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Original Research

Academic performance of third-year medical students learning in rural settings

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Abstract

Objective: *Investigate the academic performance of medical students in rural and remote discipline rotations by rurality of placement.*
Design: *A retrospective cohort study.*
Setting: *Rural and remote clinical placement locations in Queensland, Australia.*
Participants: *University of Queensland third-year medical students.*
Main outcome measures: *In this study, student results for a range of assessments are the main outcome measures with rural area of student placement locations as categorised by the Australian Standard Geographical Classification – Remoteness Areas system the independent variable of interest.*
Results: *There was a significant effect of Australian Standard Geographical Classification – Remoteness Areas of placement on the health project, clinical case presentation, clinical participation assessment and overall grade, after controlling for the potential confounding impact of sex, age, students who attended the rural clinical school, cohort year, rotation during the year and type of health service where students were placed. No significant effect of rural placement level was identified for the written examination, poster or journal of achievement assessments.*
Conclusion: *Medical students' academic achievement is associated with many factors, but this study shows that being placed in remote areas is one factor that either does not impede or can positively influence the learning and academic performance of medical students.*

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Introduction

Facilitating medical students to consider pursuing careers in rural practice as part of their training is a common practice in many countries. Students highly rate their rural experience because it provides them with useful hands-on experience, reasonable autonomy, collaboration with community providers and an understanding of community needs.[1,2]

A review by Barrett *et al.*[3] showed that placement in rural settings is a positive learning experience that students and preceptors valued.[4] However, student experiences differ due to the availability of patients with varying clinical conditions and the range of specific clinical practice situations.[4] Inevitably, there is variation in the amount of direct observation and feedback received from preceptors, the educational experience and the number and types of procedures performed by each student.[1] There are concerns that students at rural sites might encounter a poor academic environment that could compromise their clinical development.[1,5]

There is a paucity of data comparing the academic performance of medical students specifically learning in rural and remote settings. It is important to determine academic performance under these conditions as the quality of education is mostly assessed on the basis of academic performance with assessment results being the primary indicators.[6] Students highly value academic performance as a measure[5] and they are positively affected by good results.[7] Therefore, knowing students will not be academically disadvantaged is important.[8]

This study compared the academic performance of third-year medical students in their first clinical year undertaking rural and remote discipline rotations, from 2000 to 2014. It was hypothesised that the academic performance of students did not differ by rurality of placement.

***What is already known on this subject*:**
- *Much is known about how the academic performance of medical students who learn in rural and remote settings in Australia, but not in relation to specific Australian Standard Geographical Classification – Remoteness Areas.*

***What this study adds*:**
- *This unique study, extending over 14 years and multiple rural settings, significantly adds to the literature by affirming the equivalency of educational outcomes in specific Australian Standard Geographical Classification – Remoteness Areas.*
- *This not only reassures medical students, but also preceptors and educators, that learning in a rural and remote environment can support high academic achievement.*

Method

Participants and setting

At the University of Queensland (UQ), medical students are allocated to a rural, metropolitan or overseas clinical school in their third year.

Third year consists of five rotations (eight weeks' duration), one of which is Medicine in Society whereby all domestic students need to undertake Stream A Rural and Remote Medicine. Students enter rural placement preferences but do not always get their top preferences due to preceptors or accommodation not being available.

Week 1 involves a structured orientation program, comprising lectures and procedural workshops. The core of each student's learning experience is a six-week clinical placement in inner regional-to-very remote regions, defined according to the Australian Standard Geographical Classification – Remoteness Areas (ASGC-RA):[9]

- RA2 – Inner Regional Australia
- RA3 – Outer Regional Australia
- RA4 – Remote Australia
- RA5 – Very Remote Australia.

These rural placements are the subject of this study.

Students are immersed in rural medicine and work closely with their preceptor in providing health care in either a medical practice, hospital, a combination of medical practice and hospital or a remote setting. Clinical practice across facilities shares common parameters, including isolation from larger centres and their diagnostic and interventional facilities, a professionally challenging environment and a generalist-based multiskilled model of service provision. While on placement, students complete three assessments, and in the final debrief week, they sit for a written examination.

