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## Preferred practice location at medical school commencement strongly determines graduates' rural preferences and work locations

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## Main text

### **Preferred practice location at medical school commencement strongly determines graduates' rural preferences and work locations.**

#### **(i) Abstract and keywords**

**Objective:** To identify factors influencing whether Australian medical graduates prefer to, or actually, work rurally.

**Design:** Secondary analysis of longitudinal data from the Medical Schools Outcomes Database (MSOD) using univariate and multivariate logistic regression.

**Setting:** Twenty Australian medical schools.

**Participants:** Australian or New Zealand citizens and Australian permanent residents who completed MSOD questionnaires between 2006 and 2013.

**Main outcome measures:** Preferred and actual work locations one (PGY1) and three (PGY3) years post-graduation.

**Results:** Of 20,784 participants, 4028 completed a PGY1 and/or PGY3 questionnaire. Self-reported preference for rural practice location at medical school commencement was the most consistent independent predictor of whether a graduate would have a rural location preference at PGY1 (odds ratio [OR] 6.07, 95% CI 4.91-7.51) and PGY3 (OR 7.95, 95% CI 4.93-12.84), and work rurally during PGY1 (OR 1.38, 95% CI 1.01-1.88) and PGY3 (OR 1.86, 95% CI 1.30-2.64). The effect of preferred practice location at medical school commencement is independent of, and enhances the effect of, rural background. Graduates of graduate-entry programs or with dependent children were less likely to have worked rurally during PGY1 and PGY3, respectively.

**Conclusion:** The most consistent factor associated with rural preferences and work location was students' preferred location of practice at medical school commencement; this association is independent of, and enhances the effect of, rural background. Better understanding of what determines rural preference at medical school commencement and its influence on rural workplace outcomes beyond PGY3 is required to inform Australian medical school selection policies and rural health curricula.

**Key words:** Professional Practice Location, Medical Students, Medical Schools, Australia, Rural Health Services

**(ii) What this paper adds**

<b>What is already known on this subject?</b>
<ul style="list-style-type: none"><li>• Rural background and exposure is known to increase rural practice intention.</li><li>• Rural clinical school participation is strongly associated with increased likelihood of working rurally.</li><li>• Preferred rural practice location at medical school commencement and rural background are positively associated with preferred rural practice location at medical school completion.</li></ul>
<b>What does this study add?</b>
<ul style="list-style-type: none"><li>• Preferred practice location at medical school commencement is the most consistent predictor of preferred rural practice location and actually completing a rural rotation in the first and third years after graduation.</li><li>• The effect of preferred practice location at medical school commencement is independent of, and enhances the effect of, rural background.</li><li>• This study indicates that rural career intentions are determined largely prior to medical school commencement. Therefore it is essential to collect data about preferred practice location at medical school commencement and adjust for this factor when evaluating the effectiveness of programs aimed at recruiting medical graduates to work in rural Australia.</li><li>• Better understanding of what determines rural preference at medical school commencement and its influence on rural workplace outcomes beyond PGY3 is required to inform Australian medical school selection policies and rural health curricula.</li></ul>

### **(iii) Text**

#### **Introduction**

Rural Australia has severe medical workforce shortages<sup>1,2</sup> and rural Australians have poorer health and shorter life expectancy.<sup>3</sup> Understanding factors that influence medical graduates' career decisions is imperative in addressing these workforce shortages.

Rural background and exposure, such as Rural Clinical School (RCS) programs, are positively associated with having a preference for and working rurally.<sup>4-6</sup> Jones *et al.*<sup>7</sup> reported that although rural placements increased the odds of having a rural practice preference at medical school completion, this was overshadowed by stronger associations with rural background and preferred rural practice location at medical school commencement. To this date, no studies have analysed the influence of medical students' initial preference on actual workplace outcomes.

