



ORIGINAL RESEARCH

Keeping them interested: a national study of factors that change medical student interest in working rurally

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ABSTRACT:

Introduction: In most countries it remains a challenge to sustain the rural medical workforce. Based on evidence that medical students with rural backgrounds are more likely than their urban peers to enter rural practice, medical schools may have rural entry pathways. It is less well established what happens to career intentions during medical school. This study assessed how rural intentions persist or change during medical school and sought factors associated with either persistence or change in rural intention.

Methods: Students who participate in the Medical Schools Outcomes Database and Longitudinal Tracking project complete surveys at entry to and exit from medical school. They are asked about demographics, career intentions and influencing factors. This study used data from students at both of New Zealand's medical schools from 2006 to 2016. Participants were placed into one of four groups: rural intention at entry and rural intention at exit (R-R), urban at entry and rural at exit (U-R), rural at entry and urban at exit (R-U) or urban at entry and urban at exit (U-U). 'Rural' was defined as an area with a population of 100 000 or fewer. Differences among the groups in demographics and influencing factors were analysed.

Results: Overall, 4368 students completed an entry survey (response rate 85.9%), and 2243 students completed an exit survey (response rate 66.4%). A third intended to work in a rural area; of

these, 49% had a rural background and 51% an urban background. From the linked entry and exit data ($n=1114$), there were 239 (21.4%), 188 (16.8%), 135 (12.1%) and 552 (49.5%) students in the R-R, U-R, R-U and U-U groups respectively ($p<0.001$). Most students had a stable geographical career intention. Of those who changed, more moved towards a rural intention than away from it. Medical students with a persistent rural pattern had characteristics of a rural background (70%), being female (68%), New Zealand European (76%) or having involvement with a rural club for at least 1 year (45%). These students were also more likely to express a GP career intention as their first choice (25%). There were small differences in age, but otherwise no particular demographic factors were associated with students who changed intention. Similarly there were only small differences in perceived career influencing factors among groups.

Conclusion: This large national study shows a stability of career location intention for the majority of students. It confirms earlier findings of the importance of rural background in rural career preference, but shows that women may have a higher propensity for a persisting rural interest. Apart from providing quality experience in rural areas for all students, and facilitating rural clubs, the study did not reveal any other strategies that might be used by medical schools to either increase or prevent the loss of rural interest.

Keywords:

career choice, curriculum, doctors, medical student selection, New Zealand, rural, workforce.

FULL ARTICLE:

Introduction

The New Zealand (NZ) healthcare system, as in other areas in the world, continues to have an undersupply of doctors in rural areas, especially in general practice¹⁻³. In part, this shortage in NZ may be explained by a lower density of practising physicians overall – 2.2 per 1000 population compared to the OECD average of 3.1 – as well as approximately 80% of registered doctors working in urban areas, compared with 60% of the general population^{4,5}. In 2005, a rural primary healthcare report recommended medical school provide places for those from a rural origin and to organise training in rural settings before the completion of medical school or soon thereafter⁶. These recommendations were based on evidence that the combination of rural background and curriculum experience improves the likelihood of medical graduates entering rural practice⁷⁻¹⁰.

From 2004, both NZ medical schools (at the universities of Auckland and Otago) introduced the Rural Origin Medical Preferential Entry initiative, with places allocated at each school to those who met academic as well as rural criteria. Rural criteria included the population size of the student's home town (less than 20 000) and/or the student's school years in a rural setting¹¹. While the University of Otago has continued with the size of town being a determinant, criteria at the University of Auckland were altered in

2012 to become a regional–rural admission scheme¹². This was in recognition of the higher population density in the northern part of NZ. Students from outside the boundaries of NZ's largest cities are eligible to apply for this pathway. The rural entry schemes now account for approximately 20% of each year's entry cohort, being more than 50 students at each school.

All NZ medical students have some rural and regional experience during their programs. A subset of volunteer students undertake longer rural immersion programs, usually in year 5^{3,13}. Early results show a high proportion of rural immersion students intend to practise in primary and/or rural health care^{3,13}.

