



**How rural is rural? The relationship between rural background of medical students and their career location intentions**

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**Article title**

How rural is rural? Understanding the relationship between the type of rural background of medical students and their career location intentions

**Abstract**

**Objective:** Rural background is associated with greater interest in rural practice. However, there is no universally agreed definition of ‘rural’ background used in medical school selection. This study explored the association between definitions of ‘rural’ background and students’ intended career locations.

**Design:** Prospective cohort study using survey data on career intention, hometown size, rurality of background, home address, high school, and intended career location.

**Setting:** University of Auckland, New Zealand (NZ).

**Participants:** Commencing medical students 2009 to 2017, inclusive.

**Main outcome measures:** Univariate associations between student background according to seven definitions of ‘rural’, and three definitions of intended practice location based on population size: urban intention (>100,000); regional intention (25,000–100,000); rural intention (<25,000).

**Result:** The sample size was 1592 students. 27.4% had a rural background by at least one definition. All definitions of rural background were associated with a greater rural intention. Applying a restrictive definition of rural (population<25,000) was associated with a higher likelihood of rural intention, but captured a smaller number of students. There was strong agreement between the population size of a student’s background and intended practice location (chi square p<0.0001).

**Conclusion:** Rural intention varies by definition, but the number of students captured by each definition is important. Applying a binary or overly restrictive definition may limit interested students. Medical schools should adopt a definition of ‘rural’ that optimises the number of eligible students and their propensity to work rurally. Further, alternative ways of identifying students with rural intentions without a rural background should be explored.

**Key words:** health need, urban, career choice, socioeconomic, rural, definition, workforce, medical

## 32 What this paper adds

33 All rural definitions are associated with a significant increase in intention to work rurally. The  
34 degree to which a rural background is associated with rural career intention varies according  
35 to the definitions used, with the highest association seen for smaller areas. However, there  
36 are fewer students from these areas.

37 To grow the rural workforce, selecting students from the full range of non-urban backgrounds  
38 may be the best strategy. Identification of urban students with rural intention is also important.

## 39 What is already known on the subject

40 Medical workforce maldistribution and shortages contribute to poorer access to health care in  
41 rural areas.

42 Rural background is a well-established predictor of rural career intention.

43 There is a range of definitions of rural used to define student backgrounds or health service  
44 delivery, and a more consistent approach would be useful.

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**Introduction**

As in many other countries, New Zealand (NZ) has an ongoing shortage of rurally based doctors. While the geographic variation is most marked for specialists, there is also marked variation in general practitioners (GPs) per head of population,<sup>1</sup> with fewer in rural areas where GPs are critical to health service delivery. Furthermore, rural practices are more likely to be contending with a GP vacancy than urban practices - 35% versus 24% respectively.<sup>2</sup>

It is well-established in NZ, Australia and internationally<sup>3-9</sup> that a rural background is associated with increased medical student interest in rural practice. Given that nearly all medical students graduate and enter some form of medical practice, selection into medical school is a critically important first step in rural workforce development. Selection of students from rural backgrounds has been shown consistently to have an effect over and above subsequent rural experiences during the programme and beyond.<sup>10</sup> To this end, NZ's two medical schools introduced rural origin preferential entry schemes in 2004, quarantining places for rural medical students coming from areas with fewer than 20,000 inhabitants.<sup>11</sup> In 2012, the University of Auckland changed its definition to a Regional Rural Admission Scheme (RRAS)<sup>12</sup> to align with updated legal definitions of the Auckland City boundaries and to ensure that students from both regional and rural areas applied for medicine. The goal of the RRAS was to 'widen the net', to ensure that both regional and rural students applied, so that ultimately graduates would match the geographic population demographics of NZ. In addition, the RRAS made eligibility clearer, as many students who met the previous rural origin preferential entry criteria were applying from rural areas just outside Auckland, which is NZ's largest city and with a very high urban influence. Currently, RRAS-eligible students must originate outside the boundaries of NZ's major urban areas (Auckland, Wellington, Christchurch, Dunedin, Hamilton or Tauranga), all of which have a population of over 100,000. Over 50 students per year (around 20% of the cohort) are admitted to the University of Auckland's medical programme through RRAS. Our previous work suggests that almost all Auckland students from a rural origin enter medical school through the RRAS pathway.<sup>3</sup>

