

# Determinant factors to the rural and remote medical workforce in Maluku Islands of Indonesia: A cross-sectional study

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## Research Article

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# Abstract

## Background

Many factors contribute to engagement in rural and remote medical practice but little is known about the determinant factors of rural and remote medical practice in the such remote locations as the Maluku Province of Indonesia. This study describes determinants, preferences and intentions of doctors in the rural and remote practice.

## Methods

An online survey of work-related experience and intentions for future rural work was administered to 410 doctors working in the Maluku province of Indonesia. Participant characteristics were described using descriptive statistics, associations between the independent variables with the location of workforce, preference for rural practice and intention to remain in rural and remote Maluku were analysed using Chi-square tests and logistic regression.

## Results

A total of 324 responses (79% response rate) were recorded comprising 70% females and 30% Pattimura University graduates of doctors employed in Maluku. Graduating from Pattimura University was associated with a nearly twofold rate of current rural practice and preference for future rural practice compared to graduates of other universities, and also predicted intention to stay rural. Those with rural background were twice as likely to prefer future rural practice and intend to stay rural. Younger age was associated with twofold odds of current rural practice, preferred future rural practice, and intention to stay rural. Smaller salary was associated with current rural practice. Smaller take home pay predicted current rural practice, but negatively impacted preference for future rural practice and intention to remain rural (OR < 1). Being in their early career was associated with current rural practice, and with preferred future rural practice and intention to stay rural. Being currently in a rural practice strongly predicted preferred future rural practice and intention to remain in rural practice (OR 15).

## Conclusion

This study provides evidence that rural background predicts rural preference and intention, and shows the importance of a regional medical school in supplying doctors to a rural and remote region of Indonesia with persistent medical workforce shortage. Sustained collaboration between medical schools and local government to implement relevant strategies is needed to improve the recruitment and retention of rural doctors.

# Background

A shortage of health personnel and workforce maldistribution means there is unequal access to healthcare for people living in rural and remote (RR) communities, a persistent and significant problem globally.<sup>1-3</sup> Indonesia continues to struggle with community access to healthcare and insufficient health workforce, especially in its RR areas.<sup>4-6</sup> Maluku, a province in the eastern Indonesian archipelago which includes some of the most remote, isolated and poorly served islands in the country<sup>7</sup>, has national data showing maternal mortality rates (above national standards 102/100,000 live births), infant mortality rates (> 22 deaths/1,000 live births) and infectious diseases rates that are many times higher than in countries with acceptable access to care.<sup>7,8</sup> As reported in the provincial health profile, a significant challenge in achieving the national standards for this province is inadequate services due to limited resources, namely the human and capital resources for health and essential physical infrastructure.<sup>9</sup> Maluku has more than a half (6/11) of its regencies classified as underdeveloped areas.<sup>10</sup> The national government allocates just 5% of its budget for health.<sup>11</sup>

In addition to the remote and isolated nature of the province being a disincentive for medical personnel choosing to live and work there,<sup>4,12,13</sup> the region has less infrastructure, facilities and amenities, difficulties with communication, a perceived lower quality of children's education and lower employment income.<sup>4,12,13</sup> In Indonesia, the national health profile shows that the number of doctors in an area was positively related to population numbers, population density, number of hospitals, and number of community health centers.<sup>13</sup> The ratio of doctors per population is 1:7,269 in Maluku, compare to 1:2,294 nationally.<sup>7</sup> In recent years, the central government has implemented various policies such as compulsory work placements and financial and career incentives to attract and bond doctors and health professionals to remote and isolated areas of Indonesia.<sup>4,12</sup> Even though Maluku has been one province where doctors may extend their stay after compulsory work placements with government incentives<sup>14</sup>, the small numbers of doctors in RR areas of Maluku remains a significant issue.<sup>7</sup> Clearly more solutions are required.

Maldistribution of rural health personnel, particularly doctors, occurs globally.<sup>2,15-17</sup> Recruitment and retention of doctors in rural areas is influenced by many factors including personal factors such as rural background and educational factors including rural exposure during medical training. A scoping review of 61 papers published between 2010 to 2020<sup>18</sup> concluded that rural background and rural training are decisive factors in recruiting and retaining doctors in RR areas.<sup>19-43</sup>

In Indonesia, before the establishment of Pattimura University Medical School in Ambon, Maluku, doctors who worked in Maluku predominantly graduated from medical schools in Java Island (Jakarta, Surabaya, Yogyakarta, and Bandung) and cities outside Java island such as Medan, Makassar and Manado. In 2008, an undergraduate medical school was established in Pattimura University with the aim of educating medical students to work locally in Maluku. The first five cohorts of 50 students were partly funded by the government to encourage graduates to serve the province, with more than 20% of students

having a rural background.<sup>44</sup> The vision was to improve the number of doctors (an additional 50) in Maluku by 2015.

Understanding of the determinants of medical workforce taking up RR practice in Indonesia, and specifically Maluku, is limited and not adequately addressed in either Indonesian and international research. Hence, this study aimed to investigate the determinants of doctors' preferences to work in the RR areas of Maluku Province. Specifically, this research answers three research questions:

1. What are the characteristic of doctors who work in Maluku Province?
2. Which demographic variables are associated with RR practice location, preference for, and intention to remain in rural practice in rural and remote Maluku Province?
3. What variables predicts the outcomes of RR practice location, preference to RR practice, and intention to remain in practise in rural and remote Maluku Province.

Findings from this study can inform policy and practice for other archipelago regions and developing countries, especially within the Asian region which has similar societal and regional geographical characteristics.

## **Methods**

### **Study population**

The study population comprised qualified doctors who were currently working in Maluku Province.

Inclusion and exclusion: Doctors employed in Maluku Province (hospitals and health clinics, administrators and academics), of any age, gender and discipline/specialty area were included. Those temporarily unemployed or working in another province were excluded.

Sampling: Based on data recap provided by Health Human Resources division of Maluku Province Health Office, there were 496 doctors working in Maluku. However, the given list provided 440 names. After ethical and governance approvals from The University of Western Australia, Pattimura University and the Maluku Province government, all doctors were invited to participate in the study. Their names and contact details were provided by the provincial and regents health offices and the Pattimura University medical school alumni database.

