Victoria (MCCC)

GP Graduate Tracking Study: Phase 1 Report

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THE UNIVERSITY of ADELAIDE

SCHOOL OF PUBLIC HEALTH

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Abbreviations

ACRRM	Australian College of Rural and Remote Medicine
AGPT	Australian General Practice Training Program
AHPRA	Australian Health Practitioners' Agency
AMG	Australian Medical Graduate
ASGS	Australian Standard Geographical System
AST	Advanced Skills Training
ATSI	Aboriginal and Torres Strait Islander
CI	Confidence Interval
EST	Extended Skills Training
FACRRM	Fellow of the Australian College of Rural and Remote Medicine
FARGP	Fellowship in Advanced Rural General Practice
FRACGP	Fellow of the Royal Australian College of General Practitioners
GP	General Practice
GPs	General Practitioners
GPTT	General Practice Training Tasmania
IMG	International Medical Graduate
MMM	Modified Monash Model
MCCC	Murray City Country Coast GP Training
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
PGPPP	Prevocational General Practice Placement Program
Qld	Queensland
RACGP	Royal Australian College of General Practitioners
SA	South Australia
Vic	Victoria
WA	Western Australia
WAGPET	Western Australian General Practice Education and Training Ltd

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Executive summary

In 2014, Australia had 3.5 doctors per 1000 population[1] and has one of the highest number of medical graduates (15.3 graduates per 100,000) in the world, ranking third of 29 OECD countries.[2] This increase in graduates has arisen from a number of policies aimed at addressing workforce challenges. The major workforce issue in Australia for many years has been the uneven distribution of the workforce rather than absolute numbers.[3] This distribution is in terms of geography and speciality.

The most persistent challenge has been geographic maldistribution of the medical workforce, with shortages of doctors, mainly general practitioners (GPs), in rural and remote areas of Australia. Over the years, a number of strategies and programs have been implemented to address this problem. These have either focused on improving recruitment through education and training, financial incentives, regulatory such as the 10 year moratorium or support, such as locum support.

Research has shown that these strategies have been somewhat successful in influencing a rural practice location, but there is a dearth of evidence on the influence of strategies implemented during GP vocational training on subsequent practice location.

The aim of this study is examine the effectiveness of the AGPT program in addressing geographic maldistribution by determining the current practice location of GPs who graduated from the Tasmanian Regional Training Providers/Organisations in the last six years (2010-2016). More specifically, this phase of the study addresses the following questions:

1. Do GP graduates practice in a location (rural/urban) that matches their training pathway (rural/general)?
2. What factors are associated with practising in a location that matches their training pathway?

Data on graduates were obtained from the MCCC database and the Department of Health. Current practice location as at 30 September 2016, was obtained from the AHPRA database. Bivariate and univariate analysis was undertaken and a multivariable logistic regression model used to determine predictors of practice location.

The key findings from the study are outlined below:

Victorian (MCCC) graduates

- 326 MCCC graduates were included in the study with data on current practice location for 99 graduates.
- All graduates undertook the rural training pathway.
- Half of the rural pathway graduates are currently practising in a rural location and half are working in an urban location, with 77% practising in Victoria, the state of their vocational training location.
- For MCCC rural pathway graduates, several variables were found to be associated with current practice location (urban or rural). These included: country of birth (Chi square P value <0.0001), type of graduate (Chi square P value <0.0001), moratorium status (Chi square P value <0.0001); and age (Chi square P value 0.0018).
- The training characteristics found to be associated with current practice location (urban or rural) were: rural bonded student (Fisher Exact P value 0.0446), curriculum (Fisher Exact P value 0.0009), AGPT completion within five years (Chi square P value 0.0100) and number of qualifications (Chi square P value 0.0228).

- Seven graduates had undertaken an AST post during training with anaesthetics (43%) the most common discipline areas. For the 96 graduates who undertook an extended skill, general practice (48%) and Aboriginal health (17%) were the most common discipline areas.
- There is a statistically significant association between current pratie location and total FTE rural training and FTE training weeks at RA2 with rural total weeks being greater than urban total weeks for MCCC rural pathway graduates.

Predictors of practice location

- MCCC rural pathway graduates are 9 times more likely to be practising in a rural location if they were born in Australia (OR 9.31; 95% CI 5.02- 17.23).
- MCCC rural pathway graduates who were rurally bonded are 3 times more likely to be practising in a rural location (OR 3.38; 95% CI 1.10- 10.29).
- MCCC rural pathway graduates who had completed their training less than five years ago were 3 times more likely to be currently practising in a rural location than graduates who did not (OR 2.74; 95% CI 1.55-4.86).
- For every 10 week increase in Total FTE rural training weeks, the MCCC rural pathway graduates are 1% more likely to be currently practising in a rural location (OR 1.01; 95% CI 1.00-1.02).

Conclusion

This study provides evidence that parts of GP vocational training, along with experiences at the medical school level are important in influencing where a GP graduate will eventually practice.

We have found the following factors are important predictors for practising in a rural location: the amount of rural exposure during vocational training, being born in Australia, being a more recent graduate and having a rural bonded medical place.

GP training organisations such as MCCC are helping to address the geographic maldistribution of the workforce by supplying graduates that work in areas that have known workforce shortages – rural and remote locations. Moreover, most of these graduates are remaining in Victoria to practice.

Study limitations

The study had a number of limitations which related mainly to the availability of data.

- Variables were limited to those available from the GPTT and AHPRA databases and some important variables such as rural origin were not able to be obtained.
- AHPRA registration data is based on self-report and as such open to omissions and errors which may affect the outcome of the results.
- The study was cross sectional in design, in that data on current practice location was collected at one point in time. As such, analysis was only able to be undertaken on current practice location and it was not possible to examine the movement in practice location over time since graduation.
- This report is based on data for the rural pathway trained graduates from MCCC and does not include general pathway graduates from and so only provides part of the picture on practice location of graduates for the MCCC and all Victorian trained GP graduates.

Background

In 2014, Australia had 3.5 doctors per 1000 population[1] and has one of the highest number of medical graduates (15.3 graduates per 100,000) in the world, ranking third of 29 OECD countries.[2] This increase in graduates has arisen from a number of policies aimed at addressing workforce challenges. The major workforce issue in Australia for many years has been the uneven distribution of the workforce rather than absolute numbers.[3] This distribution is in terms of geography and speciality.