From the mid-2000s, all NZ medical students have been invited to participate in longitudinal career tracking studies. At the University of Auckland, this was initially the Faculty of Medical and Health Sciences Tracking Project but, in 2012, Auckland joined with the University of Otago as part of the Medical Schools Outcomes Database and Longitudinal Tracking (MSOD) project. Students are invited to complete surveys at entry to medical school (year 2) and at exit or completion (year 6), with follow-up in postgraduate years 1, 3, 5 and 8¹⁴. The database now contains a decade's worth of career tracking data, allowing for an exploration of how career intentions change during medical school. An earlier study using this dataset found that 21% of Auckland students came from an

area of 100 000 or fewer residents¹⁵. At the completion of medical school, these students were almost three times more likely than those from an urban background to intend working in an area of fewer than 100 000 (rural area). Yet only about half of rural students intended a rural career. Furthermore, 60% more students who intended a rural career came from an urban background than from a rural area¹⁵. This suggests that as well as choosing students from a rural background, preventing loss of interest and fostering increased rural interest in all students are important strategies for growing the rural workforce. There is some evidence that students with a stable intention of general practice between measures late in medical school and in the early postgraduate years are more likely to follow through on that intention¹⁶. To date, few studies have looked at stability of career location intention¹⁷.

Thus, while there is good evidence for the factors positively influencing rural intentions, there is less evidence for factors influencing a change towards or away from such intentions. Using longitudinally linked national data from the MSOD project, the aims of this study were to:

- determine how career location intention patterns change between entry and exit from medical school
- examine factors that may be associated with these changes to shed light on what may promote or hinder a rural career intention.

There was a specific focus on the characteristics of three groups: the rural 'persisters' (those with rural intention at both entry and at exit) and the two groups of 'changers' (those who change

intentions from rural at entry to urban at exit, or from urban at entry to rural at exit).

Methods

Survey

The entry and exit MSOD surveys result in self-reported student data on factors such as demographics and general career intention (discipline and location), with one question in the exit survey asking about the importance of 24 possible influencing factors on career. The survey also asks about rural club involvement.

Definitions

There is no one agreed definition of 'rural' in NZ. In the student surveys there are four options regarding the size of the geographical location of a student's background or intended career location, accompanied by examples and population sizes. An example is 'major city (population over 100 000), eg Auckland, Tauranga'. For this study, participants were deemed to have a rural background (R) or location intention if they selected one of the three options of 100 000 or less, and an urban (U) background or location intention if they selected the option of more than 100 000. Once entry and exit intentions were examined, participants were placed into one of four intention groups: rural at entry and rural at exit (R-R), urban at entry and rural at exit (U-R), rural at entry and urban at exit (R-U) or urban at entry and urban at exit (U-U). These groups are represented by the arrows in Figure 1.

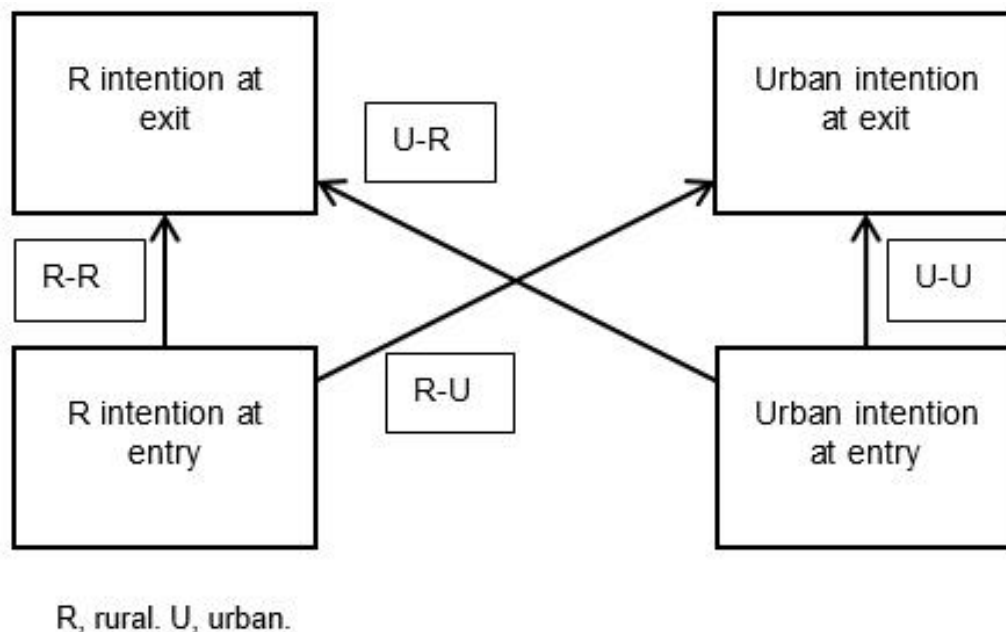


Figure 1: Study groupings based on student entry and exit intentions.