A major challenge in NZ health workforce development is that there is no widely-agreed definition of rural.<sup>2,13-18</sup> We have previously used a population-size cut-off of 100,000 to differentiate between urban and rural areas.<sup>3</sup> This number aligns with the University of Auckland RRAS definition as well as comparable workforce studies which have defined rural as being outside major urban areas, i.e. large towns, inner regional areas, as well as rural and remote areas.<sup>19</sup> With respect to health care delivery, an urban/ rural boundary definition needs to accurately reflect the needs and contexts of those living at, or close to, the upper limit of

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3 82 'rural'. For example, many of those in rural areas of high urban influence may work and access  
4 83 health care in urban areas, or people on the urban fringes may access health care in a rural  
5 84 setting. Consequently, in NZ the upper limit of 'rural' has been proposed as an independent  
6 85 urban community in which most health services are provided by generalist medical  
7 86 practitioners, including emergency and inpatient care.<sup>15</sup> In addition to defining the type of  
8 87 health professionals, this implies a degree of remoteness<sup>20</sup> from major urban centres. Given  
9 88 the importance of choosing students who will go on to work in these areas, we wished to  
10 89 understand more about the relationship between medical student backgrounds and rural  
11 90 intentions, and if a more nuanced method to align student background to community health  
12 91 needs might be preferable. Specifically, this study aimed to:

- 13 92 1. categorise medical student backgrounds and intentions using a range of definitions of  
14 93 rural;
- 15 94 2. investigate the associations between the type of rural background and rural intention  
16 95 for this range of definitions.  
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**Methods**

This study used data collected at programme commencement from nine cohorts of University of Auckland medical students (2009 to 2017), as part of the Faculty of Medical and Health Sciences Health Career Pathways Project. Since 2012, data from these students have also been included in the Medical School Outcome Database (MSOD) project.<sup>21</sup> The University of Auckland is an undergraduate entry programme, although a third of the class are graduates who enter into Year 2. There are two main priority entry pathways; one for Māori or Pacific students and one for rural students. The student proportions entering via these pathways are aligned with population proportions.

The survey has been adapted for the NZ setting from that originally designed in Australia for the MSOD project<sup>21</sup>. One of the original drivers for this project was to understand factors that might enhance rural medical workforces. In the survey, there are questions about student socio-demographics as well as career intentions. For example, students are asked to identify the settlement size in New Zealand where they have lived in the longest (hometown). The possible responses are:

- Major urban centre (population >100,000), e.g. Auckland, Tauranga, Hamilton, Wellington, Lower Hutt, Christchurch, Dunedin;
- Regional city or large town (pop. 25,000–100,000), e.g. Rotorua, Napier, New Plymouth, Palmerston North, Blenheim, Timaru, Invercargill;
- Smaller town (pop. 10,000–24,999), e.g. Whakatane, Tokoroa, Taupo, Levin, Masterton, Ashburton, Oamaru, Queenstown;
- Small community (pop. <10,000), e.g. Huntly, Dannevirke, Gore;
- Not applicable [have not lived in NZ or not intending to work in New Zealand].

These categories are the same as for the question on geographic intention of future practice. Other relevant survey data comprises home street and town, high school during final year of secondary education, and whether students self-identify as coming from a rural background.

*Constructing definitions*

A priori we proposed seven rural background definitions for application to this sample. Descriptive names appear in parentheses.

- R<sub>1</sub>: Student's hometown population <25,000 (Rural by population)
- R<sub>2</sub>: Student's hometown population <100,000 (Rural-regional by population)
- R<sub>3</sub>: Student's home street lies within a rural area with high, moderate, or low urban influence, or in a highly rural/ remote area; (Stats NZ: official)

- 132 • R<sub>4</sub>: Student's home street lies within an independent urban area, a rural area with
- 133 moderate or low urban influence, or in a highly rural/ remote area (Stats NZ: modified)
- 134 • R<sub>5</sub>: Student's home street lies outside a main urban area, according to the Statistics
- 135 NZ Urban/Rural Profiles (Rural home address)
- 136 • R<sub>6</sub>: Student's school lies outside the local authority boundaries of the Auckland,
- 137 Hamilton, Tauranga, Wellington, Porirua, Hutt, Upper Hutt, Christchurch, or Dunedin
- 138 City Councils (Rural-regional school)
- 139 • R<sub>7</sub>: Student self-identified as coming from a rural background (Self-definition)