Recruitment: After exclusions, there were 410 doctors identified as working in Maluku Province, 133 (32%) males and 277 (68%) females. Potential participants were approached based on the mobile number provided by the health offices and medical school and were sent messages containing information about the study with a link to the online survey that they could complete on their device. Consent to participate was embedded in the online survey.

### **Instruments**

The 51-item survey developed by the researchers was informed by the literature (Appendix 1) and included multiple-choice, dichotomous, multi-response and Likert type questions. The sections included

1. Demographic details, including the rural background (rural born, Maluku born, rural living experience and the length of rural living experience).
2. Medical training history including rural exposure.
3. Employment status and history including practice location defined using the Indonesian Centre Bureau of Statistic classification for urban and rural areas in Maluku<sup>45</sup> with the location of practice converted to the category (rural = 1 or urban = 0).
4. Outcome variables i.e., location of current practice, preferred future practice location, and intention to remain in the rural and remote Maluku areas.

## Data collection

Online-based delivery was the most feasible option given the doctors' geographical distribution with the survey open for a 2-month period to mitigate limited internet access in the Maluku area.

## Data analysis

All analyses were undertaken based on valid cases using IBM SPSS statistics version 26. Descriptive statistics were used to determine participants' characteristics. A Shapiro Wilks test was used to confirm normality of the data distribution. Chi-square tests were performed after a test of independence between outcome variables and independent variables (Tables 2–4) to determine the relationships between both. The outcomes of interest were defined as

1. The current workplace is in rural and remote Maluku areas (0 = No, 1 = Yes)
2. The preferred future location of practice (0 = Urban Maluku, 1 = Rural and remote Maluku)
3. The intention to remain working in rural and remote Maluku areas (0 = No, 1 = Yes).

Binary logistic regression was based on variables with a significance level  $< 0.20$  to estimate odds ratios associated with factors predictive of the target outcomes. A confidence interval of 95% and alpha significance level of 0.05 were used.

# Results

## Characteristic of respondents

There were 324 recorded responses (79% response rate) with 241 completed surveys. Most respondents being younger, female, married, and born in Maluku (Table 1). Of the females, 61% were working in a RR practice location. Of all respondents born in Maluku Province, less than a third were born in RR areas. More than half the respondents had never lived in rural areas before commencing medical school. Most

of the doctors graduated from medical schools in cities outside Java ( Fig. 1) and almost all respondents experienced some rural exposure during their medical program (Table 1).

Table 1  
 Characteristics of respondent doctors working in Maluku Province

	N <sup>a</sup> (%)	
Medical training history		
Medical School Origin	All else	227 (70)
	Pattimura University	97 (30)
Community Exposure during Medical Training	No	9 (3)
	Yes	315 (97)
Indicated Impact of community exposure*	Negative	34 (12)
	Passive	155 (54)
	Positive	98 (34)
Rural Exposure	No	33 (11)
	Yes	254 (89)
Demographic variables		
Gender	Male	76 (29)
	Female	183 (71)
Age (23 to 66 years, mean 33.4 STDEV 8.4)	Less than mean	157 (65)
	More than mean	84 (35)
Marriage status	Married	133 (51)
	Unmarried	126 (49)
Have child/ren under care	Yes	107 (41)
	No	152 (59)
Number of children	More than 2	23 (24)
	Up to two	74 (76)
Rural Born	No	189 (76)
	Yes	60 (24)
Province of Birth is Maluku	No	89 (36)
	Yes	159 (64)
Rural living experience	No	147 (59)

	N <sup>a</sup> (%)	
	Yes	102 (41)
Length of Rural living experience	Less than 10 years	179 (72)
	More than 10 years	69 (28)
Employment variables		
Employment status	Permanent	117 (44)
	Temporary	149 (56)
Length of work since graduation	More than 5 years	117 (41)
	Up to 5 years	171 (59)
Length of work in current practice	More than 5 years	86 (30)
	Up to 5 years	202 (70)
Monthly salary (Mean IDR 5,917,765, Stdev 4,575,245) (IDR 1 million – IDR 29 million)	Less than IDR 6 million	178 (67)
	Greater than IDR 6 million	88 (33)
Additional practice	No	182 (68)
	Yes	84 (32)
Take home pay (Mean IDR 11,928,497, Stdev 13,390,630) (IDR 1.5 million – IDR 150 million)	Less than IDR 12 million	182 (69)
	Greater than IDR 12 million	83 (31)
Outcome variables		
Current Practice is in Rural and Remote Maluku Areas	No	118 (41)
	Yes	169 (59)
Preferred future location of practice*	Outside Maluku	58 (23)
	Urban Maluku	128 (52)
	Rural Maluku	62 (25)
Intended to remain working in rural and remote Maluku areas	No	186 (75)
	Yes	62 (25)

**\*Ordinal categories were then adjusted to dichotomous for further analysis**

*^Not all participants answered every question so the numbers do not add to 324.*

Figure 1. *Location of participants' medical schools*

Most respondents had worked less than five years since graduation and under five years in their current post, had only temporary contracts, and did not undertake additional practice besides their main job (Table 1). Of the 11 regencies in Maluku province, respondents predominantly worked in Ambon (39%), the capital city of Maluku Province, and the nearest regency from the capital, Central Maluku regency (21%) (Fig. 2).

Figure 2. *Map of Maluku with population and respondents number per regency/city.*

Figure 3 showed how salary had not changed over duration of work and take home pay increased after work for more than 10 years. The analysis of duration of work with monthly take home pay and location of current work and additional practice showed that of doctors who had worked for more than 10 years, 50% had an additional practice and 78% were located in more developed urban areas, Ambon city (59%) and Central Maluku Regency (15%). Additionally, those doctors with more years of work and higher take home pay (greater than median IDR 8,5 million) were mostly specialists who need specialist facilities (n = 28; 57%) so are permitted to have up to an additional 2 practices.<sup>46</sup>

Figure 3. *Average monthly salary and take home pay over duration of work*

More than half the respondents stated their preferred future location for work as in the urban areas of Maluku Province with only a quarter nominating to stay in RR posts in Maluku province (Table 1). Four essential specialty areas in Indonesian Medicine (Internal Medicine, Paediatrics, Obstetrics and Gynaecology, Surgery) were the commonly chosen future disciplines, with Internal Medicine the most favoured (36; 14.5%; Fig. 4).