Analysis

Summary statistical analyses were performed. Univariate statistical significance for continuous variables was determined by single

factor ANOVA, with Bonferroni corrections for multiple comparisons used in post-hoc testing of differences in the influencing factors. Categorical data were analysed with χ^2 tests.

Further data were not obtained from the medical schools, such as whether or not students underwent a year-long rural immersion program. Nor did the authors compare results between medical schools. Analyses were performed with Microsoft Excel (2010) and SPSS v22 (IBM International; <http://www.spss.com>).

Ethics approval

Ethics approval for the Faculty of Medical and Health Sciences Tracking Project was granted by the University of Auckland's Human Participants Ethics Committee (#18456). The MSOD project received ethics approvals from the same committee at University of Auckland (#8539) and the University of Otago ethics committee (07/155).

Results

From 2006 to 2016, 4368 students completed at least part of an entry survey (response rate 85.9%), with 2243 students completing at least part of an exit survey (response rate 66.4%). Not all students answered all questions.

Longitudinally linked entry and exit data were available for

Demographics

Demographic features of students grouped according to intention patterns are shown in Table 2. There were statistically significant differences ($p < 0.001$) among groups for each variable. Of all those with rural intentions at exit, 49% had a rural background, with 51% having an urban background.

Medical students who persisted with a rural career pattern (R-R) had characteristics of coming from a rural background (70%),

1114 students made up of six paired cohorts from Auckland (2006–2011 entry corresponding to 2011–2016 exit, $n=540$, 48% of total) and four paired cohorts from Otago (2007–2010 entry corresponding to 2011–2014 exit, $n=574$, 52% of total).

Patterns

Overall, 628 (33%) of all students who responded to the location intention question in their exit survey were intending to work in a rural area. For the 427 students in the linked data set, the numbers and proportions of students within each intention group are seen in Table 1. There were 239 (21.4%), 188 (16.8%), 135 (12.1%) and 552 (49.5%) students in the R-R, U-R, R-U and U-U groups respectively ($p < 0.0001$). Most students (71%) had a stable geographical career intention at both entry and exit, and more students changed towards a rural career than away from it.

Table 1: Student intention at entry versus intention at exit

	Rural intention exit (n(%))	Urban intention exit (n(%))
Rural intention entry (n(%))	239 (21)	135 (12)
Urban intention entry (n(%))	188 (17)	552 (50)

being female (68%), identifying as NZ European (76%) or having involvement with a rural club for at least 1 year (45%). These students were also more likely to express a GP career intention as their first choice (25%). Post-hoc analysis showed that students who changed away from a rural intention during their time at medical school (R-U) were significantly older than U-U ($p < 0.001$) and U-R students ($p = 0.002$). Apart from a slightly higher age in the R-U group, and 50% of the R-U students having a rural background, no particular demographic factors were associated with students who changed.

Table 2: Student characteristics by intention group

Characteristic	R-R (mean or n(%))	U-R (mean or n(%))	R-U (mean or n(%))	U-U (mean or n(%))	p-value
Mean age (years)	25.86	25.35	26.52	25.34	<0.001
Female	163 (68) [†]	99 (53)	73 (54)	293 (53)	<0.001
Rural background	165 (70)	50 (27)	66 (50)	59 (11)	<0.001
Rural club member	96 (45)	45 (27)	26 (25)	59 (13)	<0.001
GP first preference	61 (25)	27 (14)	20 (15)	69 (13)	<0.001
Ethnicity [‡]					<0.001
Māori	28 (11)	18 (8)	21 (14)	26 (4)	
Pacific Islander	10 (4)	6 (3)	4 (3)	33 (5)	
NZ European	201 (76)	124 (58)	94 (62)	252 (42)	
Other ethnicity	24 (9)	68 (31)	33 (21)	294 (49)	

[†] Percentages determined by the response within the group, eg 238 people provided information on gender in the R-R category (not 239), so of those 238 people 68% were female.

[‡] Multiple options could be selected.

NZ, New Zealand. R, rural. U, urban.

Self-reported influencing factors

Student responses regarding the influences on most preferred type of future medical practice are shown by intention group in Table 3. The scale ranges from 1 ('not at all') to 5 ('a great deal'). Factors are ranked from the most influential overall to the least.