The most persistent challenge has been geographic maldistribution of the medical workforce, with shortages of doctors, mainly general practitioners (GPs) in rural and remote areas of Australia. Over the years, a number of strategies and programs have been implemented to address this problem. These have either focused on improving recruitment through education and training, financial incentives and the recruitment or retention of international medical graduates, through locum support, training, retention payments and ongoing professional development. For general practice, there have been a number of workforce strategies with the aim of increasing the number of GPs and/or influence their practice location. Many of these strategies have been implemented at undergraduate or graduate entry medical training, medical education and postgraduate training.[3 4]

At the medical school level these include:

- The John Flynn Placement Program
- Rural Australian Medical Undergraduate Scholarships (RAMUS)
- Bonded Medical places (BMP)
- 25% quota of rural background students
- Mandatory rural rotations at medical school; and
- Rural Clinical Schools

At the postgraduate level, those strategies that focussed on GP vocational training include:

- an increase GP training places;
- a rural pathway within the AGPT training program;
- restriction on provider numbers for overseas trained doctors; and
- incentive payments

Despite these and other strategies Australia still experience shortages of GPs in rural, remote and outer metropolitan areas and it is unclear which strategies have been effective or not.[4]

Overall aim and objectives

The aim of this study was to examine the effectiveness of the AGPT program in addressing geographic maldistribution. The overall objectives are to:

1. To determine the current practice location of GPs who graduated from AGPT training programs in the last five years (2010-2016).

2. To describe their current scope of practice/services provided (eg procedural work, workload, practice size) and involvement in teaching.

Structure of the study

The study had two phases; each aligned to the project aims. Phase 1 focused on the current location of graduates (aim 1) and Phase 2 on their current scope of practice (aim 2) including involvement in teaching.

This report presents the methods and results for Phase 1 only.

Methods

In order to address the first aim, the study had two research questions:

1. Do GP graduates practice in a location (rural/urban) that matches their training pathway (rural/general)?

2. What factors are associated with practising in a location that matches their training pathway?

Data sources

Data for the study was obtained from two sources – MCCC database (Registrar Information Data Exchange - RIDE) and from the Australian Health Practitioners Registration Agency (AHPRA). Both sets of data were compiled by MCCC and provided in a de-identified format to the University of Adelaide for analysis.

Data was obtained for all the GP registrars who had completed their training within the Australian General Practice Training Program (AGPT) in MCCC training region between the beginning of semester 1 2010 and beginning of semester 1 2016 – a six year period. Australian Defence Force registrars were excluded from this data.

Data on current practice location of MCCC AGPT graduates was obtained from the AHPRA website. This is publicly available data and records the main practice location of medical practitioners at the time of registration each year (30th September). The data obtained from the website for each graduate was: current practice location based on the principal place of practice by postcode and suburb, qualifications including organisation and year and speciality type. The data related to their location and status as at 30th September 2016. The variables collected from AHPRA are provided in Table 1. In circumstances where there might be multiple AHPRA records against a graduate name, the following process was undertaken to ensure that the correct AHPRA record was matched to the graduate. Matching was first done on name (full name), then medical school name and then Fellowship of the Royal Australian College of General practitioners (FRACGP) and/or Australian College of Rural and Remote Medicine (ACRRM) qualification and year.

Data on graduate characteristics and training experiences was obtained from MCCC. The variables collected from MCCC are provided in Table 1. A number of variables were assigned definitions in consultation with the Advisory Group. These included:

- Training pathway was defined as the graduate's pathway at time of graduation, rather than the pathway in which they entered AGPT.

- Location was defined as either urban or rural, based on Australian Standard Geographical Classification Remoteness Areas[5]. This classification system has five categories (RA1 to RA5) and for this study they were collapsed into two: RA1 (Major cities), defined as urban and RA2-RA5 (Inner regional, Outer regional, Remote and Very remote), defined as rural. This approach is commonly used for a broad definition of urban and rural areas in Australia. We also included in the analysis the Monash Modified Model (MM1 to MM7)[3 6] as this classification system is being increasingly used to define rurality for a number of workforce strategies.

- Moratorium expiry date was calculated based on the date of first registration with AHPRA and entered as 10 years plus 1 day.

Where there was a discrepancy between common variables in the MCCC database and AHPRA, the MCCC data was deemed as the more accurate and used for the analysis.

Table 1: Variables used in the analysis and data source

Source	*Variable*
RTO	RTO name
	Program Cohort
	Date of Birth
	Gender
	ATSI status
	Country of birth
	Pathway at completion of training – Rural or General
	Curriculum at entry – FRACGP, FACRRM, FRACGP+FARGP, FRACGP+FACRRM, FRACGP+FARGP+FACRRM
	Type of Graduate – AMG or IMG
	Moratorium
	Moratorium expiry date
	Moratorium exemption
	FRACGP Completion Date
	FACRRM Completion Date
	FARGP Completion Date
	AST Discipline area
	Extended skill type(completed in community or extended skill placement)
	Extended skills discipline area
	Total number of FTE rural training weeks (RA2-RA5)
	Rural bonded student
	PGPPP participant
	University
	University country
AHPRA	Date of first registration
	Qualifications including organisation and year
	Principal place of practice – Suburb, State, postcode and country
	Speciality

In addition to the data collected from AHPRA and MCCC, a number of variables were computed for the analysis. A list of these variables is provided in Table 2.

Table 2: Computed variables used in the analysis

Computed variable	*Sub-variable*
Rural/urban	Urban (RA1) Rural (RA2-RA5)
Year since graduation RTO	<3 years 3+ years
Year since graduation RTO	<5 years 5+ years
No. of qualifications	
Moratorium applied	No moratorium Ceased moratorium Continuing moratorium
FRACGP Completed (computed from curriculum and FRACGP completion)	Yes No
FACRRM Completed (computed from curriculum and FACRRM completion)	Yes No
FARGP Completed (computed from curriculum and FARGP completion)	Yes No
AHPRA record	Yes No

Statistical analysis

To address the first question, bivariate analysis was undertaken to examine the relationship between current practice location and a range of sociodemographic characteristics. The key outcome indicator was current practice location.

Initially, frequency tables were generated for all variables of interest. Cross tabulations of current practice location versus categorical variables were performed, with calculation of Chi-square test, and Fisher's Exact test P values as appropriate. For the FTE rural training week variable, Wilcoxon Sum Rank test was used to calculate P values.

There were four observations missing from the current practice location variable and there were occasional missing observations in the other variables so every frequency table may not add up to n=326 for the MCCC data.

In order to answer the second research question, we used a logistic regression framework to model the odds of current rural practice in relation to training pathway, and adjusted for the covariates found to be significantly related to practice location in the analyses for Question 1. In building up our statistical model, we initially used $P<0.2$ for inclusion of independent variables, and retained variables in the final model if they were associated with practice location at $P<0.05$. We derived unadjusted and adjusted models for the overall data set, and then separately by RTO.