Figure 4. *Participants future practice type preference*

## **Rural and remote practice in Maluku Province (Table 2)**

Younger age, being unmarried and having no children were significantly associated with rural location of practice (Chi-square  $p = 0.002$ ,  $p = 0.022$ ,  $p = 0.010$  respectively). Younger doctors were more than twice as likely taking up the rural practice than their senior (OR 2.36, CI 95% 1.37–4.08). Married doctors were almost twice as likely to practice rurally than those unmarried (OR 1.81, CI 95% 1.09–3.02). Further, doctors having no children in their care were approximately twice as likely to have a rural practice in Maluku (OR 1.95, CI 95% 1.17–3.3). No association was found between all rural background variables and the current practice location

Shorter length of work since graduation (OR 3.43, CI 95% 2.09–5.63,  $p = 0.000$ ), shorter length of work in current place (OR 2.72, CI 95% 1.62–4.56,  $p = 0.000$ ), smaller salary (OR 5.97, CI 95% 3.09–11.5,  $p = 0.000$ ), lower take home pay (OR 1.76, CI 95% 1.01–3.09,  $p = 0.046$ ), and having no additional practice (OR 2.73, CI 95% 1.60–4.65–0.63,  $p = 0.000$ ), were all positively associated with rural practice location.

Logistic regression revealed that shorter length of work since graduation, salary < IDR 6 million, take home pay < IDR 12 million, and having no additional practice were predictive of the current RR practice location. Doctors who started work within the last five years were 7 times more likely than their seniors (OR 7.07, CI 95% 2.46–20.3,  $p = 0.000$ ) to have current practice in rural and remote Maluku. Doctors with a smaller salary were almost 6 times more likely (OR 5.61, CI 95% 2.26–13.9,  $p = 0.000$ ), and doctors with smaller take home pay were almost 4 times more likely (OR 3.85, CI 95% 1.38–10.7,  $p = 0.010$ ) than those with higher salaries and take home pay to have current practice in rural and remote Maluku. Further, doctors with no additional practice were nearly 4 times more likely (OR 3.89, CI 95% 1.68–9.04,  $p = 0.002$ ) than those with additional practice to be working in rural and remote Maluku.

Table 2  
Analysis of associated and predicted factors of current rural and remote practice location

	Location of Practice		Univariate		Multivariate		
	N Valid cases	Rural and remote (%)	Urban (%)	P*	OR (CI 95%)	P*	OR (CI 95%)
Demography							
Age (less than mean 33.35)	240	73 (mean32)	53 (mean 36)	<b>0.002</b>	<b>2.36 (1.37–4.08)</b>		
Gender (female)	258	70	73	0.616	0.87 (0.50–1.51)		
Marriage status (single)	258	54	39	<b>0.022</b>	<b>1.81 (1.09–3.02)</b>		
Have child/ren uder care (No)	258	65	49	<b>0.010</b>	<b>1.95 (1.17–3.02)</b>		
Rural Background							
Rural Born	248	26	21	0.317	1.37 (0.74–2.54)		
Province of Birth is Maluku	247	63	66	0.556	0.85 (0.50–1.46)		
Have rural living experience	248	44	36	0.232	1.38 (0.81–2.35)		
Less than 10 years of Rural Living Experience	100	52	50	0.477	1.24 (0.69–2.22)		
Multistage of rural living experience	100	57	59	0.848	0.92 (0.39–2.16)		
Medical Training and Community Exposure							
Pattimura Medical School Origin	287	36	23	<b>0.017</b>	<b>1.90 (1.12–3.24)</b>		

	Location of Practice			Univariate		Multivariate	
	N Valid cases	Rural and remote (%)	Urban (%)	P*	OR (CI 95%)	P*	OR (CI 95%)
Multistages of learning using community exposure	279	53	43	0.112	0.47 (0.09–2.36)		
Positive Impact of community exposure to medical practice	245	43	34	0.187	1.42 (0.84–2.41)	0.095	1.81 (0.90–3.63)
Extracurricular community exposure more than 1 year	175	25	29	0.528	0.80 (0.41–1.59)		
Multi foci of community exposure	279	73	64	0.100	1.54 (0.92–2.56)		
Experienced rural exposure during medical training	279	90	86	0.391	1.37 (0.66–2.85)		
Employment factors							
Up to 5 years of work since graduation	287	72	42	<b>0.000</b>	<b>3.43</b> (2.09–5.63)	<b>0.000</b>	<b>7.07</b> (2.46–20.3)
Up to 5 years in current practice	287	79	58	<b>0.000</b>	<b>2.72</b> (1.62–4.56)		
Temporary employment status	265	61	50	0.079	1.56 (0.95–2.57)	0.058	0.37 (0.14–1.04)
Monthly salary less than IDR 6 Million	265	46	13	<b>0.000</b>	<b>5.97</b> (3.09–11.5)	<b>0.000</b>	<b>5.61</b> (2.26–13.9)
Having no additional practice	265	23	45	<b>0.000</b>	<b>0.37</b> (0.22–0.63)	<b>0.002</b>	<b>3.89</b> (1.68–9.04)
Monthly take home pay less than IDR 12 Million	265	35	24	<b>0.046</b>	<b>1.76</b> (1.01–3.09)	<b>0.010</b>	<b>3.85</b> (1.38–10.7)

## Preferred location of practice in rural and remote areas in Maluku (Table 3)

There was an association between younger age (nearly three times as likely to prefer future RR practice in Maluku than their seniors, OR 2.82, CI 95% 1.40–5.67,  $p = 0.003$ ) and having no children (almost twice as likely as those with children, OR 1.97, CI 95% 1.05–3.72,  $p = 0.035$ ) with the preferred location of practice being rural and remote Maluku. Rural background, that is being born in a rural area (OR 2.01, CI 95% 1.02–3.97,  $p = 0.042$ ) and having rural living experience (OR 2.24 CI 95% 1.21–4.16,  $p = 0.010$ ) were associated with preferred future practice location being rural and remote Maluku.