There was no difference among groups for the top four career influencing factors: atmosphere/work culture typical of the discipline, experience of specialty as medical student, interest in helping people and general medical school experiences (eg mentors, placements).

The rural 'persisters' were less influenced by consultants/mentors, the intellectual content of the specialty, job security, perceived career advancement prospects, opportunity for research and/or teaching, perceived financial prospects, perceived prestige of the discipline, financial costs of medical school education and/or debt and the cost of training in the discipline. They were more influenced by geographical location.

The 'changers' towards a rural intention were less influenced by

the appraisal of their own skills/aptitudes, perceived career advancement prospects, perceived financial prospects, perceived prestige of the discipline and possibly by their own domestic circumstances.

The changers away from a rural intention were more influenced by the intellectual content of specialty and perceived financial prospects.

Table 3: Mean scores on factors influencing most preferred career, by intention group

Influencing factor	R-R (n(%))	U-R (n(%))	R-U (n(%))	U-U (n(%))	p-value
Atmosphere work culture typical of the discipline	4.11 (0.85)	4.02 (0.96)	4.25 (0.92)	4.08 (0.93)	0.174
Experience of specialty as medical student	4.10 (0.92)	4.03 (1.0)	3.96 (1.16)	4.07 (0.97)	0.582
Interest in helping people	3.99 (1.03)	4.02 (1.05)	4.20 (0.95)	4.01 (0.99)	0.250
General medical school experiences (eg mentors, placements)	3.83 (0.98)	3.80 (0.98)	3.87 (1.13)	3.80 (1.01)	0.925
Influence of consultants/mentors	3.75 (0.98) [†]	3.77 (0.96)	3.95 (1.07)	3.97 (0.95) [†]	0.007**
Appraisal of own skills/aptitudes	3.71 (0.95)	3.63 (0.92) [†]	3.70 (0.96)	3.86 (0.92) [†]	0.016*
Opportunity for procedural work	3.70 (1.12)	3.79 (1.15)	3.61 (1.34)	3.70 (1.29)	0.657
Opportunity to work flexible hours	3.69 (1.2)	3.65 (1.07)	3.53 (1.22)	3.48 (1.2)	0.081
Hours of work typical of working in the specialty	3.66 (1.09)	3.65 (1.09)	3.44 (1.17)	3.50 (1.11)	0.113
Intellectual content of specialty	3.59 (1.06) [†]	3.72 (1.04)	3.99 (0.96)	3.90 (0.96) [†]	<0.001***
	3.59 (1.06) [†]		3.99 (0.96) [†]		
Type of patients typical of the discipline	3.48 (1.16)	3.44 (1.04)	3.56 (1.14)	3.42 (1.15)	0.587
Appraisal of own domestic circumstances	3.43 (1.13)	3.16 (1.15)	3.43 (1.12)	3.25 (1.12)	0.035 ^{††}
Availability of vocational training placement	3.08 (1.16)	3.14 (1.17)	3.06 (1.24)	3.22 (1.15)	0.28
Geographical location of most preferred specialty	3.05 (1.34) [†]	2.80 (1.24)	2.69 (1.27)	2.74 (1.25) [†]	0.010*
Perceived job security	2.91 (1.20) [†]	3.02 (1.22)	3.24 (1.18)	3.23 (1.17) [†]	0.003**
Perceived career advancement prospects	2.80 (1.18) [†]	3.02 (1.16)	3.17 (1.14)	3.35 (1.17) [†]	<0.001***
		3.02 (1.16) [†]		3.35 (1.17) [†]	
Number of years required to complete training	2.80 (1.17)	2.84 (1.16)	2.63 (1.27)	2.80 (1.21)	0.454
Opportunity for research and/or teaching	2.59 (1.16) [†]	2.79 (1.19)	2.85 (1.33)	3.02 (1.21) [†]	<0.001***
Perceived financial prospects	2.22 (1.14) [†]	2.40 (1.16)	2.61 (1.15)	2.72 (1.14) [†]	<0.001***
	2.22 (1.14) [†]		2.61 (1.15) [†]		
		2.40 (1.16) [†]		2.72 (1.14) [†]	
Influence of parents/relatives	1.97 (1.11)	1.82 (1.06)	1.77 (1.03)	1.95 (1.1)	0.175
Perceived prestige of the discipline	1.96 (1.09) [†]	2.20 (1.08)	2.26 (1.22)	2.55 (1.21) [†]	<0.001***
	1.96 (1.09) [†]		2.26 (1.22) [†]		
		2.20 (1.08) [†]		2.55 (1.21) [†]	
Risk of litigation and associated insurance costs	1.85 (1.06)	1.95 (1.08)	1.75 (0.92)	2.00 (1.04)	0.051
Financial costs of medical school education and/or debt	1.60 (0.88) [†]	1.84 (1.04)	1.72 (0.98)	1.84 (1.06) [†]	0.015*
Cost of training in the discipline	1.55 (0.86) [†]	1.69 (0.95)	1.64 (0.95)	1.80 (0.99) [†]	0.008**