Interaction P values were calculated for training pathway versus categorical variables for the outcome current practice location. All interaction terms with P value<0.1 and all variables with P value<0.2 in the previously-described cross-tabulations were included in an initial multivariable logistic regression model. Backwards elimination was performed (removing the variable with highest P value, one at a time) until all covariates had a P value<0.05. Interpretation of this final multivariable regression model was then given.

Using ordinal logistic regression, the analysis also investigated the gradient effect of rurality using both classifications (RA1-RA5, MMM1-MMM7) on the effectiveness of the training program (eg rural trained, rural practice) (unadjusted models only).

All significant associations are highlighted in blue on the results tables.

The statistical software used was SAS 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

The results are presented in two parts – the first part presents the results for all MCCC graduates (rural pathway trained graduates); the second part presents the results of the logistic regression modelling

For the first part, the results and their description are presented in the following way:

- A table describing the characteristics of the graduates, including any significant association between the variable and current practice location (binary outcome variable urban versus rural) as represented by the P value.

- A table describing the current practice location of graduates (binary outcome variable urban versus rural, classifications RA1-RA5 and MMM1-MMM7 and State).

- A table describing the training characteristics of the graduates, including any significant association between the variable and current practice location (binary outcome variable urban versus rural) as represented by the P value.

- Summary tables of the variables by practice location are provided in Appendix 1.

For the second part, the results of the final multivariable logistic regression model of current practice location versus various covariates are presented.

Rural Pathway Trained Graduates

A total of 326 MCCC graduates trained in the rural pathway. The characteristics of the rural pathway trained graduates are shown in Table 3. Most of these graduates were not born in Australia (71%), are female (60%) and were IMGs (54%). There are two rural trained graduate has an Aboriginal and/or Torre Strait Islander background.

Of the rural pathway graduates, 63.5% were subject to the 10 year moratorium, with 4% still practising under the moratorium requirements. A quarter of graduates went to a Victorian based university and 54% undertook their medical training in an overseas university.

In the analysis of current practice location versus rural pathway graduate characteristics it was found that there was a statistically significant association between current practice location (rural or urban) and:

- Country of birth (Chi-square P value <0.0001).
- Type of graduate (Chi-square P value <0.0001)
- Moratorium status (Chi-square P value <0.0001)
- Age (Chi-square P value 0.0018)

Table 3: Characteristics of MCCC rural pathway trained graduates (n=326)

Characteristics	*Values*	*Frequency*	*Percent*	*P value**
Training pathway	Rural	326	100	-
Country of Birth	Australia	94	28.83	<.0001
	Not Australia	232	71.17	
Gender	Male	131	40.18	0.1852
	Female	195	59.29	
Type of Graduate	AMG	149	45.71	<.0001
	IMG	177	54.29	
ATSI background	Yes	2	0.61	1.0000
	No	324	99.39	
Moratorium status	No moratorium	119	36.5	<.0001
	Ceased moratorium	194	59.5	
	Continuing moratorium	13	3.99	
Age in years (quartiles)	Q1 <36	71	21.78	0.0018
	Q2 >=36, <42	125	38.34	
	Q3 >=42, <46	55	16.87	
	Q4 >=46	75	23.01	
University	University of Melbourne	48	14.72	
	Monash University	32	9.82	
	University of Queensland	14	4.29	
	Flinders University	12	3.68	
	University of Adelaide	11	3.37	
	University of New South Wales	8	2.45	
	University of Newcastle	5	1.53	
	University of Western Australia	5	1.53	
	University of Sydney	4	1.23	
	University of Tasmania	4	1.23	
	Australian National University	3	0.92	
	Bond University	1	0.31	
	University Of Queensland	1	0.31	
	University of Auckland	1	0.31	
	Overseas university (excl New Zealand)	176	53.99	
University by Country Group	Oceania and Antarctica	150	46.01	
	Southern and Central Asia	77	23.62	
	North-East Asia	30	9.2	
	South-East Asia	22	6.75	
	Southern and Eastern Europe	14	4.29	
	North Africa and the Middle East	14	4.29	
	North-West Europe	10	3.07	
	Sub-Saharan Africa	6	1.84	
	Americas	3	0.92	

**Chi Square P value*

Analysis of current practice location of MCCC rural pathway graduates is shown in Table 4. A current practice location was found for 319/326 MCCC graduates who had trained in the rural pathway; with 77% (246) practising in Victoria, the state of their vocational training location. Of those who are currently practising outside of Victoria, most are practising in eastern seaboard states (15%). There was no significant association between current practice location and state in which they are currently practising.

In terms of rural location, 50% of graduates, 50% are currently working in a rural location (Table 4 and Figure 1), with most (39%) working in an inner regional area, 10% are currently working in an outer regional area, and 1% are working in remote or very remote areas (Figure 2). The distribution of practice location by the MMM classification is show in Figure 3, with 18% practising in a MM2 region and 13% in an MM3 region.

Table 4: Current practice location of MCCC rural pathway trained graduates (n=319)

Variable	*Values*	*Frequency*	*Percent*	*P value**
Current practice location	Urban	160	50.16	
	Rural	159	49.84	
Current practice location by AGSC-RA classification	Major cities (RA1)	160	50.16	
	Inner regional (RA2)	124	38.87	
	Outer regional (RA3)	31	9.72	
	Remote (RA4)	2	0.63	
	Very remote (RA5)	2	0.63	
Current practice location by MMM classification	Major city (MM1)	160	50.16	
	Large regional (MM2)	56	17.55	
	Medium large regional (MM3)	41	12.85	
	Medium regional (MM4)	30	9.4	
	Small regional (MM5)	28	8.78	
	Remote (MM6)	2	0.63	
	Very remote (MM7)	2	0.63	
Current practice location by State	VIC	246	76.88	0.1185
	NSW	32	10	
	QLD	17	5.31	
	SA	10	3.13	
	WA	6	1.88	
	NT	4	1.25	
	ACT	3	0.94	
	Tas	2	0.63	

**Chi Square P value*

Current practice location by AGPT completion year is shown in Table 5. This table shows that over time there is small increase in the proportion of rural pathway trained graduates currently working in an urban location.

