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ORIGINAL RESEARCH

Does the positive influence of an undergraduate rural placement persist into postgraduate years?

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ABSTRACT

Introduction: Medical schools worldwide are playing a role in addressing the shortage of rural health practitioners. Selection of rural-origin students and long-term rural undergraduate placements have been shown to have a positive influence on a subsequent career choice of rural health. Evidence for the impact of short-term rural placements is less clear. In New Zealand, the Otago University Faculty of Medicine introduced a 7 week rural undergraduate placement at the Dunedin School Of Medicine, one of its three clinical schools, in 2000. A study of the first two annual cohorts showed a positive influence of the course on student attitudes to rural health and their intention to practise in a rural setting. The purpose of this study was to test whether or not these effects persisted into postgraduate years.

Method: The original study cohorts were posted a questionnaire (questions worded identically to the original survey) in 2009 (5th and 6th postgraduate years). Non-responders were followed up after 2 months. Graduates from the same year cohort at the two other Otago clinical schools (Christchurch and Wellington) were also surveyed. In addition to analysis by question, principal component analysis (PCA) identified 3 questions which represented the influence of the medical undergraduate program on students' attitudes towards rural general practice. This was used as an index of influence of the undergraduate curriculum.

Results: There was a statistically significant difference among graduates from Dunedin and the other two schools in reporting a positive influence towards rural practice from the undergraduate course.When asked how the medical undergraduate program influenced their attitude towards a career in rural practice, 56% of respondents from Dunedin reported a positive influence

compared with 24% from Christchurch and 15% Wellington. This effect was less strong than that obtained immediately after the rural placement where 70% of Dunedin based students reported a positive influence. The index value for positive effect on attitudes was significantly higher for respondents who studied at Dunedin than at Wellington (mean index value 0.552 for Dunedin, -0.374 for Wellington t=4.172, p=0.000) or Christchurch (mean index value -0.083 for Christchurch t=2.606, p=0.011). There was no significant difference between Christchurch and Wellington (t=1.420, p=0.160). There was no significant difference among schools in the proportion of graduates who had worked or intended to work in rural general practice at any point in their career (24% Dunedin, 31% Christchurch, 16% Wellington (Phi=0.160, p=0.178).

Conclusion: Most of the literature on the influence of rural undergraduate placements, especially short term placements, examines immediate changes. This study adds to the evidence by showing that positive effects from a rural undergraduate placement persist into the postgraduate years, although that in isolation is unlikely to result in a significant workforce effect. Further investigation is warranted into which features of the undergraduate placement result in an extended positive effect on student attitudes.

Key words: curriculum, health manpower, medical students, New Zealand, rural health services, undergraduate medical education.

Introduction

Worldwide, both developed and developing nations experience problems in recruiting and retaining a rural health workforce[1-3]. The obligation of medical schools to educate practitioners able to meet a population's needs has been clearly outlined[4-8]. Research demonstrates that it is possible for medical schools to influence rural workforce issues by not only selecting students from a rural background, but also providing medical education in a rural health setting[1,4,9-14]. The evidence for the effect of rural origin is strong. However, evidence for the effect of rural based educational programs is less robust, especially for shorter-term rotations or placements in rural practice of a few weeks duration[11,15,16].

New Zealand has two medical schools, at Auckland and Otago Universities. The University of Otago Faculty of Medicine has three distinct and semi-autonomous clinical schools in the cities of Dunedin, Christchurch and Wellington. In the year 2000, the Dunedin School of Medicine introduced a seven-week course in rural health for all 5th (penultimate) year undergraduates with the dual purposes of assisting the rural workforce by linking existing practitioners with the medical school while also exposing potential future practitioners to the rural environment. This initiative also took advantage of the hitherto untapped source of clinical experience for medical students who were having increasing difficulty gaining access to patients in teaching hospitals. A survey of the first two cohorts of students showed a positive change in student attitudes to rural health following the rural health rotation for the Dunedin cohort[17].

The New Zealand Government has since introduced preferential entry for a specified number of students from a rural background, and provided funding for a rural immersion course for 5th year undergraduate medical students at both Otago (all 3 clinical schools) and Auckland Medical Schools. Despite this, the country still has a shortage of rural health practitioners and faces increasing medical workforce shortages[18-20]. It is therefore important to learn more about any workforce effects which may result from a rural undergraduate placement[21-24].

The main aims of the study were to test whether or not the positive change in attitudes towards rural health seen in the cohort of 2000–2001 Dunedin medical students following a seven-week course in the penultimate undergraduate year had persisted to 2009, and whether the attitudes of these Dunedin graduates were measurably different from their colleagues from the same cohort who had graduated from

Christchurch and Wellington and not been exposed to a rural rotation program.

