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Original Article

# Who should receive recruitment and retention incentives? Improved targeting of rural doctors using medical workforce data

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## Abstract

**Objective**: *The objective of this study was to define an improved classification for allocating incentives to support the recruitment and retention of doctors in rural Australia.*

**Design and setting**: *Geo-coded data (n = 3636 general practitioners (GPs)) from the national Medicine in Australia: Balancing Employment and Life study were used to examine statistical variation in four professional indicators (total hours worked, public hospital work, on call after-hours and difficulty taking time off) and two non-professional indicators (partner employment and schooling opportunities) which are all known to be related to difficulties with recruitment and retention.*

**Main outcome measures**: *The main outcome measure used for the study was an association of six sentinel indicators for GPs with practice location and population size of community.*

**Results**: *Four distinct homogeneous population size groups were identified (0–5000, 5001–15 000, 15 001–50 000 and >50 000). Although geographical remoteness (measured using the Australian Standard Geographical Classification – Remoteness Areas (ASGC-RA)) was statistically associated with all six indicators (P < 0.001), population size provided a more sensitive measure in directing where recruitment and retention incentives should be provided. A new six-level rurality classification is proposed, based on a combination of four population size groups and the five ASGC-RA levels. A significant increase in statistical association is measured in four of six indicators (and a slight increase in one indicator) using the new six-level classification versus the existing ASGC-RA classification.*

**Conclusions**: *This new six-level geographical classification provides a better basis for equitable resource allocation of recruitment and retention incentives to doctors based on the attractiveness of non-metropolitan communities, both professionally and non-professionally, as places to work and live.*

KEY WORDS: *ASGC – Remoteness Area, equity, geographical classifications, resource allocation, rurality.*

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## Introduction

Globally, people living in rural and remote areas experience poorer health outcomes than their metropolitan counterparts, with residents continuing to face difficulties in accessing medical care largely because of an acute shortage of medical practitioners.[1–3] In order to address the recruitment and retention problems that contribute to the medical workforce in rural areas, governments around the world have implemented a range of incentives.[4–7] Unfortunately, there is little evidence of the effectiveness of incentives in improving workforce supply in rural areas.[8]

Much is known about the factors that contribute to difficulties associated with recruitment and retention of rural doctors (including practice complexity, workload, on-call and non-professional factors relating to social and family circumstances) and the need to strategically 'bundle' recruitment and retention incentives.[7,9–15] To be effective, medical workforce incentives must address these factors.

Incentive programmes should also define and target eligibility appropriately, so that public resources are



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***What is already known on this subject:***
- *Specific rural health workforce programmes are required to ensure an adequate supply and appropriate distribution of health workers and services to rural and remote communities.*
- *Given limited resources, effective targeting of these specific programmes requires geographical classifications that are sensitive to small-area differences.*
- *Current classifications, particularly the Australian Standard Geographical Classification – Remoteness Areas classification, have significant shortcomings in relation to resource allocation because they fail to maximise between-group differences and they fail to minimise within-group differences.*

***What does this study add:***
- *Using medical data for six sentinel professional and non-professional indicators, geographical differences of attractiveness between rural and remote communities as places to work and live have been measured and validated.*
- *Evidence that a classification based predominantly on town size rather than location (remoteness) is significantly more sensitive to small-area geographical differences relevant to workforce supply.*
- *A proposed new six-level geographical classification provides a more equitable basis for the allocation of recruitment and retention incentives targeting rural and remote doctors.*

allocated efficiently and effectively. Thus, incentives should differentiate between doctors most in need of specific recruitment and retention support and those who choose to practice in existing well-supported practice and community environments. From the government's point of view, incentives are wasted if they are provided to doctors who are willing to go to, or remain in, a particular location without them. From the doctor's point of view, it is important to have equitable allocation of incentives, such that doctors practising in 'like' circumstances are eligible for 'like' incentives. Unfortunately, in Australia, there is increasing evidence that incentive funding to redress rural and remote workforce shortages is not being distributed equitably or effectively.[16] This is largely due to shortcomings associated with the existing classification, used to define the eligibility of doctors for incentives, which does not take any account of factors known to influence medical workforce recruitment and retention.