Table 5: Current practice location of MCCC rural pathway graduates by AGPT completion year

Variable		*Current Practice location*			
		Urban (RA1)		*Rural (RA2-RA5)*	
		Frequency	*Percent*	*Frequency*	*Percent*
AGPT completion year (n=160)	2010	19	57.6	14	42.4
	2011	30	61.2	19	38.8
	2012	25	53.2	22	46.8
	2013	23	42.6	31	57.4
	2014	32	41.6	45	58.4
	2015	31	52.5	28	47.5

Figure 1: MCCC rural pathway trained graduates by current practice location, urban/rural

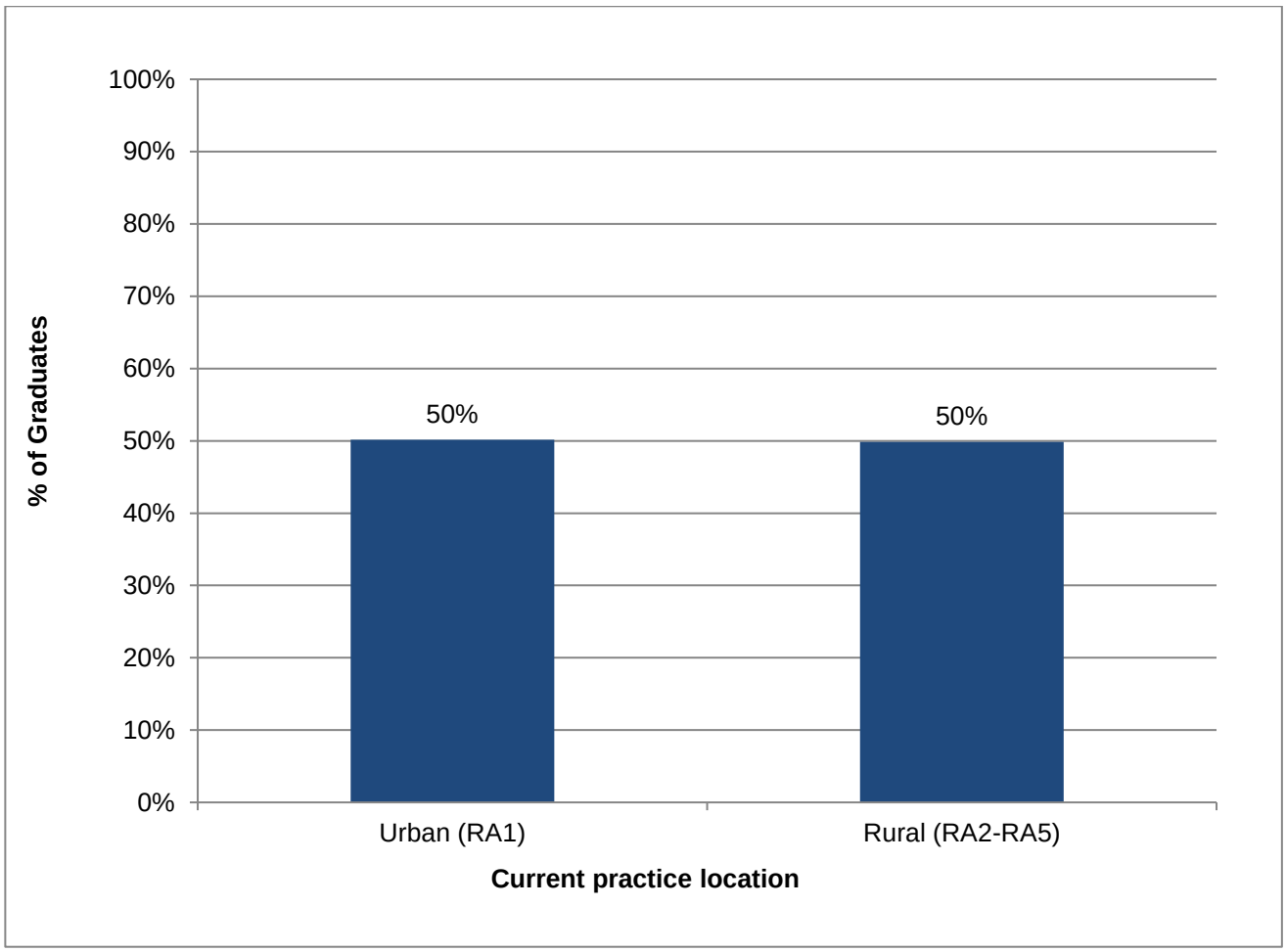


Figure 2: MCCC rural pathway trained graduates by current practice location, ASGS-RA