Medical training variables associated with the preferred rural practice location were Pattimura medical school graduate (OR 1.87, CI 95% 1.00–3.47,  $p = 0.048$ ), multistage learning using community exposure (OR 2.17, CI 95% 1.15–4.08,  $p = 0.016$ ), and positive impact of community exposure (OR 2.13, CI 95% 1.10–4.12,  $p = 0.024$ ). Employment status and history variables associated with preferred future RR work in Maluku areas were: length of work since graduation (OR 2.65, CI 95% 1.37–5.11,  $p = 0.003$ ); length of work in current place (OR 2.67, CI 95% 1.30–5.51,  $p = 0.007$ ); location of current practice being rural/remote (OR 9.46, CI 95% 3.80–23.5,  $p = 0.000$ ); temporary employment (OR 2.27, CI 95% 1.21–4.24,  $p = 0.010$ ); monthly take-home pay less than IDR 12 million (OR 0.40, CI 95% 0.20–0.81,  $p = 0.010$ ); and having no additional practice (OR 2.44, CI 95% 1.24–4.80,  $p = 0.009$ ). Smaller pay was a deterrent for RR practice preference in Maluku.

Three variables were predictive of a preferred RR location of practice: a more positive impact of community exposure during medical training (OR 2.48, CI 95% 1.12–5.48,  $p = 0.025$ ); currently practising in rural and remote Maluku (OR 15.3 CI 95% 4.87–48.1,  $p = 0.000$ ); and smaller monthly take home pay (a deterrent for future RR practice preference, OR 0.27, CI 95% 0.11–0.66,  $p = 0.004$ ). Currently work in the rural/remote Maluku was the strongest predictor of preferred future RR practice in Maluku ( $B = 2.728$ ).

Table 3

Analyses of variables associated and predicted preferred future rural and remote practice location

	Preferred future practice			Univariate		Multivariate	
	N Valid cases	Rural and remote Maluku (%)	Urban Maluku (%)	<i>P</i>	OR (CI 95%)	<i>P</i>	OR (CI 95%)
<b>Demography status</b>							
Age (less than mean 33.35)	177	77 (mean 31)	54 (mean 36)	<b>0.003</b>	<b>2.82</b> (1.40–5.67)		
Gender (female)	190	76	67	0.224	1.53 (0.77–3.05)		
Marriage status (single)	190	57	44	0.100	1.67 (0.90–3.07)		
Have child/ren under care (No)	190	68	52	<b>0.035</b>	<b>1.97</b> (1.05–3.72)		
<b>Rural Background</b>							
Rural Born	190	34	20	<b>0.042</b>	<b>2.01</b> (1.02–3.97)		
Province of Birth is Maluku	189	74	78	0.566	0.81 (0.40–1.65)		
Have rural living experience	190	55	35	<b>0.010</b>	<b>2.24</b> (1.21–4.16)	0.050	2.22 (1.00–4.93)
More than 10 years of rural living experience	79	41	49	0.496	0.73 (0.30–1.80)		
Multistage of rural living experience	79	62	56	0.580	1.29 (0.52–3.20)		
<b>Medical Training and Community Exposure</b>							
Graduated from Pattimura University	190	47	32	<b>0.048</b>	<b>1.87</b> (1.00–3.47)		

				Univariate		Multivariate	
Multistages learning using community exposure	169	63	44	0.016	2.17 (1.15–4.08)		
Positive Impact of community exposure to medical practice	184	55	36	0.024	2.13 (1.10–4.12)	0.025	2.48 (1.12–5.48)
Multifocal community exposure	184	82	69	0.061	2.04 (0.96–4.35)		
Experienced rural exposure during medical training	184	90	90	0.945	0.96 (0.34–2.71)		
Employment factors							
Up to 5 years of work since graduation	190	73	50	0.003	2.65 (1.37–5.11)		
Up to 5 years in current practice	190	81	61	0.007	2.67 (1.30–5.51)		
Currently work in rural/remote	189	90	49	0.000	9.46 (3.80–23.5)	0.000	15.3 (4.87–48.1)
Temporary employment status	190	65	45	0.010	2.27 (1.21–4.24)		
Monthly salary less than IDR 6 million	190	44	31	0.076	1.76 (0.94–3.30)		
Having no additional practice	190	81	56	0.000	3.28 (1.85–5.82)		
Monthly take home pay less than IDR 12 million	190	21	40	0.010	0.40 (0.20–0.81)	0.004	0.27 (0.11–0.66)

## Intention to remain in the rural workforce in Maluku Province (Table 4)

Factors associated with intention to remain in RR practice in Maluku Province were younger age (OR 2.02, CI 95% 1.03–3.95,  $p = 0.039$ ), rural birth (OR 1.99, CI 95% 1.06–3.77,  $p = 0.031$ ), rural living experience (OR 2.16, CI 95% 1.20–3.86,  $p = 0.009$ ), Pattimura University graduate (OR 2.53 CI 95% 1.39–4.59,  $p = 0.002$ ), multistage learning using community exposure (OR 2.18, CI 95% 1.19–3.98,  $p = 0.010$ ), positive

impact of community exposure (OR 2.22, CI 95% 1.18–4.18,  $p = 0.012$ ), multi-focus of community exposure (OR 2.26, CI 95% 1.10–4.67,  $p = 0.024$ ), location of current practice was RR (OR 7.72 CI 95% 3.17–18.8,  $p = 0.000$ ), and monthly take-home payment < IDR 12 million (OR 0.48, CI 95% 0.24–0.95,  $p = 0.034$ ).

Predictors of doctors' intention to remain working in rural and remote Maluku were current practice in rural and remote Maluku (doctors in rural practice were 15 times more likely to intend to stay than those practicing in the province and district capital cities, OR 14.9, CI 95% 4.71–47.3,  $p = 0.000$ ), positive impact of community exposure during medical course (OR 2.22, CI 95% 1.06–4.64,  $p = 0.034$ ), Pattimura University graduate (over 3 times more likely to stay in rural practice in Maluku than other universities graduates; OR 3.33 CI 95% 1.30–8.51,  $p = 0.012$ ). Low take-home pay less than IDR 12 million monthly negatively predicted future rural work (doctors with smaller take pay home were less likely to intend to stay, OR 0.29, CI 95% 0.12–0.72,  $p = 0.007$ ). Current location of practice being rural was the strongest predictor ( $B = 2.702$ ).