Method

The cohort of 367, 5th year medical students from 2000–2001 was identified by the enrolment and alumni records of the University of Otago. Addresses were checked against the electoral roll and registrations with the Medical Council of New Zealand. Students were excluded if they had died, moved overseas or if their address was unknown. The remainder were advised in writing of the follow-up study and provided with an information sheet and the questionnaire. Participation was voluntary. All participants in the first study had agreed to take part in a potential follow-up study.

Data collected included demographic information, attitudes towards working in rural health, experience of rural health and where participants were working currently. Non-responders were sent a second mail out 2 months after the first. Data were initially entered into a Microsoft Excel spreadsheet and converted to PASW Statistics v18.0.2 (http://www-01.ibm.com/software/analytics/spss) to enable an in-depth data analysis to be conducted. For comparisons between schools (Dunedin, Christchurch, Wellington), urban and rural backgrounds and place of birth (in/out of New Zealand), the tests used were the Phi statistic for nominal data (eg Yes/No, Rural/Urban) and the Mann–Whitney test for ordinal data (ie those based on a scale of responses). For a joint test of differences among all three schools (for ordinal variables), an extension of the Mann–Whitney test has been used (Kruskal–Wallis test). The questions in the survey were taken from the original study questionnaire for consistency; however, it was not possible to match individual students and their responses from the original cohort to the 2009 survey.

To test for significant differences among schools, first the Levene's test for equality of variances in the two schools was used, and then Student's *t*-test for equality of means (with the appropriate standard error based on the results of the Levene's test). Where available (all tests except Student's *t*-test for comparing means), tests were conducted using the Exact Tests option in SPSS. These provide an accurate measure of the true level of significance when the assumptions for standard asymptotic tests are not met (ie when results are obtained from small datasets or sparse or unbalanced tables). Computational limits mean that some of the Kruskal–Wallis tests were also conducted without the Exact Tests option.

For measures based on a 5 point scale (eg Not at all, Not much, Neutral, Highly, Very highly), results were collapsed into a 3 point scale because of small numbers in some of the original cells, where the two most extreme response categories on either side are combined (eg Not at all & Not much combine to become Not, Highly and Very Highly combine to become Highly in the 3-point scale Not, Neutral, Highly). To test for the effect of school and rural/urban background together, a binary logistic regression model was used.

Principal component analysis (PCA) found a single factor, consisting of 3 questions (1. How important is having an undergraduate rural experience in influencing your choice of career? Not important/Extremely important. 2. How did the medical undergraduate program influence your attitude towards a career in rural health: (a) rural general practice? (b) rural hospital work? Negatively/Positively) which represented the influence of the medical undergraduate program on students' attitudes towards rural general practice. The factor derived from the PCA was very closely approximated by the sum of the component variables. This was used as an index of influence of the undergraduate curriculum.

Ethics approval

Ethics approval for the study was provided by the University of Otago Ethics Committee (category B: #D09/169) under delegated authority to the Head of the Department of

General Practice and Rural Health as low risk research involving human subjects.

Results

Respondent characteristics

In total, 177 questionnaires were returned (63%) of which 30 were 'Gone, no address', leaving a total of 147 responders (50%). Demographic data were also collected on the students who were removed from the list (64) and the non-responders (n=138; Table 1).

The sample of respondents had a lower proportion of New Zealand citizens and graduates of New Zealand-European ethnicity than the total cohort population; and there was a higher proportion of younger graduates (aged 30 years or under). There was also a lower proportion of Dunedin graduates (explained in part by the higher proportion of international graduates in the Dunedin cohort now resident in a country other than New Zealand). Demographic information is shown (Table 2).

There were no statistically significant differences among schools regarding surveyed respondents' sex, age, marital status, urban–rural background, ethnicity or place of birth.

For Dunedin students, the proportion of respondents born in New Zealand, with New Zealand citizenship and of New Zealand-European ethnicity was significantly higher in the 2009 survey than in the original survey. There were no differences between surveys in sex or rural–urban background.

Key findings

When asked how the medical undergraduate program influenced their attitude towards a career in rural practice, 56% of Dunedin respondents reported a positive compared with 24% from Christchurch and 15% Wellington. Dunedin respondents were much less likely to say that the program had not changed their attitude towards rural general practice (28% compared with 76% and 80%, respectively). Dunedin respondents were also most likely to say that the program had influenced them negatively (17% compared with 0% and 4%, respectively). This difference was significant at $\chi 2$ =7.663 and p=0.021 (Kruskal–Wallis test). For the Dunedin-based students, the original study showed a 'positive influence' response of 70% to the same question administered immediately after their rural attachment (Table 3).