[†] p<0.05, **p<0.01, ***p<0.001 – indicates influence with a significant difference among groups.

^{††} Significant ANOVA p-value, but group difference could not be determined in post-hoc testing.

^{†††} Group for which significant difference was identified on post-hoc analysis.

NZ, New Zealand. R, rural. U, urban.

Discussion

The study was based on linked survey data collected at entry and exit from medical school from more than 1000 NZ medical students. The majority of medical students had stable career location intentions, with a fifth of all students showing persisting rural intentions (R-R) and half showing persisting urban (U-U) intentions. Encouragingly, of the changers, nearly 40% more

moved from U to R than from R to U; however, half of those who changed from R to U were from a rural background.

At graduation, over a third of NZ medical students are considering working in an area of 100 000 or fewer which was defined as 'rural' for the purposes of this study. Although encouraging, this is a lower proportion than seen in the NZ 2013 census, which reported that around 1.75 million, or 40% of the total NZ population, live

outside urban areas⁵. Nearly two-thirds of rural-intending students at graduation had a rural background, which is consistent with other studies^{7,15}.

From the present study's results, the broad themes are that rural 'persisters' seem to be 'selected, not made'; that is, they have attributes that are apparent at entry (eg from a rural background, being NZ European or female). The latter is in contrast to findings in a recent Australian study that suggested a lower rate of women heading rurally¹⁸.

The 'changers' seemed more influenced by financial and career prestige factors, which are largely outside the purview of medical schools. However, the overall influence of these factors was moderate at best. The top four influences on medical student career choice included medical school experiences and did not differ among categories. The duration of NZ medical programs is 6 years, and students have a similar range of placements, both in terms of specialty and in having one or more clinical placements in areas with populations of 100 000 or less. A small number of students undertake rural immersion programs, but as these placements may be allocated to those with a rural background or stated rural career intention, the curriculum effect may be difficult to determine. Nonetheless, incorporating details on placements students undertook during medical school, particularly rural immersion or other prolonged attachments outside urban areas, would add to future studies.

The influence of consultants/mentors was less for the R-R group than for the U-U group, but whether this relates to lack of exposure to senior rural doctors, or less need for this in the R-R group, is uncertain. It was striking how many job-related influences -- financial aspects, intellectual content of specialty, job security, career advancement prospects, opportunity for teaching/research, and prestige -- were reported as less influential to students in the R-R group than in the U-U group. This may reflect the nature of the work itself, as well as how the students see their careers developing.

Strengths of this study include the large sample size, prospective data collection and high response rates. The student backgrounds and proportions with rural intentions are comparable with previous research^{7,10,15,19}. These strengths add to the robustness of the findings. Generalisability is increased by this being a national study involving two medical schools, one in a large city. The use of a population of 100 000 as the cut-off between urban and rural areas was pragmatic, as there is no single agreed definition of 'rural' in NZ. Findings would be relevant to countries with similar health and medical education systems, and population spread.

The study has several limitations. These include self-reported data and the possibility of social desirability bias, where respondents might answer questions in a manner that would be viewed favourably by others, especially in the entry responses of those who entered medical school through a rural entry pathway. The questionnaire is a relatively blunt instrument for determining factors in career location. Students are asked to assess the level of influence on 'their most preferred area of medicine', not

specifically where they will practise. Within each influencing factor it is possible that the factor is more important to some within a group than others; this would be concealed in a mean score. However, the standard deviations of both the highest influences and the least are relatively small and consistent, around 1, giving more confidence to the findings. Future studies might verify if the observed patterns are predictive of actual practice, and explore influential factors not captured by the questionnaire.