Table 4  
Variables associated with and predicted intention to stay in rural and remote practice

	N Valid cases	Intention to remain practice in rural and remote Maluku		Univariate		Multivariate	
		Yes (%)	No (%)	<i>p</i>	OR (CI 95%)	<i>p</i>	OR (CI 95%)
Demography status							
Age (less than mean 33.35)	231	77 (mean 31)	62 (mean 34)	<b>0.039</b>	<b>2.02</b> (1.03– 3.95)		
Gender (female)	248	76	68	0.231	1.49 (0.77– 2.88)		
Marriage status (single)	248	57	48	0.271	1.38 (0.78– 2.47)		
Have child/ren under care (No)	248	68	59	0.202	1.48 (0.81– 2.72)		
Rural Background							
Rural Born	248	34	20	<b>0.031</b>	<b>2.00</b> (1.06– 3.77)	0.056	2.31 (0.98– 5.43)
Province of Birth is Maluku	247	74	61	0.053	1.87 (0.99– 3.56)		
Have rural living experience	248	41	36	<b>0.009</b>	<b>2.16</b> (1.20– 3.86)		
More than 10 years of rural living experience	101	41	52	0.293	0.64 (0.27– 1.47)		
Multistage of rural living experience	101	62	55	0.530	1.31 (0.56– 3.04)		
Medical Training and Community Exposure							
Graduated from Pattimura University	248	47	26	<b>0.002</b>	<b>2.53</b> (1.39– 4.59)	<b>0.012</b>	<b>3.32</b> (1.30– 8.51)

	N Valid cases	Intention to remain practice in rural and remote Maluku		Univariate		Multivariate	
		Yes (%)	No (%)	<i>p</i>	OR (CI 95%)	<i>p</i>	OR (CI 95%)
Multistages of learning using community exposure	241	63	44	<b>0.010</b>	<b>2.18</b> (1.20– 3.98)		
Positive Impact of community exposure to medical practice	212	55	35	<b>0.012</b>	<b>2.22</b> (1.18– 4.18)	<b>0.034</b>	<b>2.22</b> (1.06– 4.64)
Multifocal community exposure	241	82	66	<b>0.024</b>	<b>2.26</b> (1.10– 4.67)		
Experienced rural exposure during medical training	241	90	87	0.507	1.38 (0.53– 3.55)		
Employment factors							
Up to 5 years of work since graduation	248	73	59	0.058	1.83 (0.97– 3.43)	0.100	0.40 (0.13– 1.19)
Up to 5 years in current practice	248	81	68	0.062	1.94 (0.96– 3.90)		
Currently work in rural/remote Maluku	248	90	54	<b>0.000</b>	<b>7.72</b> (3.17– 18.8)	<b>0.000</b>	<b>14.9</b> (4.71– 47.3)
Temporary employment status	247	65	54	0.160	1.53 (0.84– 2.77)		
Monthly salary less than IDR 6 million	248	44	32	0.090	1.66 (0.92– 3.00)		
Having no additional practice	248	76	66	0.135	1.64 (0.85– 3.17)		
Monthly take home pay less than IDR 12 million	248	21	36	<b>0.034</b>	<b>0.48</b> (0.24– 0.93)	<b>0.007</b>	<b>0.29</b> (0.12– 0.72)

## Discussion

This survey of doctors living and practicing in Maluku province Indonesia offers valuable insights into factors significant to both recruiting and retaining a sustainable rural workforce.

Doctors currently working in rural and remote Maluku were more likely to be of younger age, single, graduated from Pattimura University, working for less than five years in current practice and since having graduated, report no additional practice, and have a smaller monthly salary and take home pay. Rural and remote practice in Maluku were predicted by shorter length of work since graduation, the absence of additional practice, and smaller salary and take home pay.

Length of work since graduation up to 5 years was the strongest predictor of RR practice location, and currently practising rural was the strongest predictor for future RR practice preference and intention to remain in RR practice.

These data inform an argument for dedicated government support of recruiting people from areas of medical workforce shortage into medical school, and support for students and graduate doctors through training and attractive opportunities to sustain their practices, which can subsequently retain the doctors in areas of workforce shortage.

This study identified more doctors practicing rurally were female (70%). This finding is notably different from other international studies describing characteristics of rural doctors, where male doctors tend to be the majority.<sup>21,30,47</sup> While not predictive in this sample, another study in Australia has reported that more women are applying to Rural Clinical Schools<sup>34</sup> and proportionately more are going on to rural work<sup>26</sup>, thus beginning to redress rural workforce shortages in female practitioners.<sup>26</sup>

The majority of doctors practicing in Maluku graduated from medical schools in regional or provincial capitals, including almost a third from Pattimura University, Maluku. Given that most of our respondents were Maluku-born, this finding confirms that regional students come back to their regions<sup>48-50</sup>, and implies that significant efforts should be put into development of regional medical schools in order to improve distribution of doctors to the regions.<sup>48-50</sup> While not significantly associated with rural practice location, we found that most doctors experienced rural exposure during their medical training. This is similar to the Australian requirement that all students experience rural work during their medical training.<sup>51</sup> Clearly more directed positive strategies are needed.

Interestingly, rural exposure during medical training which is one of the most widely reported factors in other studies, was not associated with or predictive for RR practice location, rural preference, and intention to stay in a rural post. This was also found a study from Canada<sup>52</sup>, however, that study was from 1999 when medical schools were in the early stages of advancing rural experiences for their students. A 10 year longitudinal cohort study from Australia showed that rural exposure during medical training related to rural work.<sup>51</sup>

Another important factor reported elsewhere as a determinant of RR practice uptake is rural background<sup>19-35</sup>, but in this study it was not associated with or predictive for rural practice location. However, rural born and rural living experiences were associated with the preference of future rural practice location also intention to remain in RR practice. Rural living experience was also a predictor for preferred future RR practice, and born rurally was a predictor for intention to remain in rural practice among doctors working in Maluku Province. All of these factors should inform development of pro-rural work policies for this archipelago.

These positive policies are not only the domain of Western countries, as we confirm that a geographical maldistribution exists even in this developing province.<sup>9</sup> But since our findings suggest that rural living experience and being rural born were associated with future rural work preference and intention to remain in rural practice, more focus and attention should be given to the recruitment of students and doctors with a rural background. Although this finding is not novel, this study importantly confirms the pattern among the limited number of studies from developing countries.

Additionally, evidence suggests that widening access to medical course enhanced care to underserved communities.<sup>53-57</sup> A more comprehensive approach is needed to widen the participation and aspirations for medicine of under-represented socio-economic and educationally disadvantaged groups. This could include regent government early education programs and support including scholarships aimed at these under-represented groups.