141 Both R<sub>3</sub> and R<sub>4</sub> are defined according to the profiles published by Statistics NZ.<sup>22</sup> The degree  
 142 of urban influence on the area is determined by using usual residence and workplace addresses of  
 143 the employed population in the area. The R<sub>3</sub> definition, is acknowledged to be problematic in  
 144 health services terms as it may misclassify those accessing rural health services.<sup>15</sup> R<sub>4</sub> is a  
 145 modification of R<sub>3</sub> which approximates the definition used in the National Health Committee  
 146 report on Rural Health and includes independent urban areas and removes rural areas with a  
 147 strong urban influence such as around major cities.<sup>13</sup> Unlike R<sub>3</sub>, R<sub>4</sub> considers independent  
 148 urban areas to be rural, and rural areas with high urban influence to be urban, in order to better  
 149 reflect these profiles' urban and rural associations and connections, especially regarding  
 150 health outcomes and health service delivery.<sup>15</sup> In 2010 it was estimated by the National Health  
 151 Committee that the population in the Statistics NZ modified definition R<sub>4</sub>, was about 882,000  
 152 people (22% of the NZ population) with 19% of the total population having to access rural  
 153 health care.<sup>13</sup> The R<sub>5</sub> definition is similar to the current rural admission criteria used by New  
 154 Zealand's other medical school at the University of Otago,<sup>11</sup> with R<sub>2</sub> and R<sub>6</sub> consistent with  
 155 criteria used by the University of Auckland in selecting RRAS students.<sup>11</sup>

157 Students meeting R<sub>1</sub>, R<sub>2</sub> or R<sub>7</sub> definitions could be determined directly from the survey  
 158 dataset. Determining whether students met R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, or R<sub>6</sub> definitions required  
 159 identification of the respective Statistics NZ mesh block (smallest geographic unit for which  
 160 statistical data is reported) for student home-street or high school address. These were then  
 161 classified as urban or rural according to the 2005 Statistics NZ report New Zealand: An  
 162 Urban/Rural Profile.<sup>22</sup> This was accomplished using a range of strategies such as Google  
 163 Maps comparison to district maps in the Statistics NZ report; the 'AddressFinder' address  
 164 verification website; geographic concordance files published annually by Statistics NZ as a  
 165 follow-up to its initial report; or the New Zealand Schools Directory [available from:  
 166 <http://www.bigcities.govt.nz/pdf2001/decile.pdf>].

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168 From the MSOD survey responses, it was possible to define three outcomes for career  
169 location intention:

- 170 • I<sub>1</sub>: Preferred practice location population <25,000 (Rural intention);
- 171 • I<sub>2</sub>: Preferred practice location population 25,000-100,000 (Regional intention).

172 I<sub>1</sub> and I<sub>2</sub> were combined and termed regional-rural.

- 173 • I<sub>1+2</sub>: Preferred practice location population <100,000 (Regional-rural intention)

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175 *Statistical considerations*

176 Counts and proportions were determined for each definition. A Chi Square analysis was  
177 conducted to test the null hypothesis of no association. Statistical significance was set at  $\alpha$   
178 =0.05. The intersection of definitions was generated using the UpSetR package.<sup>23</sup> Relative  
179 risks of I<sub>1</sub>, I<sub>2</sub> or I<sub>1+2</sub> preferred practice location were calculated for students meeting each of  
180 the rural background definitions compared with all other students.

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182 *Ethics*

183 Students gave written informed consent and identifying details were removed prior to analysis.  
184 The University of Auckland Human Participants Ethics Committee granted ethics approval for  
185 the Health Career Pathways Project in 2006 (#018456) and the Medical Schools Outcomes  
186 Database (MSOD) project in 2012 (#022338). Both approvals remain current.



## Results

### *Response rate*

From 2009 to 2017 inclusive, 2096 medical students filled out an entrance survey (response rate ~92%). International students or students who gave an international hometown were removed, leaving 1872 domestic students who gave a New Zealand hometown. Of these, 1822 students provided information on the size of town in which they intended to practice. The study sample was the subset of 1592 students who provided enough information for both their background and intentions to be classified according to the study definitions.