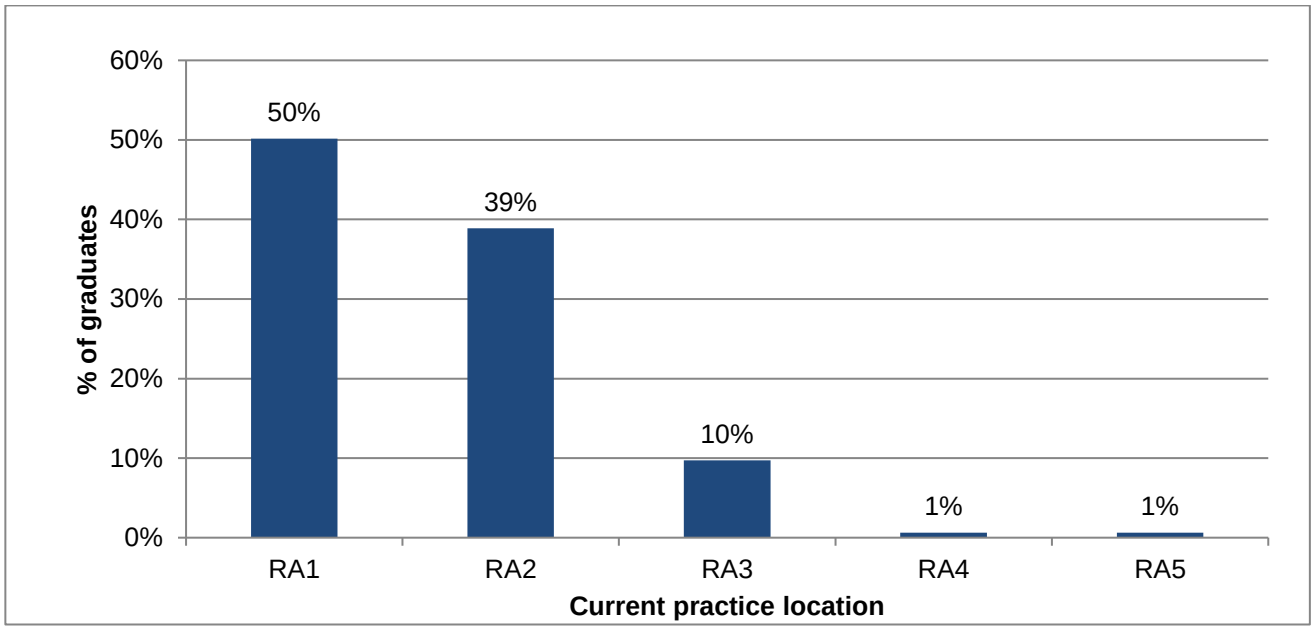
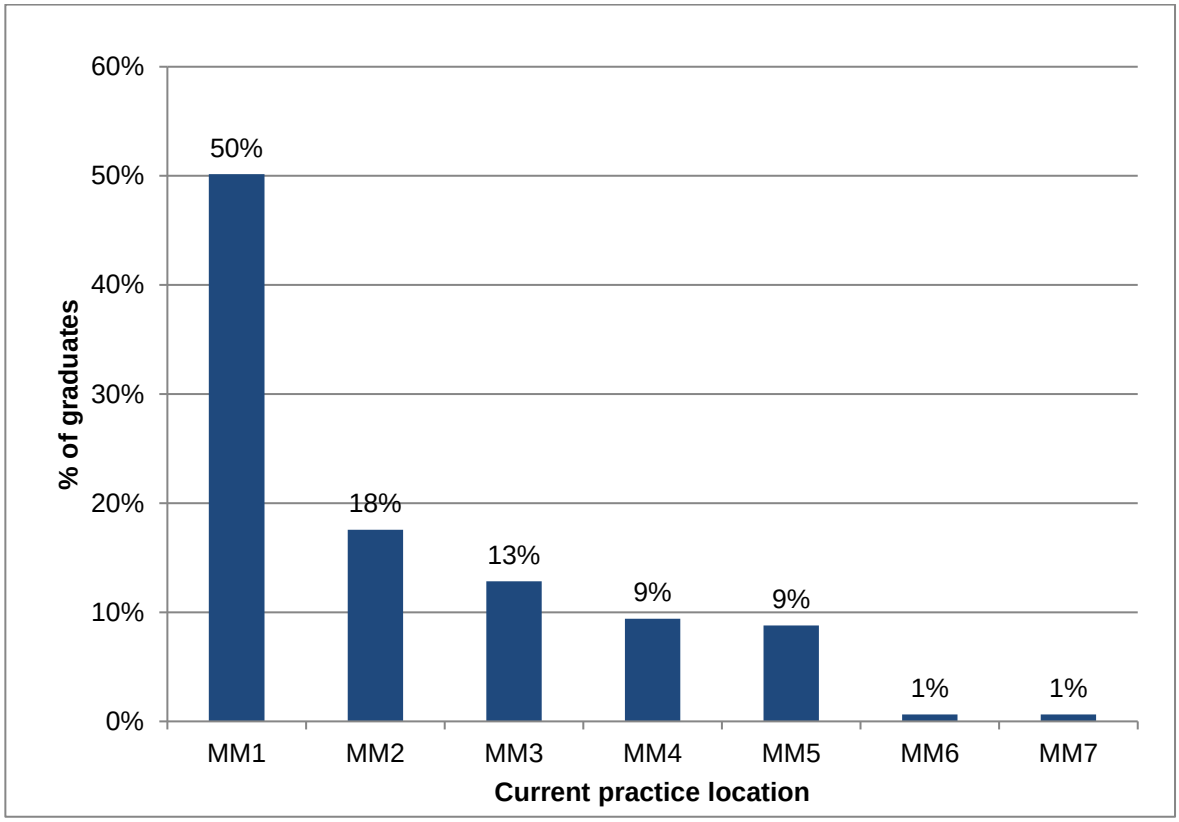


Figure 3: MCCC rural pathway trained graduates by current practice location, Monash Modified Model (MMM) rural classification



The training characteristics of rural pathway trained MCCC rural pathway graduates are shown in Table 6. Of the 326 graduates, 99% are currently practising in Australia. Only four graduates do not currently have AHPRA registration indicating they were either overseas or no longer practising medicine and 2% undertook a PGPPP placement. A small proportion of these graduates had a rural medical school bonded place (6%).

More than two thirds of the graduates had completed AGPT training less than five years ago (67%) and 25% had completed their AGPT training within the last three years (see Table 6).

Most of the rural pathway trained graduates undertook the FRACGP curriculum during training, while 8% combined the FRACGP curriculum with the FARGP curriculum. No MCCC rural pathway trained graduates undertook the FACRRM, although 3% of these graduates combined the FACRRM curriculum with another curriculum. For rural pathway trained graduates, the FRACGP was the most common qualification, with 100% of graduates obtaining this qualification, with 3% completing a FACRRM and 2% completing a FARGP.

During training, 2% of rural graduates undertook an advanced skills training post and 29% undertook an extended skills post. Nearly half of the graduates (48%) have more than one qualification (see Table 6).

In the analysis of current practice location (rural or urban) versus training characteristics for rural pathway trained graduates, there was statistically significant association between current practice location (urban and rural) and

- Rural bonded (Fisher's Exact P value 0.00446)
- Curriculum (Fisher's Exact P value 0.009)
- AGPT completion within 5 years (Chi square P value 0.0100)
- Number of qualifications (Chi square P value 0.0228)

A list of the advanced skills training and extended skills discipline areas undertaken is shown in Table 7. Anaesthetics (43%) and obstetrics (21%), obstetrics and gynaecology (29%), were the most common discipline areas for the graduates who undertook an AST posts. Of the 96 graduates who undertook an extended skills post during training, the three most common disciplines were general practice (43%), Aboriginal health (17%) and obstetrics and gynaecology (11%).