Since 2006 Medical Deans Australia and New Zealand have hosted a longitudinal tracking project known as the Medical Schools Outcomes Database (MSOD) which provides unique insight into demographics, workforce patterns and career choices of medical graduates from all Australian and New Zealand medical schools. Students are invited to complete questionnaires at commencement and completion of medical school, and at one, three, five and eight years post-graduation.<sup>8</sup> <sup>9</sup> High response rates have been reported; 95% for the Commencing Medical School Questionnaire (CMSQ), 83% for the graduating questionnaire and 70% for post-graduation questionnaires.<sup>9</sup> However, not all respondents complete all questions of each questionnaire.

This study aimed to identify factors associated with Australian medical graduates' preferences for, or actually working rurally and is the first to use MSOD data to evaluate work location post-graduation.

#### **Methods**

##### **Participants**

Potential subjects included medical students from all twenty Australian medical schools (excluding overseas campuses), who participated in CMSQ MSOD questionnaires between 2005 and 2013 (n=27,704). As 2005 was the MSOD pilot year with limited medical schools involved, those who completed the CMSQ in 2005

or had missing data for year of CMSQ were excluded (n=2913). To avoid the influence of international students who may be required to leave Australia post-graduation, citizens of countries other than Australian or New Zealand, and permanent residents of countries other than Australia were excluded (n=4007).

After exclusion of the above (n=6920), there were 20,784 Australian or New Zealand participants who completed CMSQ between 2006 and 2013. CMSQ participation was crucial in providing rural background demographics which could not be sourced from later questionnaires. All students who completed CMSQ and a post-graduate questionnaire at one and/or three years post-graduation, known as PGY1 and PGY3, were eligible for inclusion in this study (n=4028).

### **Ethical approval**

Ethical approval for this study was obtained from the Notre Dame Fremantle Human Research Ethics Committee (approval # 014076F).

### **Measures**

Outcomes of interest were preferences and rotations for PGY1 and PGY3. The preference analysed was the participants' preferred geographic location of future medical practice (urban/rural). Workplace rotations were assessed by evaluating whether graduates completed one or more rotations in a rural location during that year.

### **Statistical approach**

Data were received de-identified from MSOD, with schools classified according to their geographic location (urban/rural). All urban/rural categorisation was performed according to the Australian Standard Geographical Classification – Remoteness Area (ASCG-RA) with RA2–RA5 classified as rural, consistent with Gerber & Landau.<sup>10</sup>

Logistic regression for preferences and rotations was performed to determine associations between the outcomes and covariates, and allow for consideration of the odds of rural preference and rotations at PGY1 and PGY3.

Potential confounders and predictive covariates included in the logistic regression models were demographics, rural background, scholarships, funding scheme, medical school location, degree level, rural club membership status and self-reported preferred location of future medical practice at commencement of medical school, as specified in footnotes to Table 2.

Multivariate logistic regression was performed incorporating covariates that were statistically significant in the univariate model to determine the factors associated with rural preferences and rotations. Data were analysed using SPSS version 22.0 (SPSS Inc).

## **Results**

There were 4028 graduates from Australian medical schools who fit the inclusion criteria and completed a CMSQ and a PGY1 and/or PGY3 questionnaire between 2006 and 2013. Of these, 3936 completed PGY1 and 1050 completed PGY3 questionnaires (Figure 1).

There was a predominance of graduate-entry degree level (66%) and female (56%) participants. Their mean age was 27.85 years, with just over 20% self-reporting a rural background, having lived rurally for the longest time of their life or having a commencing practice location preference as rural (Table 1).

At PGY1 and PGY3, 19% (n=753) and 22% (n=235), respectively reported a preferred practice location of rural, and 41% (n=946) and 51% (n=536), reported completing a rotation in a rural location during PGY1 and PGY3, respectively.

Many variables were significant on univariate analysis but most of these were not significant in the multivariate model. We report only on variables significant in both uni- and multi-variate analysis.