### *Student backgrounds*

Of the 1592, 1156 (72.6%) met none of the seven definitions of rural, with 436 students (27.4%) meeting at least one definition of rural (see Table 1). The percentage of students meeting a rural definition ranged from 6.8% for R<sub>3</sub> to 21.4% for R<sub>2</sub>. There were 229 students (14.4%) meeting at least one of the more restrictive rural definitions (R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, or R<sub>5</sub>). The overlaps among the seven rural definitions are shown in Figure 1, with 42 students (3%) meeting all definitions of rural. The commonest pattern was R<sub>2</sub>-R<sub>6</sub>-R<sub>7</sub> and the second most common R<sub>2</sub>-R<sub>6</sub>, i.e. not all students meeting the broadest definition see themselves as rural. On the other hand, there were 44 students who self-identified as rural but who met none of the other rural definitions.

**\*\*Table 1 to be inserted here\*\***

**\*\* Figure 1 to be inserted here\*\***

### *Background-intention associations*

For the seven definitions of rural, the associations between background and intention to practise in rural or regional-rural settings are shown in Table 2.

**\*\*Table 2 to be inserted here\*\***

All definitions of rural were associated with a higher likelihood of students intending to work outside urban areas, whether this is shown as the proportion of students with the intention, or as a relative risk compared with all other students. Students in categories with more restrictive rural definitions (R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub>) were consistently more likely than those with a broader definition of rural (R<sub>2</sub>, R<sub>6</sub>, R<sub>7</sub>) to express rural intention (I<sub>1</sub>). Students meeting the broadest

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definition ( $R_2$ , population <100,000) still had a relative risk of over 4 for intending to work in a rural area < 25,000 compared with all other students.

Having identified that there was a differential intention effect based on background, we derived a further definition of background:

- $R_{\text{regional}}$ : student's hometown population 25,000-100,000 (Regional by population)
- Table 3 provides a comparison of the career intentions of this group with  $R_1$  and Urban students. There is a concordance between background and practice intention suggesting students intend to work in an area the size of where they have come from (Chi square  $p < 0.0001$ ). Derived from Table 3, using a restricted definition for rural (<25,000), the sensitivity of a rural background for rural intention was 49%, specificity 95%, positive predictive value 57%, and negative predictive value 92%. If rural is defined more broadly for both background and intention (<100,000), the sensitivity was 54%, specificity 92%, positive predictive value 73% and negative predictive value 83%. If rural is defined broadly for background but narrowly (<25,000) for intention, the sensitivity was 55%, specificity 84%, positive predictive value 33%, and negative predictive value 93%. In absolute terms, 45% of those intending to work in a rural area of <25,000 have an urban background, and 211 urban students intend to work in regional or rural areas, compared with 90 regional and rural background students intending to work in urban areas. In order to have one more student intending to work in rural area of <25,000, the number needed to select (NNS) from rural areas <25,000 is two and from regional-rural areas is four.

\*\*Table 3 to be inserted here\*\*

## Discussion

This study was based on intended career location and background information from 1592 medical students at entry into one NZ university (Auckland) over a nine-year period (2009–2017). Over a quarter met at least one of the study definitions of ‘rural’, and around 30% of all students had a non-urban intention. The main hub of the university is located in a city of about 1.5 million people and, since 2004, the medical programme has had a rural entry pathway through which almost all the rural students are selected.<sup>3</sup> It should be noted that the criteria for this rural pathway changed in the fourth year of this nine-year study from being restricted to smaller geographic areas, to being open to students from outside NZ’s major urban areas (regional rural). It is against this backdrop that we used information provided by medical students at the time of selection to better understand which definition(s) of rural might be the most useful in terms of shaping the future rural workforce, using career location as an outcome.

There were several major findings:

- First, over 70% of students from a rural background, however defined, expressed an intention to practice in an area with a population of 100,000 or fewer.
- Second, the degree to which a rural background is associated with rural career intention varies according to the definitions used for each.
- Third, there was a strong association between population sizes of background and future practice seen using a three-category classification based on population size, urban | regional | rural, with 100,000 and 25,000 cut points between them.
- Fourth, some urban students have rural or regional intentions from the outset, and these outnumber the rural or regional background students who intend to work in urban areas.
- Finally, not all students meeting a rural definition saw themselves as having a rural background and vice versa.