One challenge associated with using these factors is that they are measured at the level of individual doctors. However, if these factors correlate with reliably measured, locality-based characteristics, then they can be used to inform the design of incentive programmes. This paper aims (i) to examine whether defined professional and non-professional factors known to influence recruitment and retention of doctors in rural areas are associated with town size (population) and remoteness; and (ii) to use the findings of these analyses to construct a more equitable classification for defining eligibility for rural workforce incentives.

## Background

Historically, the Australian government has adopted various rural-urban classifications to define the eligibility of medical practitioners for specific recruitment and retention incentives. Three different taxonomies have been used to guide such resource allocation – the Rural, Remote and Metropolitan Area classification, the Accessibility/Remoteness Index of Australia and the Australian Standard Geographical Classification – Remoteness Area (ASGC-RA).[17] To date, insufficient attention has been paid within each classification to the criteria by which incentives should be allocated, and to developing a taxonomy that differentiates geographical variation so that the between-group differences far exceed any within-group differences. Because these classifications were based on 'geography' without regard to factors that influence rural medical workforce recruitment and retention, each has been characterised by significant shortcomings.[18]

The Australian government's *Rural Health Workforce Strategy* currently provides $134.4 million of additional financial support for rural doctors based on the ASGC-RA classification, with workforce incentives supposedly scaled or geared 'to provide greatest benefits to the most remote communities where there is the greatest need'.[19] In reality, use of ASGC-RA as the main health policy tool defining the eligibility of doctors for recruitment and retention incentives is seriously flawed as it does not account for 'need', particularly within its Inner Regional (ASGC-2) and Outer Regional (ASGC-3) categories, where doctors are eligible for the same incentives even though the communities within which they practise and the nature of their activity are very different. In particular, ASGC-RA ignores population size, a factor that influences general practitioners' (GPs) decisions to take up rural practice and how long to remain there. Despite these recognised shortcomings, the Australian government has resisted the adoption of an alternative allocation scheme to the current ASGC-RA classification.[16]

## Methods

We use data from the *Medicine in Australia: Balancing Employment and Life* (MABEL) study. MABEL is the largest longitudinal survey of the Australian medical workforce. Its primary aim was to investigate labour supply decisions and their determinants among Australian doctors. The study methods and baseline characteristics are discussed in detail in Joyce *et al.* (2010). Copies of the MABEL questionnaire are available from: https://mabel.org.au/mabelq.html. The overall response rate for wave 1 was 19.36% of the Australian population of doctors with 10 498 doctors in the baseline cohort. This comprises 3906 GPs (including 241 GP registrars), 4596 specialists, 1072 specialists-in-training and 924 hospital non-specialists. The full MABEL wave 1 cohort is representative of the national medical workforce. Comparisons made on gender, age, doctor type, geography and hours worked confirmed that there was no systematic non-response bias within our large cohort.[20] MABEL was approved by the University of Melbourne Faculty of Economics and Commerce Human Ethics Advisory Group and the Monash University Standing Committee on Ethics in Research Involving Humans.

For this study, only data from GPs are included, with 3636 usable responses after excluding GP registrars from all analyses and those with missing geographical data ($n = 29$). Wave 1 data from MABEL allow us to examine the role of professional and non-professional characteristics pertaining to the recruitment and retention of medical practitioners, and most importantly, how they vary spatially to assist in allocating resources designed to support recruitment and retention.