Multivariate analysis showed that among graduates who had a preference for rural practice location at medical school commencement the odds of having a preference for rural practice location at PGY1 and PGY3 were 6.07 and 7.95 respectively, when compared to those who had an urban preference at medical school commencement. John Flynn Placement Program (JFPP) recipients were more likely to have a preference for rural practice location during PGY1. The odds ratio of having a preference for rural practice location was 1.06 for age (continuous) for both PGY1 and PGY3 graduates (Table 2).

For PGY3 preferences, there was a significant interaction between the commencing preference and participant's background (urban/rural). Those with a commencing preference of rural were significantly more likely to have a preference of rural at PGY3 irrespective of whether they had an urban or rural background and this was more pronounced in those with a rural background; those with urban backgrounds and a commencement preference of rural were more likely to have a rural preference

at PGY3 than those with rural backgrounds and a commencement preference of urban (Table 2). These findings indicate that the effect of preferred practice location at medical school commencement is independent of, and enhances the effect of, rural background.

On multivariate analysis, having a preference for rural practice location at the commencement of medical school was the most consistent predictor of completing a rural rotation in PGY1 and PGY3, and there was a significant interaction between degree level and commencing preference. Graduates with an urban commencing preference and from graduate-entry degrees were significantly less likely to do a rotation in a rural area during PGY1 (Table 3). Having lived the longest in a rural location increased the odds of completing a rural rotation during PGY1. Those with dependent children were significantly less likely to complete a PGY3 rural rotation .

## **Discussion**

Our findings revealed that self-reported preferred practice location at medical school commencement was the most consistent predictor of preferred rural practice location and completing a rural rotation in the first and third years after graduation. Furthermore, the effect of preferred practice location at medical school commencement is independent of, and enhances the effect of, rural background. This type of analysis of medical student outcomes was not possible prior to the MSOD project.<sup>9</sup> For this reason, the importance of commencement preference had neither been recognised, nor controlled for, when assessing the influence of medical school selection policies and education programs aimed at increasing rural medical recruitment. We furthered the findings of Jones *et al*,<sup>7</sup> to demonstrate that preferred practice location at medical school commencement is not only associated with preferred, but also actual, workplace locations post-graduation for PGY3.

A significant proportion of graduates participated in one or more rural rotation (41% of PGY1 and 51% of PGY3 respondents) despite an average of only 20% having a preference for rural practice location. This could indicate openness of graduates to experience rural medicine despite not intending to work rurally long term, or deployment of junior doctors to rural rotations from urban centres,<sup>5</sup> despite this not being their preference.

Although one study demonstrated a significant relationship between intentions and rural career outcomes,<sup>11</sup> preferences may not correlate with actual career,

highlighting the importance of long term follow up and consideration of actual rotations completed. We observed much stronger associations between self-reported preferred practice location at medical school commencement and preferred practice location at PGY1 and PGY3, than between self-reported preferred practice location at medical school commencement and completion of a rural rotation in PGY1 or PGY3. This may be due to limited availability of rural positions to junior doctors,<sup>5</sup> as PGY1 rotations are determined by internship requirements<sup>12</sup> and PGY3 by availability of post-graduate training positions. Aside from the rural generalist pathway, many specialties require training in metropolitan centres,<sup>13</sup> potentially restricting some from working rurally even if that is their preference. This highlights the importance of rural prevocational and specialist training opportunities, such as the Department of Health's Specialist Training Program.<sup>14</sup>

Bonded PGY3 participants were slightly more likely to have a preference for rural practice location (Table 2). However this association was of borderline significance and further evaluation is required to assess this relationship.

Older age was positively associated with having a preference for rural location but did not increase the odds of actually working rurally. This contrasts the results of a recent Western Australian study which, for graduates of at least PGY3, demonstrated that older age groups were more likely to work rurally<sup>5</sup>. This demonstrates the importance of longer term evaluation of these factors, as our study includes up to PGY3 only.

Having dependent children or being in a graduate-entry program were negatively associated with working rurally despite these factors having no influence on preference for rural practice. These observations have not been documented previously and are significant because the number of graduate-entry programs in Australia are increasing,<sup>15</sup> which could potentially compound rural workforce shortages. A reason for the negative association with dependent children could be education, as Henry *et al*<sup>16</sup> explored, concerns regarding educational opportunities for children were significant influencing factors on rural career choice.