As yet in NZ there is no systemic linkage of MSOD data with workforce outcomes. The first set of MSOD postgraduate year 8 data will be collected in 2019 and should be informative as graduates will be confirming practice intentions. A recent Australian article has established that rural career intention at entry to medical school is predictive of rural practice, particularly when supplemented by an undergraduate rural immersion experience¹⁹. In that study, 17% of students had a rural intention at entry compared with 21% of NZ students in the present study with a rural intention at both entry and at exit. Thus, it seems plausible to assume that the latter students are more likely to enter rural practice.

Notwithstanding the weaknesses and lack of pointers to medical school experiences fostering rural careers, there are implications for medical schools and the wider health sector. Career choice involves aspects of both nature and nurture²⁰. Students with a persistent rural intention are more likely to be born in a rural area, to be female and not as concerned about career prestige, career advancement or financial factors as their urban-intending colleagues. Therefore, schools should continue to recruit large numbers of students from rural backgrounds. Over half of medical students are women, and they outnumber men among new doctors²¹. Women have long been overrepresented in general practice in NZ and elsewhere, but now the proportion of women working in rural hospital medicine is increasing²². It was encouraging that women formed more than two-thirds of the R-R group, but whether this represents greater exposure to female role models is uncertain. The findings suggest the need for strategies to ensure that women who have indicated an interest in rural medicine progress smoothly through the early years of postgraduate training, noting that this is a time when part-time or interrupted training is more likely for women than for men²³. It also underscores the importance of family-friendly features in medical practice, especially in rural areas.

Collectively, students report the atmosphere/work culture typical of the discipline as the most influential on their career decision, with medical school experiences not far behind. Thus, quality experiences in rural areas during and in post-medical school training seem important. The flip side of increased exposure is that students may be deterred if there are relative differences between rural and urban practice in work conditions, remuneration and how doctors are valued. It was notable that nearly half of students who changed from R to U had a rural background. Yet these students were numerically offset by urban background students who change their minds to R. Many work-related influences are more important to urban-intending students than to rural ones. While

health and education systems can promote rural practice as attractive compared with other specialties, in the end rural practice must be perceived by students as a job that is 'good to do' compared with other specialties²⁴⁻²⁶.

Conclusion

For nearly a third of students, career location intentions change during medical school, with more changing towards a rural career than away from it. Rural background is a key determinant of a persistent rural career intention. Being female emerged as another important factor, as did being NZ European. While some experiences during medical school will be important, overall the atmosphere/work culture typical of a discipline is the most influential. Medical schools should continue to select rural students and give all students positive rural experiences. Attention to the

REFERENCES:

- 1 Williamson M. A change in students' perceptions of peer and faculty attitudes to rural medicine following the introduction of a rural health rotation. *International Journal of Family Medicine* 2014; 124708. <https://doi.org/10.1155/2014/124708>
- 2 Hay M, Mercer A, Lichtwark I, Tran S, Hodgson W, Aretz H, et al. Selecting for a sustainable workforce to meet the future healthcare needs of rural communities in Australia. *Advances in Health Sciences Education: Theory and Practice* 2017; **22(2)**: 533-551.
- 3 Shelker W, Zaharic T, Sijnja B, Glue P. Influence of rural background and rural medical training on postgraduate medical training and location in New Zealand. *New Zealand Medical Journal* 2014; **127(1403)**: 12-16. PMID:25290494
- 4 Garces-Ozanne A, Yow A, Audas R. Rural practice and retention in New Zealand: an examination of New Zealand-trained and foreign-trained doctors. *New Zealand Medical Journal* 2011; **124(1330)**: 14-23. PMID:21681248
- 5 Statistics New Zealand. 2013 Census. 2013. Available: <http://www.stats.govt.nz/Census/2013-census.aspx> (Accessed 28 March 2018).
- 6 Goodyear-Smith F, Janes R. *The 2005 Rural Health Workforce Survey*. Wellington: Ministry of Health, 2005.
- 7 Rabinowitz H, Diamond J, Markham F, Santana A. Retention of rural family physicians after 20–25 years: outcomes of a comprehensive medical school rural program. *Journal American Board of Family Medicine* 2013; **26(1)**: 24–27. <https://doi.org/10.3122/jabfm.2013.01.120122> PMID:23288277
- 8 Jones M, Humphreys J, Prideaux D. Predicting medical students' intentions to take up rural practice after graduation. *Medical Education* 2009; **43(10)**: 1001-1009. <https://doi.org/10.1111/j.1365-2923.2009.03506.x> PMID:19769650
- 9 Kondalsamy-Chennakesavan S, Eley DS, Ranmuthugala G, Chater AB, Toombs MR, Darshan D, et al. Determinants of rural practice: positive interaction between rural background and rural undergraduate training. *Medical Journal of Australia* 2015; **202(1)**: 41-45. <https://doi.org/10.5694/mja14.00236> PMID:25588445
- 10 Hsueh W, Wilkinson TJ, Bills J. What evidence-based undergraduate interventions promote rural health? *New Zealand Medical Journal* 2004; **117(1204)**: 1-17.
- 11 Mayer H, Renouf T. Rural medical education in New Zealand. *Cureus* 2016; **8(10)**: e826. <https://doi.org/10.7759/cureus.826>
- 12 University of Auckland. Regional Rural Admission Scheme 2012. Available: <https://www.fmhs.auckland.ac.nz/en/faculty/for/future-undergraduates/admission-criteria/regional-rural-origin-preferential-entry-scheme.html> (Accessed 28 March 2018).
- 13 Matthews C, Bagg W, Yielder J, Mogol V, Poole P. Does Pukawakawa (the regional-rural programme at the University of Auckland) influence workforce choice? *New Zealand Medical Journal* 2015; **128(1409)**: 35-43. PMID:25721960
- 14 Otago Medical School. Medical Schools Outcomes Database and Longitudinal Tracking (MSOD) project. Available: <http://www.otago.ac.nz/medical-school/undergraduate/medicine/msod/index.html> (Accessed 12 September 2018).
- 15 Poole P, Stoner T, Verstappen A, Bagg W. Medical students: where have they come from; where are they going? *New Zealand Medical Journal* 2016; **129(1435)**: 59-67. PMID:27355169
- 16 Woolf K, Elton C, Newport M. The specialty choices of graduates from Brighton and Sussex Medical School: a longitudinal cohort study. *BMC Medical Education* 2015; **15(13 March)**: 46.
- 17 Goldacre M, Laxton L, Lambert T. Medical graduates' early career choices of specialty and their eventual specialty destinations: UK prospective cohort studies. *British Medical Journal* 2010; **341(6 July)**: c3199.
- 18 Puddey I, Mercer A, Playford D, Pougault S, Riley G. Medical student selection criteria as predictors of intended rural practice following graduation. *BMC Medical Education* 2014; **14(14 October)**: 218.
- 19 Playford D, Ngo H, Gupta S, Puddey IB. Opting for rural practice: the influence of medical student origin, intention and immersion experience. *Medical Journal of Australia* 2017; **207(4)**: 154-158. <https://doi.org/10.5694/mja16.01322> PMID:28814216
- 20 Wilkinson TJ. Medical careers – nature or nurture? *New Zealand Medical Journal* 2014; **127(1403)**: 9-11. PMID:25290493

- 21** Ministry of Health, New Zealand. *Health of the Health Workforce 2015*. Wellington: Ministry of Health, 2016.
- 22** Lawrenson R, Reid J, Nixon G, Laurenson A. The New Zealand Rural Hospital Doctors Workforce Survey 2015. *New Zealand Medical Journal* 2016; **129(1434)**: 9-16. PMID:27349258
- 23** Lawrence J, Poole PJ. Career and life experiences of New Zealand women medical graduates. *New Zealand Medical Journal* 2001; **114(1145)**: 537-540. PMID:11833945
- 24** Ajaz A, David R, Brown D, Smuk M, Korszun A. BASH: badmouthing, attitudes and stigmatisation in healthcare as experienced by medical students. *Psychiatric Bulletin* 2016; **40(2)**: 97-102.
- 25** Cleland JA, Johnston PW, Anthony M, Khan N, Scott NW. A survey of factors influencing career preference in new-entrant and exiting medical students from four UK medical schools. *BMC Medical Education* 2014; **14(23 July)**: 151.
- 26** Gąsiorowski J, Rudowicz E, Safranow K. Motivation towards medical career choice and future career plans of Polish medical students. *Advances in Health Sciences Education: Theory and Practice* 2015; **20(3)**: 709-725. <https://doi.org/10.1007/s10459-014-9560-2> PMID:25352498

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