The results justify the policies of NZ medical schools to have specific pathways to recruit and select students from a range of rural and regional backgrounds. When rural is defined broadly, i.e. a population of less than 100,000, our findings are consistent with literature that rural background students are over three times more likely than urban counterparts to express a rural intention.<sup>24,25</sup> In the present study, a rural background, when classified according to the broader definitions of ‘rural’ (R<sub>2</sub>, R<sub>6</sub> or R<sub>7</sub>), was associated with 3.6 to 4.4-fold increase in the likelihood of a rural career intention relative to all other students. However, we found greater likelihoods of intention to work in an area of 25,000 or fewer in students who met the more restrictive definitions of ‘rural’ viz. R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub> or R<sub>5</sub>, with relative risks from 4.5 to 7.7. **We also**

found students from regional areas intended to return to similar-sized towns or larger, but not to smaller areas. The strong relationship between background and location intention runs contrary to the findings of McGrail et al, who found little to no relationship between the size of doctors' rural background communities and their future practice locations (for populations below 100,000) in Australia.<sup>7</sup> This difference may be explained by their broad definition or respective timing of the surveys. McGrail et al studied practising doctors, whereas our participants were commencing students who may well change goals and priorities as they progress towards practice.<sup>7</sup> Junior students will be most familiar with their home environment and are yet to experience learning and practice in a range of health care settings. There may also be an element of social desirability bias in which students who have been selected through a rural entry pathway may feel obligated to signal they intend to return to a similar-sized area to practice.

An obvious question is to what extent the distribution of health care professional and services must match the distribution of the population. It has been suggested that official definitions of rural should give greater weighting to the rurality of small to medium-sized independent urban communities which are geographically distant from large centres.<sup>15</sup> There are fewer than 100 of these centres in NZ,<sup>13</sup> yet people in these centres are more likely to be in the lowest socioeconomic groups, or to be Māori, each of which is associated with greater health needs.<sup>13</sup> While a small number of these centres has a hospital with a range of specialist inpatient services, most are served by primary care doctors and generalist rural health specialists. Indeed, it is this distance from specialist services which is a key defining feature of the relatively new scope of practice in NZ, namely Rural Hospital Medicine.<sup>26</sup>

For health workforce development, an optimal definition of rural at the time of selection would encompass student backgrounds resulting in the highest likelihood of entering rural practice, but still in sufficient numbers, while aligned with the areas of NZ experiencing workforce shortages. The more restrictive definitions (R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub> or R<sub>5</sub>) classified ~5-10% of all students as rural, whereas the broader rural-regional definitions (R<sub>2</sub>, R<sub>6</sub> or R<sub>7</sub>) classified up to 20% of students as rural. Not surprisingly, the latter is roughly the proportion of places reserved by the University of Auckland for rural-regional students. This issue of scale is important as shown by there being 100 students meeting each of the rural or regional definitions with concordant rural or regional intentions, but a similar number of urban background students who had rural or regional intentions. We have previously reported that the rural pathway, even when rural is defined broadly, may not be fully subscribed.<sup>3</sup> This, combined with predictions of falling numbers of younger people in rural areas<sup>13</sup> mean that measures to increase the number of

aspirants to medicine from smaller areas may have limited effect. This phenomenon has been reported by others.<sup>27</sup> On the other hand, seeking to increase recruitment from independent urban areas with generalist health services, as well as students with rural intent from larger areas may be fruitful.

The degree of overlap in definitions was illuminating. Encouragingly 72% of students meeting at least one rural definition saw themselves as rural, but some, even from the most restrictive definitions did not. Some students self-identified as rural but did not meet any other definition. To fully understand what this means will require an in-depth exploration of the motivations underpinning these responses. It is possible that a combination of definitions may turn out to be more predictive of a rural career and these may be useful in refining criteria for rural entry pathways. For example, a longitudinal study based upon a USA rural medical programme found that 45% of graduates meeting all three criteria: coming from a rural background; having a rural career intention, and intending to practise family medicine, were in rural practice three decades later.<sup>28</sup> Rural practice was the outcome for 33% of those meeting two criteria and 21% for one. Yet, 12% meeting none of these criteria were working rurally. In that USA study, 'rural' meant coming from a rural area or small town versus a non-rural area (city or suburb)<sup>28</sup> which is similar to the R<sub>4</sub> definition in our study.