Table 6: Training characteristics of MCCC rural pathway graduates (n=326)

Variable	*Values*	*Frequency*	*Percent*	*P value**
AHPRA Registration***	Yes	322	98.77	
	No	4	1.23	
Rural Bonded	Yes	21	6.44	0.0446**
	No	305	93.56	
PGPPP placement	Yes	6	1.84	0.6845**
	No	320	98.16	
AST skills training	Yes	7	2.15	0.0669**
	No	319	97.85	
Extended skills training	Advanced Academic	1	1.04	
	Extended Skills	79	82.29	
	Special Skills	16	16.67	
Curriculum	FRACGP	285	87.42	0.0009**
	FACRRM	0	0.0	
	FRACGP + FARGP	26	7.98	
	FRACGP + FACRRM	9	2.76	
	FRACGP + FARGP + FACRRM	1	0.31	
	FRACGP + Grad Dip	4	1.23	
FRACGP completed	Yes	326	100	-
	No	0	0.0	
FACRRM completed	Yes	10	3.07	0.2184**
	No	316	96.93	
FARGP completed	Yes	6	1.84	1.0000**
	No	320	98.16	
AGPT completion 5y	Less than 5 years	219	67.18	0.0100
	Greater or equal to 5 years	107	32.82	
AGPT completion 3y	Less than 3 years	82	25.15	0.4534
	Greater or equal to 3 years	244	74.85	
Number of Qualifications	1	168	51.53	0.0228
	2	118	36.2	
	3	40	12.27	

**Chi Square P value*
***Fisher's Exact Test P value*
****Cross tabulation not possible as all available observations have 'Yes' value*

Table 7: Advanced skills and extended skills training discipline areas undertaken by MCCC rural pathway trained graduates

Variable	*Values*	*Frequency*	*Percent*
AST discipline area (n=7)	Anaesthetics	3	42.86
	Obstetrics	2	28.57
	Emergency Medicine	1	14.29
	Obstetrics & Gynaecology	1	14.29
Extended skills discipline areas (n=96)	General Practice	41	42.71
	Aboriginal Health	16	16.67
	Obstetrics & Gynaecology	11	11.46
	Alpine Sports Medicine	6	6.25
	Emergency Medicine	6	6.25
	Paediatrics	6	6.25
	Medical Education	3	3.13
	Mental Health	3	3.13
	Palliative Care	3	3.13
	Academic General Practice	2	2.08
	Anaesthetics	2	2.08
	General Medicine	2	2.08
	Psychiatry	2	2.08
	Dermatology	1	1.04
	Endoscopy	1	1.04
	Family Planning	1	1.04
	Geriatrics	1	1.04
	Immigration Medicine	1	1.04
	Intensive Care Unit	1	1.04
	Night Duty	1	1.04
	Orthopaedics	1	1.04
	Plastic Surgery	1	1.04
	Refugee Health	1	1.04
	Rehabilitation	1	1.04
	Sexual Health	1	1.04
	Small Town	1	1.04
	Women's & Children’s health	1	1.04
	Women's Health	1	1.04

Additional descriptive statistics of full time equivalent weeks spent in rural training are given in Table 8. All of these variables (total weeks and then weeks spent at RA1, RA2, RA3, RA4 and RA5) are right-skewed and therefore the median and interquartile ranges were used to describe them. It was found that there is a statistically significant association between current practice location and Total FTE rural training weeks and FTE rural training weeks at RA2 (Table 8).

Table 8: Full time equivalent weeks spent in rural training for rural pathway trained MCCC graduates

Variable	*Median*	*IQR*	*Mean*	*Standard deviation*	*Range*	*P value**	*Direction of Comparison*
Total FTE Rural training weeks	131	113.3,164	142.2	39.3	26,261	0.0033	Rural weeks>Urban weeks
FTE training weeks RA1	32.3	26,52	41.0	28.0	4.3,153.2	0.4158	Not significant
FTE training weeks RA2	130	104.9,156.8	131.8	45.1	2.9,261.0	0.0256	Rural weeks>Urban weeks
FTE training weeks RA3	54.3	26,108.3	73.9	47.9	5.3, 208.0	0.8938	Not significant
FTE training weeks RA4	26	17.3,26	23.1	5.0	17.3, 26.0	1.0000	Not significant
FTE training weeks RA5	26	26,26	26.0	-	26.0,26.0	1	--

**Wilcoxon Rank Sum Test P value*

Linear regression analysis showed a significant relationship between current practice location and the location of rural GP training (RA2 and RA3) (Table 9). For rural pathway trained graduates currently working in a practice in an RA2, RA3 and RA4 region, they undertook significantly more training weeks in RA2 than graduates currently practising in an RA1 or RA5 location. Similarly, graduates currently working a practice in a RA2 and RA3 region, undertook significantly more training weeks in RA3 than graduates currently practising in an RA1, RA4 or RA5 location.

Table 9: Full time equivalent week location versus current practice location (ASGS) for rural pathway trained MCCC graduates

Outcome	*Current practice location (ASGS)*	*Mean FTE weeks RA1*	*Mean FTE weeks RA2*	*Mean FTE weeks RA3*	*Mean FTE weeks RA2-5*
FTE weeks RA2	RA1 Major city		126.92		
	RA2 Inner regional		142.47*		
	RA3 Outer regional		106.42**		
	RA4 Remote		104.00**		
	RA5 Very remote		78.6500		
FTE weeks RA3	RA1 Major city			68.7486	
	RA2 Inner regional			39.9224*	
	RA3 Outer regional			113.51*,**	
	RA4 Remote			104.00	
	RA5 Very remote			40.2900	
FTE total weeks RA2-5	RA1 Major city				136.64
	RA2 Inner regional				149.44*
	RA3 Outer regional				146.57
	RA4 Remote				104.00
	RA5 Very remote				111.80

** Significant difference in mean FTE week between RA and RA1*
*** Significant difference in mean FTE week between RA and RA2*
**** Significant difference in mean FTE week between RA and RA3*
For FTE weeks RA4 and RA5, sample size too small for model to work

Logistic regression model results

Multivariable logistic regression model was used to examine current practice location (urban/rural) and various potential predictors. The final model of current practice versus pathway and various significant cofounders or predictors for all MCCC rural pathway graduates are shown in Table 10.

For MCCC rural pathway graduates, there is a statistically significant association between current practice location (urban/rural), country of birth, rurally bonded, AGPT completion and rural training weeks. The results show that:

- MCCC rural pathway graduates are 9 times more likely to be practising in a rural location if they were born in Australia (OR 9.31; 95% CI 5.02- 17.23).
- MCCC rural pathway graduates who were rurally bonded are 3 times more likely to be practising in a rural location (OR 3.38; 95% CI 1.10- 10.29).
- MCCC rural pathway graduates who had completed their training less than five years ago were 3 times more likely to be currently practising in a rural location than graduates who did not (OR 2.74; 95% CI 1.55-4.86).
- For every 10 week increase in Total FTE rural training weeks, the MCCC rural pathway graduates are 1% more likely to be currently practising in a rural location (OR 1.01; 95% CI 1.00-1.02).