Building upon evidence of how the 'complexity' of activities undertaken by doctors varies geographically,[21] six validated sentinel indicators from MABEL data were mapped against workplace location. Four professional indicators and two non-professional indicators were selected on the basis of their known importance in attracting workforce or influencing length of stay. While procedural activity at public hospitals is known to be attractive to some rural GPs, long hours, excessive on-call and difficulty in getting time off are known deterrents of rural practice.[22–25] Similarly, lack of employment opportunities for (de facto) spouses and inadequate educational facilities locally are important considerations or triggers for leaving rural practice.[23] Other recruitment and retention indicators (opportunities for continuing medical education, availability of peer support and availability of locums) were tested and shown to be far less significant in discriminating geographically. The six sentinel indicators selected on the basis of international evidence were:

1. *Total Hours* = Total hours worked in their usual week (excluding after hours on-call);
2. *Public Hospital* = whether the GP undertakes work in a public hospital;
3. *On-call* = whether the GP is called out to attend patients two or more times (per week) after hours;
4. *Time-off* = whether it is difficult for the GP to take time off;
5. *Partner Employment* = whether there are good employment opportunities locally for the GP's partner;
6. *Schooling* = whether the choice of schools locally is adequate.

The last two indicators (positively worded in the MABEL survey) were reverse coded for consistent direction of responses across all six indicators. Each GP was geo-coded so their responses could be mapped to a community, defined by the Australian Bureau of Statistic's Urban Centre/Locality.

Statistical analysis was performed using Predictive Analytics SoftWare Statistics (PASW) 18.0 (SPSS Inc, Chicago, IL, USA). The significance of association between five of the six indicators and each community's population size and designated remoteness (ASGC-RA) was measured using the linear-by-linear (ordinal) association test (chi-squared test with 1 degree of freedom), while total hours (continuous outcome) and population size was measured using Spearman's Rho test of ordinal correlation. ASGC-1 data were not included in statistical testing of association because they are all considered similar to metropolitan centres.

## Results

Table 1 shows a significant and consistent association between remoteness (using ASGC-RA) and our six key indicators ($P < 0.001$); however, it does not reveal the complete picture. ASGC-2 and ASGC-3 categories consist of a wide range of different rural communities varying greatly in population size and composition. Using MABEL data, we further tested the homogeneity of our six indicators within ASGC-2 and ASGC-3 categories (that is, whether the indicators are significantly associated with population size, after first accounting for remoteness). Table 2 shows that there is a significant variation by community size in both 'inner' and 'outer regional' ASGC-RA groups, with all indicators trending upwards with decreasing population size, highlighting that even after accounting for remoteness, these sentinel indicators are mostly strongly associated with population size.

Figure 1 displays the association between our six indicators and population size alone, independent of

TABLE 1: *Association between ASGC-RA and the six sentinel indicators*

| | ASGC-1 | ASGC-2 | ASGC-3 | ASGC-4 | ASGC-5 |
|---|---|---|---|---|---|
| Sample (*n*) | 2399 (66%) | 718 (20%) | 344 (10%) | 130 (4%) | 45 (1%) |
| Total hours | 38.8 | 43.2 | 45.9 | 47.8 | 48.2 |
| Public hospital (%) | 7 | 35 | 45 | 54 | 48 |
| On-call (%) | 10 | 33 | 43 | 52 | 73 |
| Time-off (%) | 45 | 47 | 54 | 65 | 60 |
| Partner employment (%) | 20 | 28 | 39 | 35 | 37 |
| Schooling (%) | 10 | 24 | 41 | 58 | 77 |

ASGC-RA, Australian Standard Geographical Classification – Remoteness Areas.

TABLE 2: *Association between population size and the six sentinel indicators, for general practitioners located in ASGC-2 and ASGC-3*