While the strengths of our study include large sample size, prospective data collection and high response rates, there are several limitations. The main limitation is that this study assessed career location intentions at entry to the programme. **As insufficient time has elapsed to ascertain long term location of practice of participants in this study, we recognise this is a surrogate measure only.** However, we have shown previously that most medical students have a stable geographical career intention between entry and graduation five years later.<sup>29</sup> Of those who change, more moved towards a rural intention than away from it.<sup>3,29</sup> **Again, this study did not look at longer term practice.** Further, in the aforementioned USA study, the three factors which predicted rural practice were all identifiable at entry.<sup>28,30</sup> Finally, a longitudinal study of 4028 medical students in Australia, using similar methods to the present study, found location preference at entry was a strong predictor of actual career location in PGY1 or PGY3, independent of background.<sup>31</sup> A second limitation of this study was difficulty with home address verification for some students. In the survey, students provide their hometown street, but not their house number. This made mesh block identification difficult as many rural roads crossed between Statistics NZ urban/ rural profiles. As a result, 119 students living on the outskirts of urban or regional centres were excluded from the final sample of 1592 students. These students could either have more of an urban

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influence, or more connectedness to rural areas than those from the centre of a large city. This further emphasises the challenge of developing a practical definition of the boundary between urban and rural dwellers. Finally, the study used the size of town rural definitions that were developed for the MSOD project in the early 2000's. Nevertheless, they have all been shown in this study to be predictive of increased rural intention. They also allow alignment with a three-category classification, metropolitan / regional / rural with cut points between them - 100,000 and 25,000, that is better aligned with necessary distribution of the NZ health workforce.<sup>15</sup>

While the study was conducted in NZ, our findings may be generalisable to similar programmes and contexts. Students were enrolled in a medical programme that is based in a large metropolitan centre with a regional rural preferential selection pathway for about 20% of its students. This would fall into what Hays considers a Category 1 (metropolitan-based) medical school.<sup>20</sup> Around 30% of Auckland students intended to work outside urban areas. Regionally-based medical schools may have a higher proportion of students intending to practice medicine outside of major cities.<sup>32</sup> For example, compared with other Australian programmes, two thirds of James Cook University medical graduates undertook their early postgraduate training outside a metropolitan centre, and 47% in outer regional centres.<sup>33</sup> It is also worth noting that NZ is smaller than Australia or Canada, and has few areas considered remote. The finding that students intend to practise in areas with similar characteristics to their hometown locations is plausible and supports selection of students from a range of backgrounds in line with health service needs.

Dedicated selection pathways for non-urban students are critically important. This study may provide assurance that any of a range of definitions of rural may have some effect on the rural workforce. However, for medical schools who wish to further enhance rural workforce development, we suggest a more detailed examination of how student background is associated with career location intentions. There will be an optimal distribution for each school to find across the range of communities within its sphere of influence. Given the limited supply of students from small rural areas, students from a range of backgrounds will need to be recruited and selected. For schools such as Auckland using broader definitions, a consideration might be to give increased weighting at selection for students from independent urban towns and more rural backgrounds, based on a greater propensity to return to those areas. Schools may also explore how to identify urban students with rural intentions.

While outside the scope of this paper, the effect of a rural background may lessen over time,<sup>5</sup> but is bolstered by rural immersion experience.<sup>19</sup> Initiatives during and after medical school that influence urban background students to take up rural careers, or encourage rural background students to keep their rural intent rather than moving to urban centres are important.<sup>19,24</sup> Thus, in addition to rural selection pathways, schools must offer placements in rural contexts, which are ideally built upon in early postgraduate and specialty training experiences.<sup>32,34</sup> Knowledge of the backgrounds and prior intentions of students may help in selection of students for whom placements may have the greatest career impact.