When asked how important their undergraduate experience was in influencing their career choice, 28% of Dunedin graduates said that having a rural undergraduate experience was very important and 41% said it was important in influencing a choice of career compared with 13% and 38% for Christchurch and Wellington combined (tau-c=0.198, p=0.043). They were also much more likely to say rural general practice was viewed positively by their undergraduate teachers (63% to 34%). This difference is statistically significant between Dunedin and Wellington (U=473.5, p=0.063), but not between Dunedin and Christchurch (U=470.0, p=0.123).

The index of influence value for positive effect on attitudes was significantly higher for respondents who studied at Dunedin than at Wellington (mean index value 0.552 for Dunedin, -0.374 for Wellington t=4.172, p=0.000) or Christchurch (mean index value -0.083 for Christchurch t=2.606, p=0.011). There was no significant difference between Christchurch and Wellington (t=1.420, p=0.160; Table 4). Respondents who attended Dunedin or Christchurch who were born outside New Zealand were much more likely than those born in New Zealand to say that having a rural experience as part of their undergraduate medical education was important in influencing their choice of career. This difference was not apparent in those from Wellington (Table 5).

Table 1: Cohort numbers

Cohort data	*N*
Size	367
Size after exclusions	293
Location: Dunedin, Christchurch, Wellington	83, 105, 105
Responders	147
Responders' location: Dunedin, Christchurch, Wellington	36, 59, 52

Table 2: Demographic characteristics of respondents and the surveyed population

Characteristic	Responders %	% Total population
Sex		
Female	60	55
Male	40	45
Age (years)		
≤30	28	19
31-35	61	72
≥36	12	9
Citizenship		
NZ	94	80
School:		
Dunedin	25	30
Christchurch	40	36
Wellington	35	34
School RR:		NA
Dunedin	43 (*n*=36:83)	
Christchurch	56 (*n*=59:105)	
Wellington	50 (*n*=52:105)	
Sex RR:		NA
Female	55	
Male	44	
Age (years) RR:		NA
≤30	64	
>30	46	
Ethnicity RR:		NA
NZ European	54	
Non NZ European	43	
(*p*=0.1051)		

NA, Not applicable; NZ, New Zealand; RR, Response rate.

Table 3: How did the medical undergraduate program influence your attitude towards a career in rural general practice?

Influence	School *n* (%)			
	Dunedin		Christchurch 2009 Follow up *N* = 59 (%)	Wellington 2009 Follow up *N* = 52 (%)
	Post-course 2000/2001 *N* = 79 (%)	2009 Follow up *N* = 36 (%)		
Positively	55 (70)	20 (56)	14 (24)	8 (15)
No change	20 (25)	10 (28)	45 (76)	42 (80)
Negatively	4 (5)	6 (17)	0	2 (4)

Table 4: The influence of medical undergraduate program on attitudes towards a career in rural health (index score), as at 2009 follow-up survey

Attitude	School – *n* (%)		
	Dunedin *N* = 32 (%)	Christchurch *N* = 37 (%)	Wellington *N* = 39 (%)
Index highly positive	17 (53)	8 (22)	6 (15)
Index positive	9 (28)	14 (38)	16 (41)
Index not positive	6 (19)	15 (41)	17 (44)

Table 5: How important an influence on your choice of career is an undergraduate rural clinical rotation? – according to place of birth

2009 Follow-up survey	Birth location according to school – *n* (%)					
	Dunedin		Christchurch		Wellington	
	NZ *N* = 21 (%)	Outside NZ *N* = 10 (%)	NZ *N* = 28 (%)	Outside NZ *N* = 8 (%)	NZ *N* = 30 (%)	Outside NZ *N* = 9 (%)
Very important	4 (19)	5 (50)	2 (7)	3 (38)	3 (10)	1 (11)
Important	7 (33)	5 (50)	9 (32)	3 (38)	13 (43)	4 (44)
Not important	10 (48)	0	17 (61)	2 (25)	14 (47)	4 (44)

NZ, New Zealand.

The results do not provide any evidence on whether this attitude change was carried through to actual career choices by the time of the survey. There was no significant difference among schools in the proportion that have worked or intend to work in rural general practice at any point in their career (24% Dunedin, 31% Christchurch, 16% Wellington [Phi=0.160, p=0.178]). Neither was there a significant difference among schools in the proportion of students who had worked or intended to work in rural hospital medicine (31% Dunedin, 28% Christchurch, 18% Wellington [Phi=0.133, p=0.336]). There were no significant differences among schools in the proportion of students working in a rural area at the time of the follow-up survey (6% Dunedin 14%, Christchurch, 4% Wellington [Phi=0.166, p=0.155]). It was not possible to tell whether the apparent trend in favour of Christchurch was significant based on these sample proportions, because the required sample size to find a statistically significant difference

between Dunedin and Christchurch would be 182 from each school (for an 80% probability of detecting a significant difference at the 10% level of significance).