| ASGC-2 | <1 K | 1–2.5 K | 2.5-5 K | 5–10 K | 10–25 K | 25–100 K | >100 K |
|---|---|---|---|---|---|---|---|
| Sample (*n*) | 29 (4%) | 69 (9%) | 86 (12%) | 102 (14%) | 158 (22%) | 221 (31%) | 53 (8%) |
| Total hours | 40.3 | 45.1 | 41.3 | 45.7 | 44.9 | 42.7 | 36.3 |
| Public hospital (%) | 26 | 53 | 47 | 54 | 48 | 15 | 2 |
| On-call (%) | 31 | 45 | 42 | 49 | 38 | 21 | 11 |
| Time-off (%) | 48 | 47 | 45 | 49 | 49 | 46 | 43 |
| Partner employment (%) | 37 | 49 | 32 | 47 | 26 | 16 | 14 |
| Schooling (%) | 22 | 40 | 29 | 46 | 29 | 10 | 5 |
| **ASGC-3** | **<1 K** | **1–2.5 K** | **2.5–5 K** | **5–10 K** | **10–25 K** | **25–100 K** | **>100 K** |
| Sample (*n*) | 37 (11%) | 50 (14%) | 63 (18%) | 49 (14%) | 36 (11%) | 82 (24%) | 27 (8%) |
| Total hours | 51.2 | 43.5 | 50.9 | 45.4 | 46.3 | 41.7 | 40.8 |
| Public hospital (%) | 51 | 67 | 65 | 46 | 43 | 25 | 8 |
| On-call (%) | 54 | 58 | 59 | 47 | 36 | 27 | 15 |
| Time-off (%) | 67 | 52 | 53 | 52 | 59 | 46 | 38 |
| Partner employment (%) | 50 | 76 | 50 | 43 | 41 | 14 | 4 |
| Schooling (%) | 70 | 63 | 58 | 44 | 35 | 15 | 5 |

K indicates 1000 people.
ASGC-RA, Australian Standard Geographical Classification – Remoteness Areas.

ASGC-RA. All indicators increase (becoming more problematic within that locality) as population size decreases. Four broad population size groupings, which minimise 'within-group' variation while also maximising 'between-group' variation, emerge. These are: (i) 0–5 K – 'Small Rural'; (ii) 5–15 K – 'Medium Rural'; (iii) 15–50 K – 'Large Rural'; (iv) > 50 K – 'Regional Centre' & 'Metropolitan' – groupings that are not dissimilar from the service centre levels used in the calculation of ASGC-RA.[17]

Further exploration of the heterogeneity of the existing ASGC-RA groups is summarised in Table 3, which tests the statistical association between population size and the six indicators within each ASGC-RA group individually. If the ASGC-RA categories are homogeneous, then most associations within Table 3 should not be statistically significant. However, within each of ASGC-2, ASGC-3 and ASGC-4, the associations between population size and public hospital work, on-call work, good partner employment and adequate schooling are all highly statistically significant. Total hours is only significantly associated with population size within ASGC-3, while difficulty getting time off is not associated with population size.

In contrast, Table 4 tests the association between ASGC-RA and the six indicators within each population size group individually. The addition of ASGC-RA captures no additional variation of the six indicators within both the >50 K and 15–50 K categories and very little association within the 5–15 K category. It is only when population size decreases to the smallest group (0–5 K) that the addition of ASGC-RA captures a significant