Regarding future preference of practice type, doctors in Maluku preferred to work in specialist practices, namely Internal Medicine, Paediatrics, Obstetrics and Gynaecology, and Surgery. Specialist practice, especially within the four major specialties, is an opportunity to earn more income and the four specialty areas align with international preferences among doctors and medical students.<sup>58-60</sup> Although there are currently few specialists in Maluku and there is a great need for more specialists, priority should be given to primary care, rural practice, rural generalist, and family medicine for these areas of practice are associated with improved recruitment and retention of RR medical human resources.<sup>21,23,24,27,28,32,61,62</sup>

We found that monthly salary and take home pay were relatively low regardless of the length of work (IDR 5 million, equal to USD 350/GBP 250 and IDR 34.5 million equal to USD 2400 or GBP 1750 respectively), and low salary was associated with and predicted current rural practice. Smaller take home pay deterred doctors from future rural preference and intention to stay rural, highlighting the call from others internationally that meaningful reward for rural work is needed.<sup>63</sup>

This study shows that being a graduate of Pattimura University was significantly associated with all three outcome variables, and predicted the intention to remain practising in rural and remote Maluku. From this result, it can be said that Pattimura University has successfully produced doctors who are willing to serve in the RR areas of Maluku Province. This evidence supports the achievement of Pattimura University Medical School philosophy, akin to the vision of the Philippines medical school<sup>64</sup> and the vision for rural clinical schools in Australia.<sup>26,34,65</sup>

Considerable evidence shows that a medical school intentionally established in a region of workforce shortage pays much greater attention to the region's health status and concern. This is the case in both the developed.<sup>22,66-68</sup> and developing world.<sup>49,64,69</sup> The medical school in The Philippines, Zamboanga<sup>64</sup>, has a similar rural, archipelago, and developing country context as Indonesia so its findings are likely to be immediately relevant. This medical school showed that effective and sustainable medical education is possible in poor rural areas.<sup>64,70</sup> Compared to James Cook University which strongly favours applicants with rural backgrounds and requires a commitment to work rurally after graduation<sup>22,66-68</sup>, Pattimura University only stresses the philosophical value to practise rurally and offers rural exposure during medical training without any requirement for a rural background or commitment to work rurally.

From the successful experience of other universities<sup>24,26,28,49,64,69,71</sup>, and based on this study's findings, Pattimura University could expand even further into the rural areas of the region. Stressing the university's values by increasing the proportion of students with a rural background and ensuring rural exposure is offered at different year levels for a range of disciplines during the medical course will likely increase the number of graduates serving the RR areas of Maluku Province.

It is evident from this study that younger doctors were more likely to work rurally and to stay rurally, perhaps reflecting this generations' ethical stances around the world.<sup>72,73</sup> Those who start working in the last five years were more likely to take up and prefer rural practice, however, they received a lower salary and smaller take-home pay which reduces their intention to stay in RR practice. The rural work experience requirement and recommendation from the rural government for scholarship in specialist training from the Ministry of Health<sup>74</sup> means these rural posts are likely to temporarily attract younger doctors to rural service in Maluku. However, retaining doctors in rural and remote Maluku Province requires more than financial incentives. Evidence from elsewhere shows that educational<sup>61,75-80</sup>, multi dimensional<sup>81-85</sup>, and professional development strategies<sup>86,87</sup> improves retention of doctors in RR areas. Consequently, collaboration between medical schools and local government is required to ensure relevant strategies are implemented to improve the recruitment and retention of doctors in RR areas.

## Study limitation

Pertaining to the sampling frame, we noted difference in the number of doctors working in Maluku compare to the list provided from provincial and regents health offices, and the medical school. There was no integrated database listing all doctors working in this province. The use of the Pattimura University alumni database to identify additional medical graduates augments the denominator for sampling but may potentially bias the participant sample.

This study is cross sectional, so it is not possible to draw inferences of causality and outcomes of individual preferences and inclination to remain in rural practice which can easily change. A longitudinal study is needed to track whether the participants are still in rural practice 5 to 10 years from now. Secondly, despite the high response rate, the study may not have had power to detect less strong associations between rural exposure in medical training and subsequent practice location.

The definition of rurality used in this study was the Indonesian national classification which may differ to that used by other countries and make comparison challenging.

## **Conclusion**

This study provides evidence that rural background predicts doctors' RR preference and intention, and that a regional medical school helps supply doctors to the RR areas in its region. Sustained collaboration between medical schools and local government implementing relevant strategies are needed to widen participation and improve the recruitment and retention of rural and remote doctors.

## **Abbreviations**

RR

Rural and remote

OR

Odds ratio

## **Declarations**

### **Ethics approval and consent to participate**

Approval to conduct this study was provided by the University of Western Australia with reference number RA/4/20/5065, and by Pattimura University, Indonesia with reference number 008/FK-KOM. ETIK/VIII/2019, in accordance with its ethics review and approval procedures.

Consent to participate to this study was embedded in the online survey administered to the participants, in which participation in the survey means consent to participate.

### **Consent for publication**

Not Applicable

### **Availability of data and materials**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### **Competing interests**

The authors declare that they have no competing interests.

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## Authors' contributions

FN led the design and conceptualisation of this work, drafted the protocol, developed the instrument, collected data, and conducted the analysis and data interpretation. SC, ST, RC, and DP guided the conceptualisation and design of the study and data analyses, and have revised all drafts of this manuscript for important intellectual content and clarity. All authors read and approve the final manuscript and the publishing of this manuscript.