A potential limitation of this study is the inability to control for RCS exposure as MSOD questionnaires did not collect this data. Kondalsamy-Chennakesavan *et al.*<sup>6</sup> reported that RCS participation and rural background are both independent predictors of rural medical practice and that their effects are duration dependent, but their study did not control for preferred practice location at medical school commencement

which is likely to be a key determinate of RCS participation. Future research on the effect of RCS participation on rural preferences and practice location should include preferred practice location at medical school commencement as a covariate.

Although we grouped medical schools into urban/rural based on their geographic location to account for rurally located training, it is important to acknowledge that our analysis was unable to control for differences in rural focus and exposure, as well as selection criteria, between medical schools.

The modest effect of the JFPP scholarship on preference for rural practice location in PGY1 could be interpreted as disappointing. However, when considering the value of this and other programs that promote rural medicine it is important to reflect on outcomes and benefits beyond that of recruiting medical graduates to work in rural Australia. Programs such as JFPP and other community-based rural placement programs have a role in developing medical students' understanding of the rural community context and its impact on health and health services so that medical graduates, regardless of where they work, are better equipped to provide quality care to rural people and provide collegial support to their rural colleagues.<sup>17</sup>

This study indicates that rural career intentions are determined largely prior to medical school commencement. Therefore it is essential to better understand what determines rural preference at medical school commencement, continue collecting data about preferred practice location at medical school commencement and adjust for this factor when evaluating the effectiveness of programs aimed at recruiting medical graduates to work in rural Australia. As of 2014, the MSOD medical school commencement and completion/postgraduate questionnaires were collated into a single questionnaire to be completed in the final year of medical studies.<sup>18</sup> This means we will no longer capture students' commencement preferences nor be able to consider this in future analysis models.

The contribution of the influence of initial preference, degree level and dependent children is a valuable addition to our understanding of the complex factors involved in influencing rural career choices. This validates the importance of further studies to allow for additional exploration of these aspects beyond PGY3 and the importance of controlling for initial preferences when evaluating the effectiveness of programs in increasing rural uptake.

Words: 2047

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Table 1: Demographics of graduates of Australian medical schools who completed both the commencing medical school and postgraduate year 1 and/or 3 Medical Schools Outcomes Database questionnaires between 2006 and 2013.

<b>Demographics</b>	<b>Participants</b>
	<b>(n=4028)</b>
Graduate-entry degree: <i>n</i> (%)	2667 (66)
Age <sup>†</sup> : mean (SD)	27.85 (4.76)
Married/living with partner <sup>†</sup> : <i>n</i> (%)	1723 (43)
Dependent children <sup>†‡</sup> : <i>n</i> (%)	370 (9)
Female gender: <i>n</i> (%)	2255 (56)
Rural background <sup>§</sup> : <i>n</i> (%)	860 (21)
Location lived longest (rural): <i>n</i> (%)	897 (22)
Preferred location (rural) at medical school commencement: <i>n</i> (%)	902 (22)

Demographics sourced from commencing medical school questionnaire.

<sup>†</sup>Age, marital and dependent children status sourced from the postgraduate year one questionnaire. <sup>‡</sup>Dependent children =  $\geq 1$  dependent child under 16 years old. <sup>§</sup>Rural background self reported.

Table 2: Multivariate logistic regression for factors associated with having a preference for rural practice location during post graduate year one (PGY1) and three (PGY3) for graduates of Australian medical schools between 2006 and 2013.