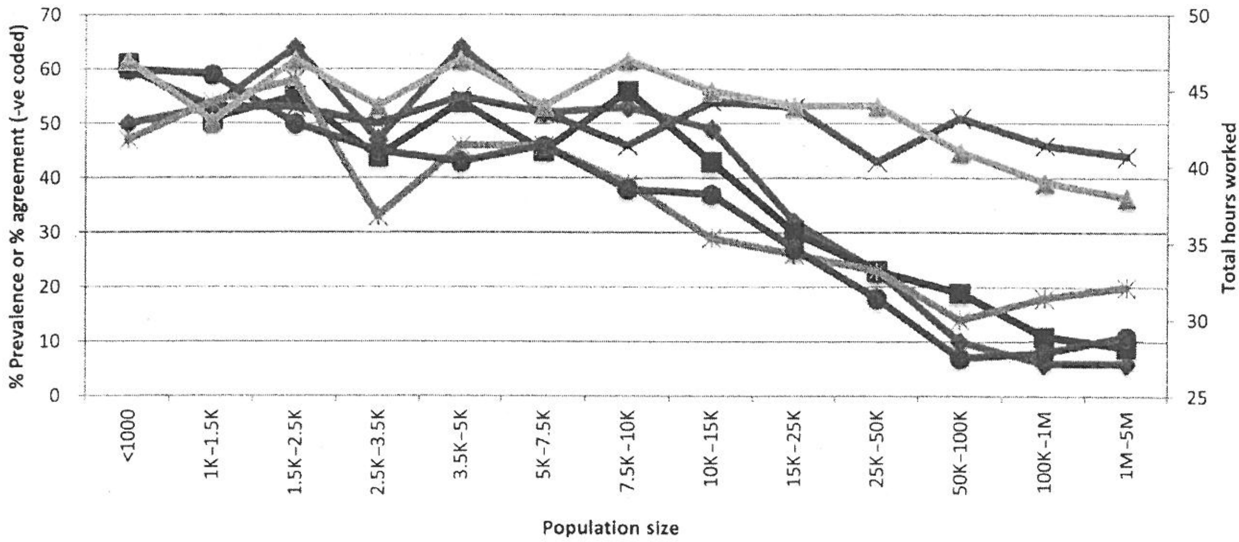


FIGURE 1: *Association between population size and six sentinel indicators. K indicates 1000 and M indicates 1 000 000. (—◆—) public hospital; (—■—) on-call; (—✕—) time-off; (—✳—) partner employment; (—●—) schooling; (—▲—) total hours.*

TABLE 3: *Statistical significance of association between the six sentinel indicators and four population size levels (0–5 K; 5–15 K; 15–50 K; > 50 K) within each ASGC-RA (2–4) individually*

| | Statistical test | ASGC-2 only | ASGC-3 only | ASGC-4 only |
|---|---|---|---|---|
| Total hours | Rho | 0.04 ($P = 0.26$) | 0.177 | 0.146 ($P = 0.10$) |
| Public hospital | $\chi^2$ (1) | 62.0 | 54.3 | 34.0 |
| On-call | $\chi^2$ (1) | 31.2 | 37.4 | 17.2 |
| Time-off | $\chi^2$ (1) | 0.16 ($P = 0.69$) | 2.20 ($P = 0.14$) | 1.88 ($P = 0.17$) |
| Partner employment | $\chi^2$ (1) | 27.6 | 43.5 | 5.2 ($P = 0.02$) |
| Schooling | $\chi^2$ (1) | 30.6 | 49.2 | 11.8 |

All *P* values are <0.001 unless specified.
ASGC-RA, Australian Standard Geographical Classification – Remoteness Areas.

TABLE 4: *Statistical significance of association between the six sentinel indicators and four remoteness levels (Australian Standard Geographical Classification – Remoteness Areas 2–4) within each population size group (0–5 K; 5–15 K; 15–50 K) individually*

| | Statistical Test | >50 K only | 15–50 K only | 5–15 K only | 0–5 K only |
|---|---|---|---|---|---|
| Total hours | Rho | −0.005 ($P = 0.94$) | 0.013 ($P = 0.83$) | 0.069 ($P = 0.25$) | 0.190 |
| Public hospital | $\chi^2$ (1) | 1.4 ($P = 0.23$) | 3.3 ($P = 0.07$) | 0.0 ($P = 0.93$) | 4.9 ($P = 0.03$) |
| On-call | $\chi^2$ (1) | 2.2 ($P = 0.13$) | 1.4 ($P = 0.23$) | 0.1 ($P = 0.75$) | 23.3 |
| Time-off | $\chi^2$ (1) | 0.1 ($P = 0.79$) | 0.1 ($P = 0.74$) | 4.8 ($P = 0.03$) | 7.0 ($P = 0.01$) |
| Partner employment | $\chi^2$ (1) | 2.1 ($P = 0.15$) | 0.9 ($P = 0.35$) | 1.6 ($P = 0.21$) | 0.6 ($P = 0.46$) |
| Schooling | $\chi^2$ (1) | 0.6 ($P = 0.44$) | 1.9 ($P = 0.17$) | 2.5 ($P = 0.12$) | 32.7 |

All *P* values are <0.001 unless specified. K indicates 1000 people.

association for total hours, public hospital, on-call and schooling.