Some assessment components have changed over time or become redundant. The health project was renamed, while the written examination and clinical case presentation assessments have been consistent.

Preceptors rate their students using a standardised clinical preceptor assessment and clinical case presentation templates. All other assessments are marked using a standardised template by independent markers. These templates aid consistency of measurement by providing explicit, observable performance criteria against which performance is judged.[2]

Overall grade is derived by calculating the weighted average percentage mark achieved across assessment tasks (all equally weighted).

Data collection

For the years 2000–2014, 4616 student assessment records were accessed through Faculty of Medicine databases. Data were not available for Rotation 1, 2000, Rotation 5, 2001, and Rotations 2, 3, 4 and 5, 2002. Of the available assessment records, 889 (19.3%) were excluded from this study. This included 235 records where the placement location could not be identified, 561 international student assessment records (Stream B–E students who either did not undertake a rural placement in Australia or completed a metropolitan placement in Brisbane, Australia, and 93 records associated with placements in Caboolture, Caloundra and Buderim Table 1). Under the Rural Remote Metropolitan Area (RRMA)[10] classification, these locations were considered rural but RRMA was superseded by the ASGC-RA system in 2009, so these locations are no longer considered rural.

Table 2 shows the study variables and the years for which they are available, including the independent variable, remoteness of placement location, seven assessment item dependent variables and six variables included to account for potential confounding factors.

Analysis

Characteristics of the study sample are described (*n*, %) by level of rural placement (RA2–RA4). Descriptive statistics (mean, standard deviation (SD)) are used to summarise dependent variables (six individual assessments and overall grade) by level of rural placement. A one-way MANCOVA was conducted to determine the

TABLE 1: *Details of data excluded from the study analysis*

Year	RA 1 exclusions	International students				No location/RA available	Total
		Stream B	Stream C	Stream D	Stream E		
2000						122	122
2001						82	82
2002						31	31
2004	3						3
2005	2						2
2006	5						5
2007	23						23
2008	21						21
2009	15	4					19
2010	10	14		18	15		57
2011	9	18		9	21		57
2012	4	21	110				135
2013	1	9	161				171
2014		30	131				161
Total	93	96	402	27	36	235	889

TABLE 2: *Details of study variables*

Independent variable/predictor
- ASGC-RA placement location data available from 2000 to 2014

Dependent/outcome variables
- Written examination results 2000–2014
- Clinical case presentation results 2007–2013
- Health project results 2007–2013
- Clinical participation assessment results 2007–2012
- Journal of achievement results 2001–2008
- Poster results 2003
- Overall grade results 2000–2014

Covariates
- Sex available 2000–2014
- Age available 2003–2014
- Cohort year available 2000–2014
- Rotation during year available 2000–2014
- Health service type available 2000–2014
- Clinical school (RCS-metropolitan clinical school) available 2007–2014

No data available for 2002. RCS, rural clinical school.

effect of ASGC-RA on student assessments, controlling for the potential confounding effects of sex, age, cohort year, rotation during the year, type of health facility and clinical school (rural or metropolitan). Correlations were calculated to demonstrate: bivariate relationships among outcome variables (assessment items); among potential confounding factors; and between outcome variables and potential confounding factors.

Variation in the number of assessment variables across cohort years meant that testing the effects of all assessment variables in one analysis incurred large amounts of data loss. Therefore, a stepped approach was taken with an initial analysis incorporating the largest number of variables collected over the largest number of cohorts, followed by more targeted analyses with assessment variables collected in a limited number of cohorts.

A comparison ANCOVA was conducted with overall grade. An omnibus test (MANCOVA or ANCOVA) indicated a significant difference across ASGC-RA categories, whereas follow-up univariate tests conducted with individual dependent variables identified the location of the significant differences. Statistical significance was evaluated at $P < 0.05$.

