%) | 75 (77%) | |
| Any part-time during training | No | 148 (69%) | 64 (67%) | 0.71 |
| | Yes | 65 (31%) | 31 (33%) | |
| Rural vocational training experience | No | 140 (70%) | 9 (10%) | <0.001 |
| | Yes | 60 (30%) | 82 (90%) | |
| Low SES practice location during training | No | 119 (59%) | 53 (58%) | 0.95 |
| | Yes | 84 (41%) | 38 (42%) | |
| Fail any exam component | No | 159 (76%) | 74 (84%) | 0.14 |
| | Yes | 49 (24%) | 14 (16%) | |
| Regional training organisation | RTO 1 | 153 (70%) | 57 (57%) | <0.001 |
| | RTO 2 | 62 (28%) | 17 (17%) | |
| | RTO 3 | 4 (2%) | 26 (26%) | |
| Regional, remote or urban schooling prior to university | Metropolitan/major city | 182 (85%) | 43 (44%) | <0.001 |
| | Regional/rural/small town | 33 (15%) | 54 (56%) | |
| Worked at current practice previously | No | 99 (45%) | 31 (31%) | 0.017 |
| | Yes | 120 (55%) | 69 (69%) | |
| Year of fellowship | Mean (SD) | 2017 (1) | 2017 (1) | 0.22 |
| Years of postgraduate experience in an Australian hospital prior to GP term 1 | Mean (SD) | 4 (2) | 4 (2) | 0.90 |

*Numbers may not add to 319 due to missing data within each variable.

MMM, Modified Monash Model; RTO, regional training organisation; SES, socioeconomic status.

Implications for future research

Future research is needed to assess longer-term post-training rurality outcomes and how these evolve over time. Our study of early-career GPs 6 months to 2 years post fellowship may be reflecting rural recruitment to a greater degree than rural retention. Further research should explore the relative contributions of recruitment and retention to rural workforce, especially in early-career GPs who may be more geographically mobile than established GPs.

Similarly, further research examining the retention of GPs within geographical training footprints is required to better understand the longer-term effectiveness of

regionalised training provision in sustaining local GP workforce needs within geographic catchment areas/communities, particularly given existing evidence that suggests migration of GPs back to metropolitan regions remains problematic.^{11 31} This will help to better understand the success of vocational training workforce distribution policies.

Strengths and limitations

Having assessed actual practice location (rather than intention to practise rurally) alongside contemporaneously collected training practice location data are key strengths of the present analysis.

Table 3 Factors associated with practising in a rural location post fellowship—final univariate and multivariable models

| Variable | Class | Univariate | | Adjusted | |
|--|-------------------------------|---------------------|---------|---------------------|---------|
| | | OR (95% CI) | P value | OR (95% CI) | P value |
| Gender | Female | 0.60 (0.36 to 0.99) | 0.047 | 0.52 (0.23 to 1.18) | 0.12 |
| Dependent children | Yes | 1.72 (1.04 to 2.84) | 0.033 | 0.73 (0.32 to 1.65) | 0.45 |
| Relationship status/ spouse employment Referent: no spouse/ partner | Spouse employed full-time | 1.71 (0.72 to 4.08) | 0.22 | 2.59 (0.75 to 8.96) | 0.13 |
| | Spouse employed part-time | 3.91 (1.52 to 10.1) | 0.005 | 3.51 (0.85 to 14.5) | 0.084 |
| | Spouse not in workforce | 3.32 (1.17 to 9.36) | 0.023 | 5.43 (1.13 to 26.1) | 0.035 |
| Regional, remote or urban schooling prior to university | Regional/rural/ small town | 6.83 (3.96 to 11.8) | <0.001 | 4.21 (1.98 to 8.94) | <0.001 |
| Worked at current practice previously | Yes | 1.82 (1.11 to 3.0) | 0.019 | 3.01 (1.42 to 6.39) | 0.004 |
| RTO Referent: RTO 1 | RTO 2 | 0.75 (0.4 to 1.38) | 0.35 | 0.87 (0.38 to 2.03) | 0.75 |
| | RTO 3 | 15.7 (5.45 to 45.4) | <0.001 | 4.17 (1.20 to 14.5) | 0.025 |
| Fail any exam component | Yes | 0.63 (0.33 to 1.2) | 0.16 | 0.48 (0.19 to 1.23) | 0.13 |
| Rural vocational training experience | Yes | 20.2 (9.64 to 42.2) | <0.001 | 16.0 (6.79 to 37.9) | <0.001 |

RTO, regional training organisation.