Table 10: Results of final multivariable logistic regression model of current practice location versus various covariates MCCC rural pathway trained graduates

Data	*Covariate*	*Comparison*	*Reference*	*Odds Ratio**	*Lower 95% CL*	*Upper 95% CL*	*P value*
MCCC rural pathway graduates	Country of birth	Australia	Not Australia	9.31	5.02	17.23	<.0001
	Rural bonded	Yes	No	3.38	1.10	10.29	0.0321
	AGPT completion	Less than 5 years	>= 5 years	2.74	1.55	4.86	0.0006
	Total FTE rural training weeks[2]			1.01	1.00	1.02	0.0014

**Modelling the probability that current practice location is rural*

[2] *Per 10 week increase in total FTE rural training weeks*

Discussion

This study has been one of the few to assess the impact of vocational GP training on practice location in Australia. By analysing the current practice location of MCCC AGPT rural pathway trained graduates (2010-2016), we can understand what influences current practice location in terms of personal characteristics and training experiences across both medical school and GP training. The study also allowed for a separate analysis of those GP graduates who were specifically trained for rural practice and the influences on their current practice location.

Current practice location

A key focus of this study was to determine if GP graduates who were trained in a particular pathway (rural or general) subsequently practice in locations that reflect their training pathway. With the MCCC analysis, this included only rural pathway trained graduates and therefore the comparative analysis is more limited than other RTOs where they have both rural and general pathway trained graduates.

The descriptive results indicate that half of MCCC AGPT graduates are practising in a location that reflects their training pathway – a rural practice location. These results differ from that found in other studies. An analysis of the practice location of Remote Vocational Training Scheme registrars found that 81% remain working in a rural location after completion of their training[7] while analysis by a Queensland rural vocational training provider reported 75% of rural pathway trained registrars were working in rural areas one or more years after completion of training[8]. Analysis of the MABEL data showed that 78% of rural trained GPs remained practising in a rural location two years after completion of training[9]. The research also showed that this percentage decreased over time, with only 60% of rural trained graduates working in a rural location five years post-graduation.

The analysis shows that the majority of MCCC AGPT rural pathway graduates are still practising in Victoria (77%) with only a small proportion moving interstate after training, this is despite only 25% of these graduates undertaking their medical school training in Victoria. This suggests that the location of GP vocational training and/or the RTO has some influence on practice location after completion of training. There is currently very limited research in Australia that explores location of training and current practice location in terms of jurisdiction. A study of University of Tasmanian medical graduates from 1970 to 2011 found that 36.2% of graduates who were GPs, were providing a service in Tasmania.[10] Research from Canada on the retention of family physicians in the region of their family practice residency indicates some variation across the provinces[11 12]. For some provinces such as Ontario and Quebec, there were similar retention rates to our study, between 82%[12] and 90%[11]. For other provinces the rates were much lower. We can now see from the MCCC data that retention within the state of GP graduates is an important workforce outcome for vocational training.

In terms of the distribution of graduates, half of MCCC rural pathway graduates are working in a major city (RA1) with 49% working in RA2-RA3. When we compare practice location of MCCC graduates with all Australian GPs in 2015-2016[13] there are some key differences in their distribution across the remote areas. The proportion of MCCC graduates are working in metropolitan areas compared with all Australian GPs is less (50% versus 68%) and more graduates work in inner regional areas (39% versus 19%). When comparing GPs working in outer regional and remote, MCCC represent a slightly lower proportion of GPs than found nationally (11% versus 13%). When comparing MCCC graduates with Victorian GPs[13], a larger proportion of graduates are working in rural areas RA2-RA5 than found among all Victorian GPs (50% versus 25%). This may be related to the large number of graduates affected by the 10 year moratorium that limits their location to areas of need, which are mainly found in rural locations.

We found that the mean number of weeks spent in a rural location during training was greatest in an RA2 location and this was the location of training for the majority of registrars.

Characteristics

In terms of the profile of the MCCC rural pathway graduates a few characteristics are of note. The majority of graduates are male (60%) which is much higher proportion than found in Australian GPs (55%) and Victorian GPs (55%)[13]. The majority of graduates are deemed IMGs and this is confirmed by the large proportion who undertook the basic medical training outside Australian and NZ (54%). This is a greater proportion than found across all Australian and Victorian GPs, where 40% and 42% respectively, have undertaken their basic qualification in Australia[13]. This is likely to reflect the entry requirements to AGPT training, selection processes and pathways to practising in Australian for IMGs and the location of the MCCC RTO, which covers mainly of rural locations. As such, it would attract those IMGs subject to the 10 year moratorium and this is supported by the percentage of graduates who fit this category (63%). An IMG registrar can be subject to the moratorium and thus be required to participate in the AGPT rural pathway. The moratorium also requires overseas trained doctors to work in area of workforce shortage such as rural and remote areas for up to 10 years since first registered, part of which can be undertaken during GP vocational training. Therefore it is not surprising that country of birth, moratorium status and type of rural graduates were found to be associated with practice location.

Training characteristics

In recent years, there has been a body of research that shows the influence of training on practice location, particularly a rural location. This research has shown significant associations of rural clinical schools[14-19], regional medical schools[20], being a rural bonded medical student[15 17] and rural generalist training[20]. The MCCC results confirm some of these conclusions. We found an association between current practice location and having a rural bonded medical place. We also found the curriculum and years since graduation were associated with practice location.

Predictors of rural practice location

As this analysis focussed on MCCC graduates undertook rural pathway training, determining if it was a predictor of rural practice was not possible. The results from the multivariable model found a number of predictors for rural practice location. Being Australian born was a predictor of rural practice location. Country of birth, which impacts on location of medical school training, type of medical graduate and thus choice of GP vocational training pathway. This result has not been found in other studies. Several studies on University of WA medical graduates and practice location found no association between country of birth and rural practice, although this was across all specialities and not just general practice[5, 26].

We found that the having a rural bonded scholarship was also predictor for currently practising in a rural area. A number of other studies have also shown the influence of being rurally bonded on rural practice. McGrail et al[9], also found that the being rurally bonded increased the odd of GP graduates working in a rural areas one to five years post training. A study of University of Queensland graduates between 2002 and 2011, found that if a graduate was a GP and had had a rural bonded scholarship, they were six times more likely to be working in a rural location[15] Playford et al[17] also found that having a rural bonded scholarship was a predictor of rural practice among a cohort of University of Western Australian graduates.

In addition, our results also identify that the number of rural training weeks undertaken during vocational training is also a predictor for working in a rural location. This result is an important finding in that continued rural exposure during vocational training for can influence the decision to

work in a rural practice location after graduation. It is also one of the few studies to quantify the amount of training undertaken in a rural location and its influence on practice location.