Assuming all ASGC-1 locations are 'metropolitan', combining the four population size groups identified in Figure 1 (ordered first) with the four non-metropolitan ASGC-RA levels (ordered within each of four population size groups) defines 13 different ordered levels, with examples of locations within each level shown in Table 5. However, our results, to this point, in particular those in Tables 3 and 4, strongly suggest that only a six-level classification is necessary, with combined levels also shown in Table 5. Non-metropolitan populations are separated into three population groups >50 K, 15–50 K and 5–15 K, where further separation by ASGC-RA has been shown to add nothing to its discriminatory power (see Table 4). Finally, the smallest communities of 0–5 K are separated into those in 'regional' areas (ASGC-2 & 3) and 'remote' areas (ASGC-4 & 5), where further separation did significantly add to its discriminatory power (see Table 4).

Table 6 confirms that adoption of a new six-level rurality classification measures a significantly stronger association with four out of six sentinel indicators, compared with the association with ASGC-RA alone, and is statistically equivalent to the full 13-level classification. For example, the measured association (chi-square statistic) between GPs undertaking work in a public hospital and rurality increases dramatically from 18.2 for

**TABLE 5:** *Proposed new six-level rurality classification*

| New six-level classification | Full 13-level classification | Population Size | ASGC-RA | Example locations |
|---|---|---|---|---|
| 1 | 1 | All | ASGC-1 | Most capital cities, Wollongong, Newcastle, Geelong, Sunshine Coast, Gold Coast |
| 2 | 2 | >50 K | ASGC-2 | Bendigo, Ballarat, Hobart, Mackay, Launceston, Rockhampton |
| 2 | 3 | >50 K | ASGC-3 | Townsville, Cairns, Darwin |
| 3 | 4 | 15–50 K | ASGC-2 | Coffs Harbour, Shepparton, Mt Gambier, Bundaberg, Busselton |
| 3 | 5 | 15–50 K | ASGC-3 | Mildura, Albany, Broken Hill, Whyalla, Burnie, Kalgoorlie |
| 3 | 6 | 15–50 K | ASGC-4 | Alice Springs, Mt Isa |
| 4 | 7 | 5–15 K | ASGC-2 | Ulladulla, Sale, Warwick, Ararat, Gympie, Lithgow, Victor Harbor |
| 4 | 8 | 5–15 K | ASGC-3 | Port Augusta, Emerald, Bairnsdale, Horsham, Moree, Ayr, Parkes |
| 4 | 9 | 5–15 K | ASGC-4 | Broome, Port Lincoln, Esperance, Katherine, Karratha |
| 5 | 10 | 0–5 K | ASGC-2 | Gundagai, Leongatha, Strathalbyn, Pinjarra, Cooroy, Latrobe |
| 5 | 11 | 0–5 K | ASGC-3 | Port Sorell, Naracoorte, Bega, Kerang, Chinchilla, Margaret River |
| 6 | 12 | 0–5 K | ASGC-4 | Bourke, Kununurra, Roxby Downs, Charleville, Queenstown |
| 6 | 13 | 0–5 K | ASGC-5 | Derby, Tennant Creek, Halls Creek, Ceduna, Nhulunbuy, Weipa |

K indicates 1000 people.
ASGC-RA, Australian Standard Geographical Classification – Remoteness Areas.

**TABLE 6:** *Statistical significance of association between the six sentinel indicators and the new 13 and six-level classifications compared to the currently used ASGC-RA classification*

| | Statistical Test | ASGC-RA | Full 13-level classification | New six-level classification |
|---|---|---|---|---|
| Total hours | Rho | 0.114 | 0.137 | 0.125 |
| Public hospital | $\chi^2$ (1) | 18.2 | 149.7 | 156.8 |
| On-call | $\chi^2$ (1) | 42.9 | 121.3 | 120.2 |
| Time-off | $\chi^2$ (1) | 11.8 | 6.0 ($P = 0.014$) | 5.0 ($P = 0.025$) |
| Partner employment | $\chi^2$ (1) | 5.2 | 72.2 | 72.3 |
| Schooling | $\chi^2$ (1) | 68.6 | 141.2 | 134.5 |

Responses from ASGC-RA = 1 were excluded for all statistical tests.
All $P$ values are <0.001 unless specified.
ASGC-RA, Australian Standard Geographical Classification – Remoteness Areas.