The cross-sectional nature of this study precludes determination of causality in the associations explored. The modest response rate, while reasonable for studies of GPs,^{33 34} may impact generalisability of findings. Similarly, while the sample frame included alumni of RTOs that are responsible for delivering training to 44% of GP registrars within the AGPT, only three of Australia's nine RTOs participated (due to capacity and logistical constraints associated with undertaking the research). However, characteristics of the study sample (including gender, age and Australian primary medical qualification) are generally comparable with general practice registrars and similar Australian studies of recently-fellowed GPs, although with modestly fewer IMGs.^{11 12 30} Further, the lower than expected response rate produced a lower than predicted sample size. We were still able however to establish statistically significant associations with large effect sizes.

The sample for this study consisted of very new fellows (6 months to 2 years post fellowship), which may have contributed to the large effect sizes found for rural vocational training and having worked previously at the practice. It remains underexplored if and to what extent this relationship persists.

Due to the relatively small sample of rural responders, we were unable to analyse practice location outcome using finer-grained MMM categorisations. This precluded more nuanced exploration of differences between the larger population regional centres and smaller, more rural/remote areas. Rural exposure duration training was treated dichotomously rather than continuously due to limitations within routine training data, preventing

assessment of the relationship between length of rural training exposure and likelihood of subsequent rural practice.

Data were not collected on moratoriums or rural bonding (time-limited constraints on place of practice for IMGs and some AMGs, respectively), which are potential confounders in interpreting post-fellowship rural practice associations. However, country of primary medical degree was not associated with post-fellowship practice location, suggesting limited potential influence of moratorium status. Further, while approximately 80% of IMG registrars commence training under a moratorium (representing approximately 30% of AGPT registrars in total),¹² the proportion of registrars subject to the 10-year moratorium is declining,³⁵ and graduate tracking data suggest that as few as 4% of IMGs who trained on the rural pathway are still subject to moratorium at 1–6 years postvocational training.³⁶ It is possible that rural bonding may partially explain associations between rural training exposure and post-fellowship practice location for AMG participants.^{7 11} However, on commencement of vocational training, fewer than 10% of registrars hold a rural medical school bonded place³⁶ and a similar prevalence of rural bonding has been reported in other studies of early-career GPs.¹¹ This suggests it is unlikely the study sample included a substantive proportion of rurally bonded alumni.

Conclusion

Our findings demonstrate a positive association with large effect size for the relationship between rural vocational



training experience and subsequent post-fellowship rural practice. This further establishes the important relationship between vocational general practice training and subsequent post-fellowship rural practice in early-career GPs. Vocational training policy should endeavour to ensure that the ‘right’ registrars are placed in the right rural training environment to sustain and nurture their vocation for rural practice.

Author affiliations

¹NSW & ACT Research and Evaluation Unit, GP Synergy, Regional Training Organisation (RTO), Mayfield West, New South Wales, Australia

²School of Medicine and Public Health, University of Newcastle, Callaghan, New South Wales, Australia

³Clinical Research Design and Statistical Support Unit (CRDITSS), University of Newcastle Hunter Medical Research Institute, New Lambton, New South Wales, Australia

⁴Australian General Practice Training, General Practice Training Tasmania (GPPT), Regional Training Organisation, Hobart, Tasmania, Australia

⁵Tasmanian School of Medicine, University of Tasmania, Hobart, Tasmania, Australia

⁶Australian General Practice Training, Eastern Victoria General Practice Training (EVGPT), Regional Training Organisation, Hawthorn, Victoria, Australia

⁷Department of Health, Australian Government, Hobart, Tasmania, Australia

⁸Department of General Practice and Primary Health Care, University of Melbourne, Carlton, Victoria, Australia

⁹Primary Care Clinical Unit, Faculty of Medicine, University of Queensland, Brisbane, Queensland, Australia

Twitter Allison Turnock @aclairet

Contributors AF, PM, DM and ATa conceived the project, study design and analysis plan. JB and EH analysed the data. AF drafted the manuscript. All authors provided intellectual input to the study design and manuscript. All authors contributed to critical revision of the manuscript. All authors read and approved the manuscript prior to submission. AF is guarantor.