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## Figures

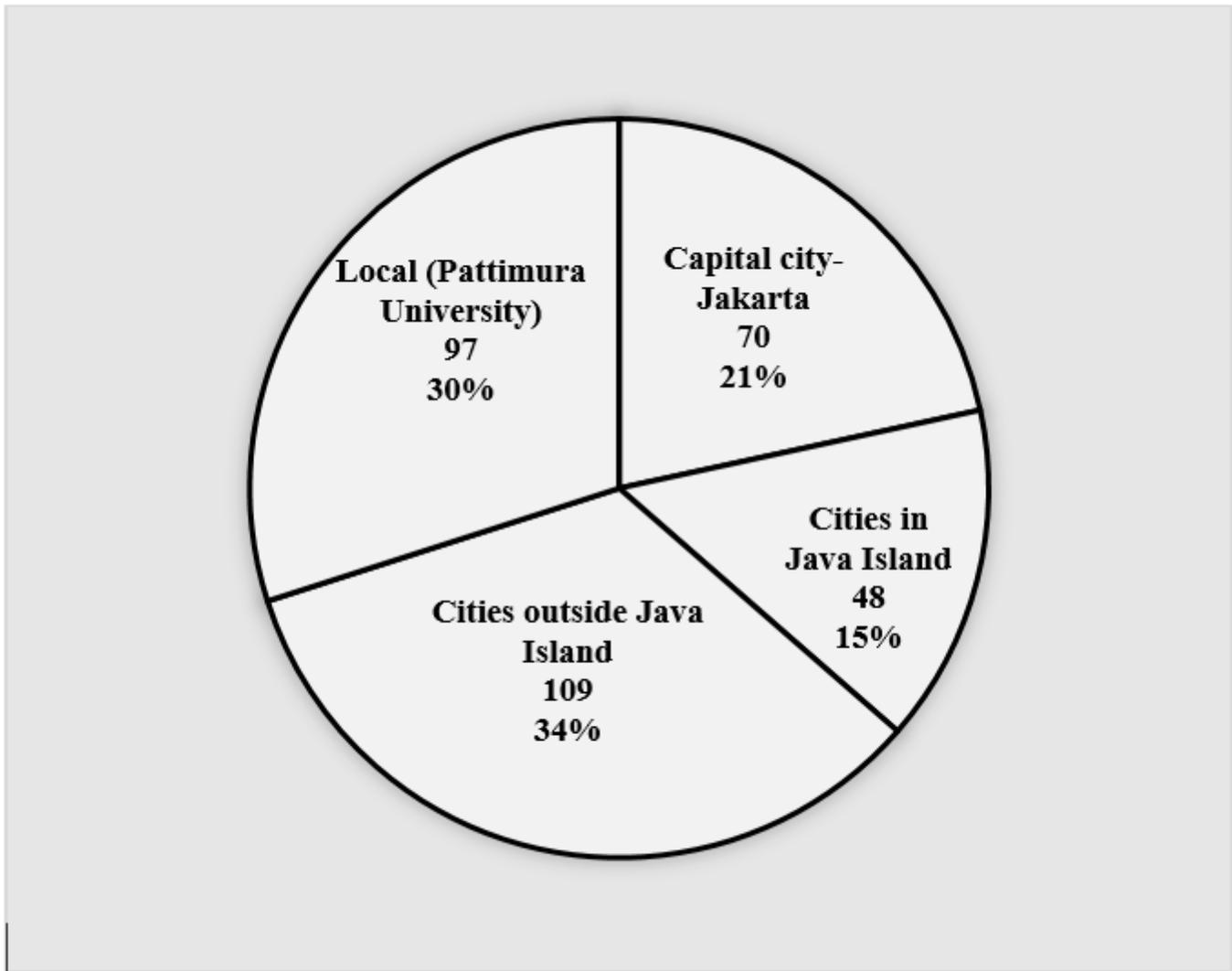
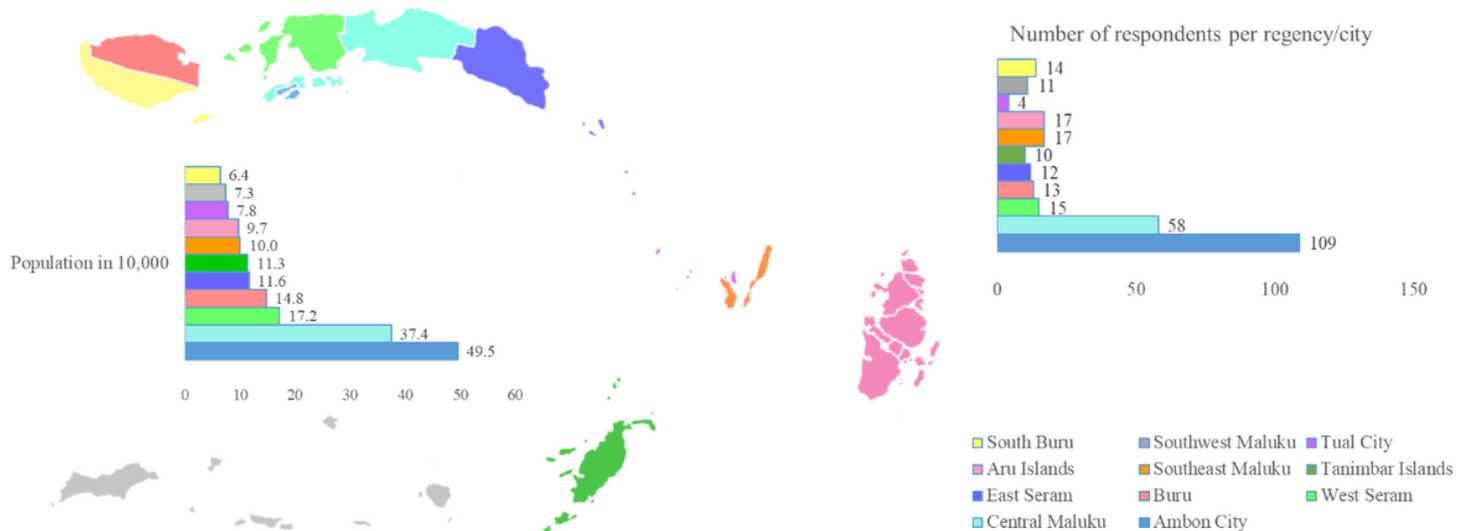