Ethics clearance was obtained from the Behavioural and Social Sciences Ethical Review Committee, UQ. Data were analysed using IBM SPSS Statistics for Windows, (v. 22; IBM Corporation, Armonk, NY, USA).

Results

Assessment records for 3727 students were available to be analysed. The number varied from 64 to 373 students per year from 2000 to 2014 (Table 3). Of the 3727 students, 42.6% were placed in a RA-2 location, 34.8% RA-3, 14.4% RA-4 and 8.2% RA-5. The age of 3571 students ranged from 20 to 59 years, with a mean of 25.34 (SD 4.17).

Of the 3554 students with type of health service data available, almost half were placed in a hospital

and one-third in a medical practice. Fewer than 10% were located in a combined medical practice and hospital or a remote area (Top End, Central Australia, Royal Flying Doctor Service or Mt Isa Centre for Rural & Remote Health).

The written examination is the only assessment conducted over the entire 14-year study period, while the poster assessment occurred only in the 1 year (Table 4). Three of the assessments (written examination, health project and clinical participation assessment) included student results covering the full (1–7) range of grades possible. Mean grades for assessment variables by placement rurality ranged from 5.28 to 6.00.

TABLE 3: *Characteristics of study sample as per ASGC-RA location* (n, *%)*

		Level of rural placement			
Characteristic	Total *n* (%)	RA2	RA3	RA4	RA5
Sex	3727				
Female	1715 (46.0)	735 (42.9)	595 (34.7)	246 (14.3)	139 (8.1)
Male	2012 (54.0)	854 (42.4)	701 (34.8)	290 (14.4)	167 (8.1)
Age (years)	3571				
20–24	2007 (56.2)	859 (56.3)	716 (57.0)	272 (55.2)	160 (54.1)
25–29	1163 32.6)	472 (31.0)	414 (32.9)	170 (34.5)	107 (36.1)
30–34	262 (7.3)	115 (7.5)	93 (7.4)	37 (7.5)	17 (5.7)
35–40	94 (2.6)	54 (3.5)	23 (1.8)	7 (1.4)	10 (3.4)
40 and over	45 (1.3)	25 (1.6)	11 (0.9)	7 (1.4)	2 (0.7)
Clinical school	2588				
Rural	630 (24.3)	213 (33.8)	221 (35.1)	120 (19.0)	76 (12.1)
Metropolitan	1958 (75.7)	927 (47.3)	674 (34.4)	224 (11.4)	133 (6.8)
Service type	3554				
Medical practice	1174 (33.0)	581 (49.5)	455 (38.8)	103 (8.8)	35 (3.0)
Hospital	1731 (48.7)	885 (51.1)	546 (31.5)	178 (10.3)	122 (7.0)
Combination	323 (9.1)	28 (8.7)	175 (54.2)	81 (25.1)	39 (12.1)
Remote	326 (9.2)	0 (0.0)	81 (24.8)	154 (47.2)	91 (27.9)
Rotation during year	3727				
1	726 (19.5)	327 (45.0)	238 (32.8)	98 (13.5)	63 (8.7)
2	774 (20.8)	327 (42.2)	269 (34.8)	113 (14.6)	65 (8.4)
3	773 (20.7)	322 (41.7)	271 (35.1)	125 (16.2)	55 (7.1)
4	731 (19.6)	304 (41.6)	266 (36.4)	105 (14.4)	56 (7.7)
5	723 (19.4)	309 (42.7)	252 (34.9)	95 (13.1)	67 (9.3)
Cohort year	3727				
2000	64 (1.7)	16 (25.0)	23 (35.9)	24 (37.5)	1 (1.6)
2001	79 (2.1)	41 (51.9)	11 (13.9)	19 (24.1)	8 (10.1)
2003	236 (6.3)	93 (39.4)	77 (32.6)	45 (19.1)	21 (8.9)
2004	225 (6.0)	88 (36.2)	76 (40.7)	39 (17.3)	22 (9.8
2005	243 (6.5)	88 (36.2)	99 (40.7)	35 (14.4)	21 (8.6)
2006	310 (8.3)	124 (40.0)	119 (38.4)	43 (13.9)	24 (7.7)
2007	280 (7.5)	122 (43.6)	96 (34.3)	35 (12.5)	27 (9.6)
2008	312 (8.4)	109 (34.9)	134 (42.9)	45 (14.4)	24 (7.7)
2009	373 (10.0)	158 (42.4)	146 (39.1)	46 (12.3)	23 (6.2)
2010	349 (9.4)	132 (37.8)	142 (40.7)	46 (13.2)	29 (8.3)
2011	370 (9.9)	172 (46.5)	111 (30.0)	47 (12.7)	40 (10.8)
2012	309 (8.3)	160 (51.8)	84 (27.2)	41 (13.3)	24 (7.8)
2013	287 (7.7)	145 (50.5)	82 (28.6)	38 (13.2)	22 (7.7)
2014	290 (7.8)	141 (48.6)	96 (33.1)	33 (11.4)	20 (6.9)
Total	3727 (100.0)	1589 (42.6)	1296 (34.8)	536 (14.4)	306 (8.2)