Funding This research project was supported by The Royal Australian College of General Practitioners with funding from the Australian General Practice Training Program: An Australian Government initiative (reference number ERG-020, year: 2018-19).

Competing interests DM, PM, AF, AT & AD are employees of GP Synergy; KF and MB are employees of General Practice Training Tasmania; NS is an employee of Eastern Victoria General practice training. All authors have no other interests to declare.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the University of Newcastle Human Research Ethics Committee (reference H-2018-0333). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The data analysed during the current study are available from the corresponding author on reasonable request.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Alison Fielding <http://orcid.org/0000-0001-5884-3068>

Dominica Moad <http://orcid.org/0000-0002-2593-6038>

Amanda Tapley <http://orcid.org/0000-0002-1536-5518>

Andrew Davey <http://orcid.org/0000-0002-7547-779X>

Elizabeth Holliday <http://orcid.org/0000-0002-4066-6224>

Mieke L van Driel <http://orcid.org/0000-0003-1711-9553>

Parker Magin <http://orcid.org/0000-0001-8071-8749>

REFERENCES

- McGrail MR, Russell DJ. Australia's rural medical workforce: supply from its medical schools against career stage, gender and rural-origin. *Aust J Rural Health* 2017;25:298–305.
- Ogden J, Preston S, Partanen RL, *et al*. Recruiting and retaining general practitioners in rural practice: systematic review and meta-analysis of rural pipeline effects. *Med J Aust* 2020;213:228–36.
- Australian Government Department of Health. General practice workforce providing primary care services in Australia - statistics by calendar year: 2014 to 2019, 2020. Available: <https://hwd.health.gov.au/CalendarYear.html> [Accessed 29 Oct 2020].
- Australian Institute of Health and Welfare. *Rural & remote health. Cat. no. PHE 255*. Canberra: AIHW: Australian Government, 2019. <https://www.aihw.gov.au/reports/rural-remote-australians/rural-remote-health>
- Verma P, Ford JA, Stuart A, *et al*. A systematic review of strategies to recruit and retain primary care doctors. *BMC Health Serv Res* 2016;16:126.
- Parlier AB, Galvin SL, Thach S, *et al*. The road to rural primary care: a narrative review of factors that help develop, recruit, and retain rural primary care physicians. *Acad Med* 2018;93:130–40.
- Kwan MMS, Kondalsamy-Chennakesavan S, Ranmuthugala G, *et al*. The rural pipeline to longer-term rural practice: general practitioners and specialists. *PLoS One* 2017;12:e0180394.
- Fuller L, Beattie J, Versace V. Graduate rural work outcomes of the first 8 years of a medical school: What can we learn about student selection and clinical school training pathways? *Aust J Rural Health* 2021;29:181–90.
- Fisher KA, Fraser JD. Rural health career pathways: research themes in recruitment and retention. *Aust Health Rev* 2010;34:292–6.
- Wenghofer EF, Hogenbirk JC, Timony PE. Impact of the rural pipeline in medical education: practice locations of recently graduated family physicians in Ontario. *Hum Resour Health* 2017;15:16.
- McGrail MR, Russell DJ, Campbell DG. Vocational training of general practitioners in rural locations is critical for the Australian rural medical workforce. *Med J Aust* 2016;205:216–21.
- Sureshkumar P, Roberts C, Clark T, *et al*. Factors related to doctors' choice of rural pathway in general practice specialty training. *Aust J Rural Health* 2017;25:148–54.
- O'Sullivan B, McGrail M, Major L, *et al*. Rural work outcomes of medical students participating in a contracted Extended Rural Cohort (ERC) program by course-entry preference. *Med Teach* 2019;41:703–10.
- McGirr J, Seal A, Barnard A, *et al*. The Australian Rural Clinical School (RCS) program supports rural medical workforce: evidence from a cross-sectional study of 12 RCSs. *Rural Remote Health* 2019;19:4971.
- Playford D, Ngo H, Atkinson D, *et al*. Graduate doctors' rural work increases over time. *Med Teach* 2019;41:1073–80.
- McGrail MR, Russell DJ, O'Sullivan BG. Family effects on the rurality of GP's work location: a longitudinal panel study. *Hum Resour Health* 2017;15:75.
- Viscomi M, Larkins S, Gupta TS. Recruitment and retention of general practitioners in rural Canada and Australia: a review of the literature. *Can J Rural Med* 2013;18:13–23.
- Young L, Peel R, O'Sullivan B, *et al*. Building general practice training capacity in rural and remote Australia with underserved primary care services: a qualitative investigation. *BMC Health Serv Res* 2019;19:338.
- Magin P, Moad D, Tapley A, *et al*. New alumni experiences of training and independent unsupervised practice (NEXT-UP): protocol for a cross-sectional study of early career general practitioners. *BMJ Open* 2019;9:e029585.
- Tapley A, Davey AR, van Driel ML, *et al*. General practice training in regional and rural Australia: a cross-sectional analysis of the registrar clinical encounters in training study. *Aust J Rural Health* 2020;28:32–41.
- Couch D, O'Sullivan B, Russell D, *et al*. 'It's so rich, you know, what they could be experiencing': rural places for general practitioner learning. *Health Sociol Rev* 2020;29:76–91.
- Bayley SA, Magin PJ, Sweatman JM, *et al*. Effects of compulsory rural vocational training for Australian general practitioners: a qualitative study. *Aust Health Rev* 2011;35:81–5.