In contrast, respondents from a rural background were much more likely to be working in a rural area at the time of the survey than those of urban background (16% vs 5% [Phi=0.183, p=0.039]). They were also much more likely to have worked or to intend to work in rural general practice (45% vs 16% [Phi=0.301, p=0.001]) or rural hospital medicine (41% vs 20% [Phi=0.205, p=0.028]) at any point in their career.

There was no statistical difference between urban and rural respondents in the influence of the undergraduate program on their attitudes towards rural health (Phi=0.081, p=0.511), or in how they felt their teachers viewed rural general practice (U=997.0, p=0.266).

Discussion

The results suggest that the influence of a 7 week rural health course on students' attitudes to rural health (both positive and negative) persists well into postgraduate years, although there is a reduction in the strength of the positive effect on attitudes held immediately post-course. This finding for a relatively short rotation, which is independent of rural origin effect, is an important addition to the accumulating evidence of the impact of an undergraduate rural placement.

The findings also have implications for the ability of an undergraduate course to positively influence the status or reputation of 'rural health' within the profession, which may in turn influence career choice[25,26]. There is evidence that attitudes expressed by medical school faculty (both positive and negative) influence the career choices of medical graduates[7,26-29]. Thus a sustained positive shift in attitudes towards rural health, even among those not working in rural health, may have longer term benefits. There are also potential advantages for those working in rural health in terms of an increased understanding of issues unique to rural practice becoming the norm among work colleagues elsewhere.

The results could not show that the reported increase in likelihood of working in rural practice is reflected in actual career choice. While this could be so, it may also represent an effect of the size of the study or the influence of other factors[11,26,30] outweighing the influence of the course alone. Certainly the findings lend weight to the need to provide rural based experience at early postgraduate levels to reinforce positive workforce effects.

The study confirms the strong effect of rural origin on doctors choosing to work in rural areas. It could be argued that there is some value in the small but significant number of students who realised that they did not like or were not suited to work in rural health, who reported a negative effect in the survey. This may mitigate the occurrence of doctors choosing to leave rural practice within a year of starting it[31]. Other studies have found a similar negative effect, although proportions vary[11,32].

The attitudes of students born in New Zealand suggest they are less amenable to change than those born overseas and this may be due to the latter's relative naivety to New Zealand's culture, demography and geography. Those born in New Zealand are more likely to be familiar with the New Zealand rural landscape (eg from rural holidays), and so their attitudes may be more informed. Students' past experience of rural New Zealand was not tested.

Limitations

This study has limitations, which relate to its cohort nature, response rate of 50% and the total study population size. The response rate may be mitigated by demographic consistency between respondents and total cohort. The inability to correlate individuals' responses in this survey with their responses in the first study is a disadvantage and so caution should be used when interpreting the results to draw inferences for other settings, especially in a quantitative sense. Each rural undergraduate course will be different and

courses may even differ over the years within schools. The faculty may change and even the loss of one or two enthusiasts could be significant in terms of effect.

The important next step is to explore what it was about the rural rotation that altered students' attitudes. Until these key features are established the present results should not be generalised in terms of curriculum, school or country.

The students in the current study were not randomly allocated according to the three clinical schools so there may be bias in the results from self-selection. However, the rural course was introduced (2000) after the graduates studied had selected their clinical school (1998–1999). It is possible that students making a choice of clinical school in 1999 were aware that a rural course was being planned but they would have been unaware of its nature and quality.

The 2009 follow-up survey identified three questions (representing a single factor), which could be attributed to the influence of the undergraduate program on students' attitudes to rural general practice. Of interest is that re-analysis of the original survey data revealed two separate indices, one being a measure of students' intention and desire to enter rural practice, the other a measure of the perceived attitudes of teachers and peers to rural practice. In the original survey these factors were uncorrelated and this suggests the potential of developing indices of likelihood to enter rural practice, which will be explored in subsequent work.

Conclusion

It is possible for positive effects on students' attitudes towards rural health resulting from a short undergraduate attachment in a rural health setting to be detectable up to at least 8 years post-graduation. These attitude changes are not as strong as those detected immediately post-course and may not translate into effects on career choice. Therefore on its own, such a course is unlikely to be enough to have the desired degree of effect. Rural origin of students is confirmed as an important factor in both attitude and choice of place of practice. Further study is warranted to investigate the factors within a clinical placement that influence attitudes to career choice, why a positive attitude may still not influence place of practice, and whether or not it would be possible to develop indices which are reliable predictors of choice.

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