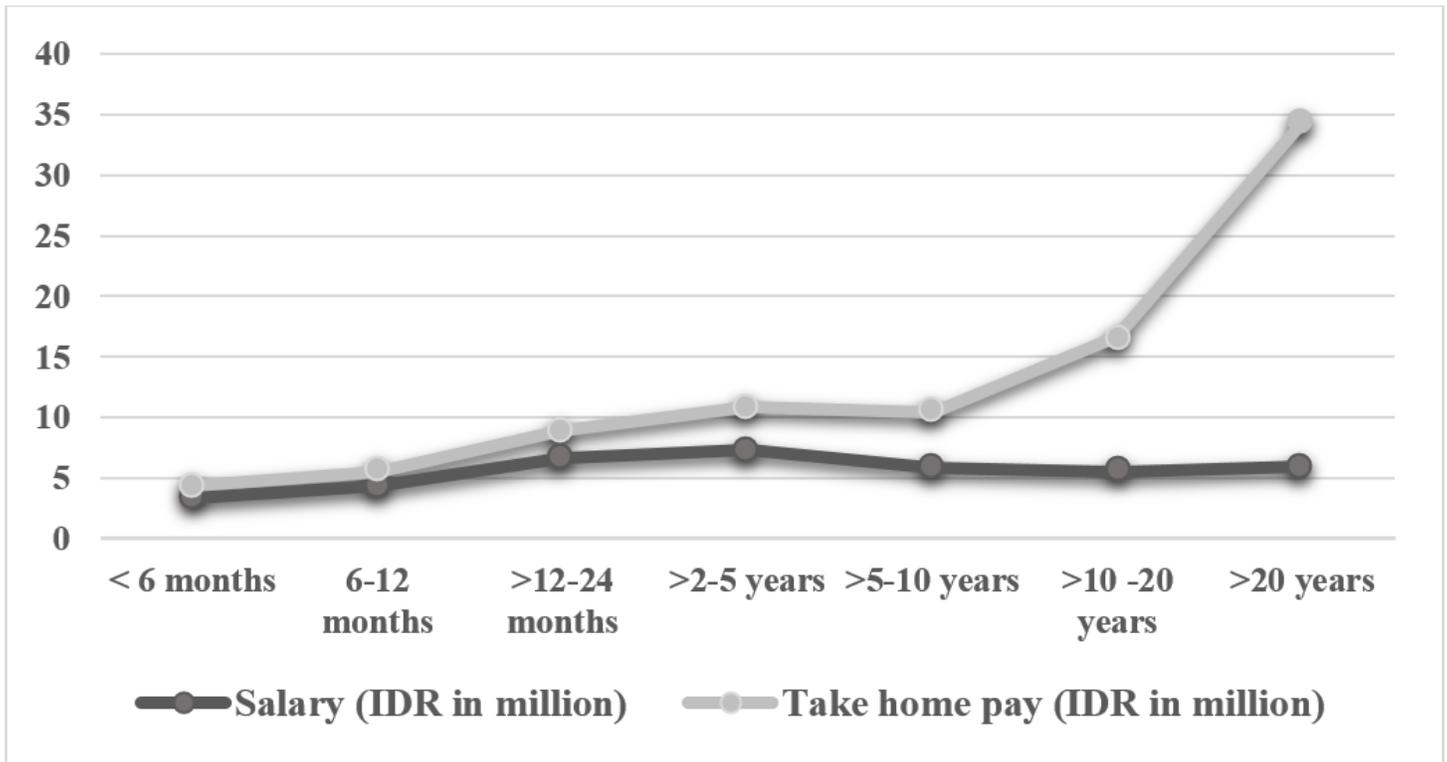
Figure 1

Location of participants' medical schools



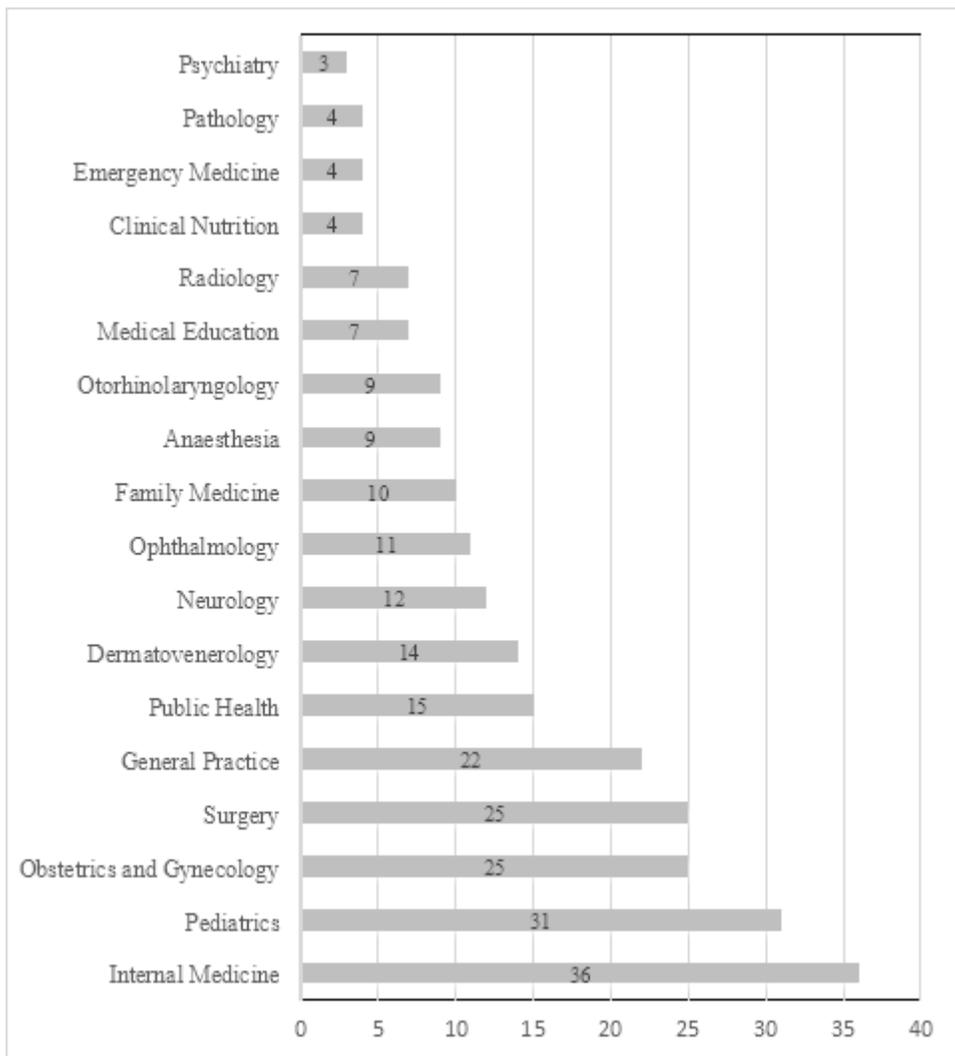
**Figure 2**

Map of Maluku with population and respondents number per regency/city.



**Figure 3**

Average monthly salary and take home pay over duration of work



**Figure 4**

Participants future practice type preference

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SurveyQualtricsBahasaIndonesia.pdf](#)