In conclusion, the present study adds to what is known about definition of rural background, practice and intention, particularly for programmes with a metropolitan hub. We found a strong positive association between the rurality of background and practice intention, but also that some urban students may have rural intentions from the outset. Longer term tracking of workforce outcomes is needed to establish predictive validity of various rural definitions as well as criteria for selection to ensure the greatest number of students with predisposition to rural practice. In the coming years this should be possible through ongoing longitudinal career tracking and linkages to workforce data.<sup>21</sup>

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## Tables

Table 1. Number and percentages of students meeting rural definitions, compared with urban. The percentage exceeds 100% as students may meet more than one rural definition.

Definition	Description	No. of students	% of all students
R <sub>1</sub>	Rural by population	174	10.9
R <sub>2</sub>	Rural-regional by population	341	21.4
R <sub>3</sub>	Stats NZ: official	109	6.8
R <sub>4</sub>	Stats NZ: modified	131	8.2
R <sub>5</sub>	Rural home address	176	11.1
R <sub>6</sub>	Rural-regional school	295	18.5
R <sub>7</sub>	Self-identified	316	19.8
	Meet no rural definition	1156	72.6

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Table 2. Relationship of practice intention with background. Relative risk is for the outcome compared with all students not meeting the background definition.

Background		I <sub>1</sub> : rural practice (pop. <25,000)		I <sub>2</sub> : regional practice (pop. 25,000 – 100,000)		I <sub>1</sub> + I <sub>2</sub> : regional-rural practice (pop. <100,000)	
Definition of rural	No. (%) of students	Proportion intending	Relative risk vs Urban background , Rural intending students [95% CI]	Proportion intending	Relative risk vs Urban background , Regional intending students [95% CI]	Proportion intending	Relative risk vs Urban background, Rural intending students [95% CI]
R <sub>1</sub> : Rural by pop. (<25,000)	174 (10.9)	0.57	7.69 [7.46 - 7.91]	0.21	1.33 [1.02 - 1.65]	0.78	3.40 [3.28 - 3.52]
R <sub>2</sub> : Rural-regional by pop. (<100,000 )	341 (21.4)	0.33	4.55 [4.30 - 4.79]	0.40	4.22 [4.01 - 4.44]	0.74	4.36 [4.23 - 4.50]
R <sub>3</sub> : StatsNZ: official	109 (6.8)	0.47	4.48 [4.23 - 4.73]	0.28	1.87 [1.55 - 2.20]	0.75	2.94 [2.80 - 3.07]
R <sub>4</sub> : StatsNZ: modified	131 (8.2)	0.54	5.87 [5.64 - 6.09]	0.24	1.59 [1.27 - 1.92]	0.79	3.20 [3.07 - 3.33]
R <sub>5</sub> : Rural by address	176 (11.1)	0.47	5.32 [5.09 - 5.55]	0.27	1.86 [1.58 - 2.13]	0.74	3.15 [3.02 - 3.28]
R <sub>6</sub> : Rural-regional school	295 (18.5)	0.31	3.41 [3.17 - 3.66]	0.43	4.33 [4.12 - 4.54]	0.74	3.89 [3.76 - 4.03]
R <sub>7</sub> : Self-definition	316 (19.8)	0.38	5.52 [5.28 - 5.77]	0.32	2.59 [2.37 - 2.81]	0.69	3.64 [3.50 - 3.77]

Table 3. Comparison of background population and intended size of town of practice. The concordance of backgrounds and intentions is shown in the grey squares (population).

Background		I <sub>1</sub> : rural practice intention (<25,000)	I <sub>2</sub> : regional practice intention (25,000-100,000)	Urban intention (>100,000)
Definition	No. students (% of total)	No. intending (% of row)	No. intending (% of row)	No. intending (% of row)
R <sub>1</sub> : Rural (<25,000)	174 (10.9)	100 (57.5)	36 (20.7)	38 (21.8)
R <sub>regional</sub> : Regional (25,000- 100,000)	167 (10.5)	14 (8.4)	101 (60.5)	52 (31.1)
Urban (>100,000)	1251 (78.6)	92 (7.4)	119 (9.51)	1040 (83.1)

Figures

Figure 1. Patterns of overlap of rural definitions from most frequent to least. For full descriptions of R<sub>1</sub>-R<sub>7</sub> refer to Table 1.