No data available for 2002.

TABLE 4: *Description of study variables by rural placement*

Study variable	Number (range)	Overall Mean (SD)	Mean (SD) by rural placement			
			RA2	RA3	RA4	RA5
Written examination (2000–2014)	3677 (1–7)	5.32 (0.98)	5.30 (0.99)	5.30 (0.96)	5.40 (1.00)	5.37 (0.92)
Clinical case presentation (2007–2013)	2265 (2–7)	5.56 (0.84)	5.52 (0.82)	5.57 (0.85)	5.49 (0.85)	5.74 (0.85)
Health project (2007–2013)	2269 (1–7)	5.34 (1.04)	5.28 (1.01)	5.34 (1.06)	5.41 (1.00)	5.61 (1.10)
Clinical participation assessment (2007–2012)	1969 (1–7)	5.40 (0.88)	5.40 (0.88)	5.39 (0.85)	5.35 (0.86)	5.58 (0.88)
Journal of achievement (2001–2008)	1456 (2–7)	5.55 (0.97)	5.46 (0.95)	5.60 (0.98)	5.57 (0.95)	5.75 (0.98)
Poster (2003)	232 (2–7)	5.68 (1.06)	5.62 (1.08)	5.62 (1.10)	6.00 (0.90)	5.47 (1.02)
Overall grade (2000–2014)	3697 (2–7)	5.45 (0.85)	5.41 (0.84)	5.45 (0.85)	5.48 (0.84)	5.60 (0.87)

No data available for 2002.

Of the potential confounding variables, sex was significantly correlated with five of the seven assessment items (Table 5). Similarly, rotation was significantly correlated with six of the assessment items and cohort year with four assessment items. In contrast, age was only significantly correlated with three assessment items and rural clinical school with two assessment items. The health service type was not significantly related to any student assessment results. Significant bivariate correlations among assessment variables ranged from small ($r = 0.060$) to large ($r = 0.685$).

Tests showed that multivariate analysis assumptions were met. The multivariate test (MANCOVA) for the main effect of rurality of placement on written examination, clinical case presentation, health project and clinical participant assessment was significant $F(12, 5634) = 3.178$, $P < 0.001$, after controlling for the potential confounding effects of sex, age, cohort year, rotation, service type and attendance at RCS. Significant univariate main effects for rurality were obtained for clinical case presentation: $F(3, 1879) = 4.908$, $P = 0.002$; health project: $F(3, 1879) = 7.300$, $P < 0.001$; and clinical participation assessment: $F(3, 1879) = 2.890$, $P = 0.035$. No significant effect was obtained for written examination.