ASGC-RA to 156.8 for the new six-level classification. Associations for three other indicators have also increased significantly for the six-level classification: on-call work, good partner employment and adequate schooling. Associations for total hours increased slightly, while associations with difficulty getting time off (not statistically significant) decreased slightly.

## Discussion

Which doctors receive incentives (and their amount) is currently determined by geographical criteria, as defined by ASGC-RA. Continuing to use ASGC-RA in its current form will not only maintain the existing distributional inequities (with GPs receiving the same incentives regardless of the fact that their practice activities and workplace locations vary significantly), but also exacerbate existing difficulties in attracting GPs to small, 'difficult-to-recruit-to' communities where they receive the same incentives as doctors practising in larger communities.

Our choice of medical workforce indicators relates to their importance to recruitment and retention in rural areas where the shortage of doctors is most acute and persistent. Our research shows that key professional and non-professional aspects of rural practice correlate with locality-based characteristics including town size and remoteness. This is useful in grouping doctors according to those warranting incentives and those who do not, and delimiting geographically defined groups, which maximise 'within-group' and minimise 'between-group' similarity. In this way, GPs sharing similar characteristics and needs for support are grouped together and differentiated from other groups of GPs who arguably need more or less support through incentives. Using the indicators, it is shown that a classification predominantly defined by population size effectively defines homogeneous groupings of doctors eligible for incentive funding.

An important motivation for this research has been the anomalies in the distribution of incentives for rural GPs resulting from using the existing ASGC-RA classification. Based on our research, an improved geographical classification is proposed as the basis for allocating resources designed to support recruitment and retention of doctors in non-metropolitan Australia. Although the new six-level classification exceeds the current five categories, it has the important benefit of reducing existing anomalies that result from the enormous heterogeneity characterising the current scheme – particularly in ASGC-2 and ASGC-3 regions.

What our study does not do, however, is to indicate what the nature of the differential between the six groups should be. That is, it does not determine the amount of resources that should be allocated in the form of incentives for GPs in different groups. This is clearly the next aspect to be considered, and results from the MABEL study discrete choice experiment data will assist here.

Some limitations should be acknowledged. The study was restricted by the range of variables available at the national level. Wave 1 data from MABEL provided the best available sentinel professional and non-professional indicators, consistent with their proven importance to rural workforce recruitment and retention. Access to alternative unit record data (such as Medicare) is, however, almost impossible to obtain and even then Medicare data do not include information on the six sentinel indicators. The six sentinel indicators are based on extant literature, but could in the future be based on more robust evidence of the factors that influence recruitment and retention in underserved areas. It should be emphasised that the lower than desirable proportion of doctors participating in the baseline cohort of MABEL represents a subset of the full population rather than a subset of a sample and has been shown to be representative of the national medical workforce.

## Conclusion

In order to overcome existing problems associated with the recruitment and retention of doctors to underserved rural and remote areas, Governments and health authorities require a resource allocation framework that distributes taxpayers' money to its best effect and targets those most in need ensuring that it is graduated equitably according to the magnitude of the problems faced by practitioners working in different areas. What we propose here is a validated geographical classification scheme that provides a better basis for equitable resource allocation for doctors based on (i) the nature of activity and service provided by doctors in their communities; and (ii) their attractiveness both professionally and non-professionally as settings to work and live in.

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it do not necessarily reflect the views or policy of the Australian Primary Health Care Research Institute of the Commonwealth of Australia (or the Department of Health and Ageing).

## Author contributions

JH 35%, MM 35%, CJ 10%, AS 10%, GK 10%.

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