Outcomes	Adjusted significant factors <sup>†</sup>	OR	95% CI	P-value
<b>Preference for rural practice location</b>				
PGY1	Commencing preference rural <sup>‡</sup> (versus urban)	6.07	4.91, 7.51	<0.001
	Location lived longest (rural versus urban)	3.12	2.52, 3.88	<0.001
	JFPP (recipient versus not)	1.58	1.15, 2.18	0.005
	Age (continuous)	1.06	1.04, 1.08	<0.001
PGY3	Commencing preference rural <sup>‡</sup> (versus urban)	7.95	4.93, 12.84	<0.001
	Rural background <sup>§</sup> (versus none)	3.23	1.84, 5.68	<0.001
	Bonded (versus not bonded)	1.45	0.98, 2.16	0.066
	Age (continuous)	1.06	1.02, 1.10	0.001
	Interaction between commencing preference <sup>‡</sup> and background <sup>§</sup> (versus urban commencing preference with urban background)			
	Rural commencing preference, rural background	10.96	6.99, 17.19	<0.001
	Rural commencing preference, urban background	7.98	4.99, 12.77	<0.001
	Urban commencing preference, rural background	3.02	1.74, 5.25	<0.001

<sup>†</sup>Adjusted for demographics (gender, age, marital status [married/living with partner or single], dependent children), rural background (self-reported, location lived the longest in Australia, living rurally >5 years since primary school, attending rural secondary school), scholarships (JFPP, Rural Australia Medical Undergraduate Scholarship), entry scheme (bonded [Medical Rural Bonded Scholarship, Bonded Medical Places and state bonded], fee paying status [full-fee paying or other]), medical school location (urban/rural), degree level (graduate-entry/undergraduate), rural club membership status and preferred location of future medical practice at commencement of medical school. Variables not listed in this table were not significant, nor had interactions, in the multivariate logistic regression model.

<sup>‡</sup>Self reported preferred geographic location of future medical practice at commencement of medical school (rural versus urban).

<sup>§</sup> Rural background self reported.

CI, confidence interval; OR, odds ratio; JFPP, John Flynn Placement Program.

Table 3: Multivariate logistic regression for factors associated with working rurally during post graduate year one (PGY1) and three (PGY3) for graduates of Australian medical schools between 2006 and 2013.

Outcomes	Adjusted significant factors <sup>†</sup>	OR	95% CI	P-value
<b>Completing one or more rotation in a rural location</b>				
PGY1	Location lived longest (rural versus urban)	1.46	1.20, 1.76	<0.001
	Commencing preference rural <sup>‡</sup> (versus urban)	1.38	1.01, 1.88	0.04
	Graduate-entry degree level (versus undergraduate)	0.58	0.49, 0.69	<0.001
	Interaction between commencing preference <sup>‡</sup> and degree level (versus urban commencing preference with undergraduate degree level)			
	Commencing preference urban, graduate-entry degree	0.54	0.49, 0.61	<0.001
	Commencing preference rural, undergraduate degree	1.31	0.98, 1.74	0.07
	Commencing preference rural, graduate-entry degree	1.13	0.92, 1.38	0.23
PGY3	Commencing preference rural <sup>‡</sup> (versus urban)	1.86	1.30, 2.64	0.001
	Dependent children <sup>¶</sup> (versus none)	0.50	0.34, 0.72	<0.001

<sup>†</sup>Adjusted for demographics (gender, age, marital status [married/living with partner or single], dependent children), rural background (self-reported, location lived the longest in Australia, living rurally >5 years since primary school, attending rural secondary school), scholarships (John Flynn Placement Program, Rural Australia Medical Undergraduate Scholarship), entry scheme (bonded [Medical Rural Bonded Scholarship, Bonded Medical Places and state bonded], fee paying status [full-fee paying or other]), medical school location (urban/rural), degree level (graduate-entry/undergraduate), rural club membership status and preferred location of future medical practice at commencement of medical school.

Variables not listed in this table were not significant, nor had interactions, in the multivariate logistic regression model.

<sup>‡</sup>Self reported preferred geographic location of future medical practice at commencement of medical school (rural versus urban).

<sup>¶</sup> Dependent children =  $\geq 1$  dependent child under 16 years old.

CI, confidence interval; OR, odds ratio.

Figure 1: Participants included in study.

(see attachment Figure 1)

†Australian medical schools only, overseas campuses excluded.