Post hoc comparisons indicated that the health project mean score for students placed in RA5 areas was higher than for students placed in RA2 ($P < 0.001$), RA3 ($P = 0.001$) and RA4 ($P = 0.014$) areas. Similarly, for the clinical case presentation assessment, students in RA5 areas had higher mean scores than students in RA2 ($P = 0.001$), RA3 ($P = 0.017$) and RA4 ($P = 0.003$) areas. Clinical participation assessment showed the same effect, with RA5 student mean scores higher than for students in RA2 ($P = 0.017$), RA3 ($P = 0.013$) and RA4 ($P = 0.01$) areas.

Significant effects on assessment results were associated with the covariates of sex ($F(4, 1876) = 11.297$, $P < 0.001$), attendance at the RCS ($F(4, 1876) = 2.681$, $P = 0.030$), cohort year ($F(4, 1876) = 3.066$, $P = 0.016$) and rotation ($F(4, 1876) = 9.849$, $P < 0.001$). There was no significant difference in assessment results associated with age or the type of health service that students attended.

Rural placement was associated with the final student grade, as assessed by overall grade ($F(3, 2461) = 4.831$, $P = 0.002$), after accounting for the effects of potential confounding factors (sex, age, cohort year, rotation, service type and RCS status). Supplementary multivariate analyses showed no significant effect of rurality of placement on the poster or the journal of achievement assessments.

Discussion

Students in rural locations encounter an environment that supports their academic performance and clinical development[1,5] and provides a positive learning experience.[3] One study showed that most rural and remote students did not think they had missed out academically[11] and another study found that rural students did not receive unfavourable exam results.[1]

This study showed that students placed remotely (RA5) achieved a higher mark for their health project, clinical case presentation and clinical participation assessments, which sometimes resulted in a better overall grade.

The intensive nature of the rural experience could have contributed to the assessment performance of those students who chose to go remote.[12] Specifically, students receiving high health project assessment marks might have benefited from the way remote communities viewed and valued their own participation in these projects,[13] aimed at identifying and addressing community need.

The clinical case presentation assessment is used in real clinical settings and has a known reliable

TABLE 5: *Correlations among study variables (P)*

	Age	Cohort year	Rotation during year	Health service type	Clinical school location	Rural placement	Written examination	Clinical case presentation	Health project	Clinical participation	Journal of achievement	Poster	Overall grade
Sex	0.059	−0.045	−0.015	0.019	−0.011	−0.005	0.047	0.054	0.131	0.032	0.135	0.079	0.080
	(0.000)	(0.006)	(0.367)	(0.252)	(0.560)	(0.778)	(0.004)	(0.010)	(0.000)	(0.158)	(0.000)	(0.232)	(0.000)
Age	—	−0.138	−0.012	0.030	−0.024	−0.023	−0.071	−0.029	−0.006	0.005	−0.062	−0.037	−0.078
		(0.000)	(0.462)	(0.077)	(0.233)	(0.166)	(0.000)	(0.173)	(0.777)	(0.827)	(0.019)	(0.574)	(0.000)
Cohort year	—	—	0.012	−0.100	−0.022	−0.072	0.038	0.081	0.035	0.058	−0.061	—†	−0.023
			(0.447)	(0.000)	(0.266)	(0.000)	(0.021)	(0.000)	(0.094)	(0.010)	(0.020)		(0.156)
Rotation during year	—	—	—	0.018	−0.006	0.008	0.093	0.076	−0.021	0.096	0.099	−0.171	0.085
				(0.275)	(0.752)	(0.644)	(0.000)	(0.000)	(0.325)	(0.000)	(0.000)	(0.009)	(0.000)
Health service type	—	—	—	—	0.048	0.117	−0.022	0.000	−0.022	0.012	0.048	−0.001	−0.012
					(0.016)	(0.000)	(0.197)	(0.990)	(0.292)	(0.603)	(0.075)	(0.991)	(0.484)
Clinical school location	—	—	—	—	—	0.145	0.051	0.029	0.026	0.003	0.029	—‡	0.057
						(0.000)	(0.010)	(0.164)	(0.219)	(0.890)	(0.495)		(0.004)
Rural placement level	—	—	—	—	—	—	0.031	0.046	0.083	0.030	0.081	0.048	0.059
							(0.064)	(0.029)	(0.000)	(0.182)	(0.002)	(0.469)	(0.000)
Written examination	—	—	—	—	—	—	—	0.138	0.115	0.117	0.060	0.228	0.521
								(0.000)	(0.000)	(0.000)	(0.024)	(0.000)	(0.000)
Clinical case presentation	—	—	—	—	—	—	—	—	0.196	0.685	0.172	—‡	0.638
									(0.000)	(0.000)	(0.000)		(0.000)
Health project	—	—	—	—	—	—	—	—	—	0.146	0.194	—‡	0.526
										(0.000)	(0.000)		(0.000)
Clinical participation assessment	—	—	—	—	—	—	—	—	—	—	0.152	—‡	0.628
											(0.000)		(0.000)
Journal of achievement	—	—	—	—	—	—	—	—	—	—	—	0.356	0.464
												(0.000)	(0.000)
Poster	—	—	—	—	—	—	—	—	—	—	—	—	0.492
													(0.000)