- 23 McGrail MR, Humphreys JS. Geographical mobility of general practitioners in rural Australia. *Med J Aust* 2015;203:92–6.
- 24 Walters LK, McGrail MR, Carson DB, *et al.* Where to next for rural general practice policy and research in Australia? *Med J Aust* 2017;207:56–8.
- 25 Department of Health. AGPT training obligations policy, 2020. Available: <https://www.health.gov.au/resources/publications/agpt-program-training-obligations-policy-2020> [Accessed 17 Jun 2021].
- 26 Australian Government, Department of Health. Modified Monash model, 2019. Available: https://www.health.gov.au/sites/default/files/download-pdf_0.pdf [Accessed 10 Oct 2019].
- 27 Firth D. Bias reduction of maximum likelihood estimates. *Biometrika* 1993;80:27–38.
- 28 McGrail MR, Humphreys JS, Joyce CM. Nature of association between rural background and practice location: a comparison of general practitioners and specialists. *BMC Health Serv Res* 2011;11:63.
- 29 MacQueen IT, Maggard-Gibbons M, Capra G, *et al.* Recruiting rural healthcare providers today: a systematic review of training program success and determinants of geographic choices. *J Gen Intern Med* 2018;33:191–9.
- 30 Seal A, Harding C, McGirr J. What influences trainee decisions to practise in rural and regional Australia? *Aust J Prim Health* 2020;26:520–5.
- 31 Kitchener S. Local regional workforce returns on investment of a locally governed and delivered general practice vocational training program. *Aust Health Rev* 2020;44:254–7.
- 32 O'Sullivan B, Russell DJ, McGrail MR, *et al.* Reviewing reliance on overseas-trained doctors in rural Australia and planning for self-sufficiency: applying 10 years' MABEL evidence. *Hum Resour Health* 2019;17:8.
- 33 Bonevski B, Magin P, Horton G, *et al.* Response rates in GP surveys - trialling two recruitment strategies. *Aust Fam Physician* 2011;40:427–30.
- 34 Sebo P, Maisonneuve H, Cerutti B, *et al.* Rates, delays, and completeness of general practitioners' responses to a postal versus web-based survey: a randomized trial. *J Med Internet Res* 2017;19:e83.
- 35 Laurence C, Hanson-Easey S, Elliott T. Medical speciality decision-making study - final report: the University of Adelaide, 2020. Available: https://gpex.com.au/wp-content/uploads/2020/03/MSDM-Final-Report_29_Jan_2020.docx_compressed.pdf [Accessed 3 Sep 2021].
- 36 Laurence C, Edwards P. Victoria (MCCC) GP graduate tracking study: phase 1 report: University of Adelaide, 2018. Available: <https://www.mccc.com.au/wp-content/uploads/2019/11/MCCC-GP-Graduate-Tracking-Study-Phase-1-Final-report.pdf> [Accessed 17 Jun 2021].