Being Australian born was identified as a predictor of rural practice location for rural pathway graduates, a result which has not been found in other research in Australia. This outcome may result from more rural exposure opportunities provided to such graduates during medical training but also the pathway they choose at the vocational training level. Sureshkumar et al's[23] study on predictors of pathway in the AGPT program found that those applicants who were foreign graduates of accredited medical schools were less likely to choose a rural pathway if eligible for a general pathway place. Our results suggest that those graduates who have been medically trained outside Australian and therefore required to undertake the rural pathway training, may not have rural practice as their goal and may leave after they have completed their obligations. This is supported by a study on geographic mobility of GPs[24] which found that IMGs had an increased risk of moving in five years, particularly the sub-group of IMGs who were restricted in their practice location, compared to Australian-trained GPs.

Our results provide some evidence that more recent rural pathway graduates are likely to be working in rural areas. Those rural pathway graduates who completed their training five or less years ago are more likely to be practising in a rural location. This supports the pattern seen by McGrail et al[9], who found that the proportion of rural pathway GP graduates remaining in a rural location reduced over time, with the largest proportion remaining in rural locations in the first three years , ranging from 87% one year post training to 56% three years post training.

Limitations

While this study is the most comprehensive analysis of graduates of GP vocational training and practice location to date in Australia it has several limitations.

A number of important variables were collected from AHPRA, most importantly the current practice location of graduates. While AHPRA provides a comprehensive list of registered doctors, the data are based on self-report by GPs and thus subject to omissions and errors. For example, the list of qualifications reported on the AHPRA website was not complete with many graduates omitting key qualifications such as FRACGP. Thus analysis of qualifications must be viewed with caution and is likely to under-represent qualifications held by SA graduates. Additionally, the location recorded for main practice may be a home address for a GP rather than a practice location. This becomes an issue when looking at practice location using the wider definitions such as AGSC and MMM, where a home postcode may vary from a practice postcode.

In addition, the data on rural bonded scholarships is likely to be an underestimation as this data was collected for all applicants over the study period.

In this analysis, our outcome was current practice location as defined at the time of 2016 medical registration renewal. As such it was cross sectional in that data on practice location was collected at one point in time and thus we are limited to exploring relationships between variables. We did not have data on the movement of the graduates between different locations since their graduation. Longitudinal research suggests that GPs are mobile and move between different locations, particularly rural areas over time[25]. In Phase 2 of this study, we will address this gap by obtaining data from the graduates on all their practice locations since graduation.

In our analysis we were also limited to the factors that were collected by the RTO. As such some important factors, such as rural background, were not included in the analysis. However, we were able to include if a graduate had a rural bonded place in medical school.

Conclusion

Currently there is a debate on the effectiveness of policies directed at ensuring there is an adequate rural workforce[4 26], and also highlighted in the Mason Review of health workforce programs[3]. Walters et al[4] called for evidence on the effectiveness of interventions to address rural workforce shortages and to inform rural generalist training. This study addresses the gap in the evidence by providing a comprehensive analysis of practice location for a large number of GP graduates.

The research on the influence of vocational training on practice location has been limited. This study provides some evidence that parts of GP vocational training are important in influencing where a GP graduate will eventually practice. We know from previous research that rural clinical school exposure and rural pathway training during GP vocational training are important influences on subsequent rural practice location. What we have found is that it is the amount of rural exposure during vocational training is a predictor for practising in a rural location.

This study also provides evidence that Regional Training Organisations such as MCCC are helping to address the geographic maldistribution of the workforce by supplying graduates that work in areas that have known workforce shortages – outer metropolitan and rural and remote locations. Moreover, Regional Training Organisations area also having a positive impact on GP workforce within Victoria, with most of these graduates remaining in Victoria to practice.

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Appendix

Appendix 1: Selected characteristics of MCCC rural pathway trained graduates by current practice location

		Current practice location				
		Urban (RA1)		Rural (RA2-RA5)		
Variable	*Values*	*Frequency*	*%*	*Frequency*	*%*	*Chi-Square P value*
Country of birth	Australia	15	9.38	78	49.06	<.0001*
	Not Australia	145	90.63	81	50.94	
Gender	Male	70	43.75	58	36.48	0.1852
	Female	90	56.25	101	63.52	
Type of Graduate	AMG	46	28.75	99	62.26	<.0001
	IMG	114	71.25	60	37.74	
ATSI background	Yes	1	0.63	1	0.63	1
	No	159	99.38	158	99.37	
Moratorium status	No moratorium	141	88.13	150	94.34	0.0383
	Ceased moratorium	13	8.13	3	1.89	
	Continuing moratorium	6	3.75	6	3.77	
Age in years(quartiles)	Q1 <36	22	13.75	45	28.3	0.0018
	Q2 >=36, <42	59	36.88	64	40.25	
	Q3 >=42, <46	32	20	23	14.47	
	Q4 >=46	47	29.38	27	16.98	
State	Victoria	117	73.13	128	80.5	0.1185
	Other states/territories	43	26.88	31	19.5	
Training Pathway	General					
	Rural	160	50.16	159	49.84	-

		Current practice location				
		Urban (RA1)		Rural (RA2-RA5)		
Rural Bonded	Yes	6	3.75	15	9.43	0.0446**
	No	154	96.25	144	90.57	
PGPPP placement	Yes	4	2.5	2	1.26	0.6845**
	No	156	97.5	157	98.74	
AST skills training	Yes	1	0.63	6	3.77	0.0669**
	No	159	99.38	153	96.23	
Curriculum	FRACGP	151	94.38	128	80.5	0.0009**
	FRACGP + FARGP	5	3.13	20	12.58	
	FRACGP + FACRRM	2	1.25	7	4.4	
	FRACGP + FARGP + FACRRM	0	0	1	0.63	
	FRACGP + FACRRM + Grad Dip	1	0.63	0	0	
	FRACGP + Grad Dip	1	0.63	3	1.89	
FRACGP completed	Yes	2	1.25	159	100	-
	No					
FACRRM completed	Yes	3	1.88	7	4.4	0.2184**
	No	157	98.13	152	95.6	
FARGP completed	Yes	3	1.88	2	1.26	1**
	No	157	98.13	157	98.74	
AGPT completion 5y	Less than 5 years	96	60	117	73.58	0.0100
	Greater or equal to 5 years	64	40	42	26.42	
AGPT completion 3y	Less than 3 years	42	26.25	36	22.64	0.4534
	Greater or equal to 3 years	118	73.75	123	77.36	

		Current practice location				
		Urban (RA1)		Rural (RA2-RA5)		
Number of Qualifications	1	70	43.75	94	59.12	0.0228
	2	67	41.88	49	30.82	
	3	23	14.38	16	10.06	

**Fisher's Exact test