†No value; cohort year is a constant for Poster; ‡no value; comparison variable data not collected in same year as Poster.

assessment methodology.[14] Both the clinical case presentation and clinical participation assessment are marked by preceptors and involve assessment of professionalism and core clinical skills. For these assessments, remote students might have benefited from having more opportunities to see a wider array of patients and experience more continuity of care with less competition from other learners.[15,16] Alternatively, the significant variation between student results across ASGC-RA locations could also suggest subjectivity, different expectations about performance level or the effect of multiple ratings across different cases influencing preceptors' judgement.[17]

Despite overall grade being derived from different combinations of assessment over the years, this study showed that rural placement was associated with student's final grade. Similarly, one study found generally rural students achieved higher overall grades and higher clinical evaluations.[12] While we have no reason to expect that higher-achieving students are more likely to select a rural or remote placement, we were unable to account for this factor and this remains a limitation of this study.

The sex difference in academic achievement was significant, revealing higher academic performance of female students compared to their male counterparts for five of the assessments. These results are consistent with previous research,[18] with the difference attributed to their motivation for academic success.[19] However, the age of students did not account for assessment differences across the rural areas. One study found no significant effect for age on measures of academic performance.[20]

Comparing academic performance between students with prolonged rural and urban experience has shown different results. This study found students who spent the academic year in a RCS achieved significantly better written examination and overall grade assessment results than those students located in a metropolitan clinical school. In contrast, one study found academic performance among students studying in rural and urban settings was comparable.[8] Conversely, another study showed that the academic performance of students from urban areas was better than the performance of students from rural areas.[6]

This study found no significant difference in assessment results associated with the type of health service. Other research also suggests students being taught in combination facilities should not have concerns about their academic performance,[21] particularly as most students are exposed to high-quality education and dedicated teaching time.[22] This includes general practice, which can provide one-on-one teaching with greater access to patients with chronic conditions or undifferentiated illness outside the hospital setting.[23] Students have indicated that general practice and hospital teaching complement each other and recognise basic clinical skills can be learnt in either setting, but for some areas, they are more appropriately learned in one rather than the other.[24]

This study has established that medical students' academic achievement was associated with many factors, but being placed in remote areas is one factor that either does not impede or can positively influence the learning and academic performance of medical students.

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Author's contributions

Both authors have made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; drafting the work or revising it critically for important intellectual content; final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Ethical approval

Approval was granted by the Behavioural & Social Sciences Ethical Review Committee – Approval Number 2014001071 on the 14/08/2014.

References

1 Bennard B, Wilson JL, Ferguson KP, Sliger C. A student-run outreach clinic for rural communities in Appalachia. *Academic Medicine* 2004; **79**: 666–671.
2 Council AM. *Workplace Based Assessment Resource Guide*. Kingston, ACT: Australian Medical Council Limited, 2009.
3 Barrett FA, Lipsky MS, Nawal Lutfiyya M. The impact of rural training experiences on medical students: a critical review. *Academic Medicine* 2011; **86**: 259–263.
4 Alhaqwi AI, van der Molen HT, Schmidt HG, Magzoub ME. Determinants of effective clinical learning: a student and teacher perspective in Saudi Arabia. *Education for Health (Abingdon, England)* 2010; **23**: 369.

5 Worley P, Esterman A, Prideaux D. Cohort study of examination performance of undergraduate medical students learning in community settings. *BMJ* (Clinical Research Ed.) 2004; **328**: 207–209.
6 Nasir M. Demographic characteristics as correlates of academic achievement of university students. *Academic Research International* 2012; **2**: 400.
7 Artino AR, La Rochelle JS, Durning SJ. Second-year medical students' motivational beliefs, emotions, and achievement. *Medical Education* 2010; **44**: 1203–1212.
8 Waters B, Hughes J, Forbes K, Wilkinson D. Comparative academic performance of medical students in rural and urban clinical settings. *Medical Education* 2006; **40**: 117–120.
9 Statistics ABo. *Australian Standard Geographical Classification*. Canberra: Australian Bureau of Statistics, 2011. [Cited 18 May 2016]. Available from URL: http://www.phcris.org.au/fastfacts/fact.php?id=8290
10 Australian Institute of Health and Welfare. *Rural, Remote and Metropolitan Areas (RRMA) Classification*. Canberra, CT: AIHW, 2016.
11 Wilson M, Cleland J. Evidence for the acceptability and academic success of an innovative remote and rural extended placement. *Rural and Remote Health* 2008; **8**: 960.
12 Maxfield H, Kennedy M, Delzell JJE, Paolo AM. Performance of third-year medical students on a rural family medicine clerkship. *Family Medicine* 2014; **46**: 536.
13 Preston R, Waugh H, Taylor J, Larkins S. The benefits of community participation in rural health service development: where is the evidence?. 10th National Rural Health Conference, Cairns, QLD, 2009.
14 Bergus GR, Woodhead JC, Kreiter CD. Using systematically observed clinical encounters (SOCEs) to assess medical students' skills in clinical settings. *Advances in Medical Education and Practice* 2010; **1**: 67–73.
15 Lacy NL, Paulman PM, Hartman TL. The effect of preceptorship rurality on students' self-perceived clinical competency. *Family Medicine* 2005; **37**: 404–409.
16 Jensen CC, DeWitt DE. The reported value of rural internal medicine residency electives and factors that influence rural career choice. *The Journal of Rural Health* 2002; **18**: 25–30.
17 Kreiter CD, Wilson AB, Humbert AJ, Wade PA. Examining rater and occasion influences in observational assessments obtained from within the clinical environment. *Medical Education Online* 2016; **21**: 29279.
18 Jaeger AJ, Eagan MK Jr. Exploring the value of emotional intelligence: a means to improve academic performance. *NASPA Journal* 2007; **44**: 8–935.
19 Rusillo MTC, Arias PFC. Gender differences in academic motivation of secondary school students. *Electronic Journal of Research in Educational Psychology* 2004; **2**: 97–112.
20 Carr SE, Celenza A, Puddey IB, Lake F. Relationships between academic performance of medical students and their workplace performance as junior doctors. *BMC Medical Education* 2014; **14**: 157.
21 Worley P, Strasser R, Prideaux D. Can medical students learn specialist disciplines based in rural practice: lessons from students' self reported experience and competence. *Rural and Remote Health* 2004; **4**: 338.
22 Kamien M. A comparison of medical student experiences in rural specialty and metropolitan teaching hospital practice. *The Australian Journal of Rural Health* 1996; **4**: 151–158.
23 Pearce R, Laurence CO, Black LE, Stocks N. The challenges of teaching in a general practice setting. *Medical Journal of Australia* 2007; **187**: 129–132.
24 O'Sullivan M, Martin J, Murray E. Students' perceptions of the relative advantages and disadvantages of community-based and hospital-based teaching: a qualitative study. *Medical Education* 2000; **34**: 648–655.