MED-2013-1449 Special Issue *Medical Education* on equality, diversity and fairness in Medical Education

Impact of selection strategies on representation of underserved populations and intention to practice for students entering socially accountable medical schools.

Associate Professor Sarah Larkins (Corresponding Author)

School of Medicine and Dentistry,

James Cook University, Douglas campus,

Townsville, Australia 4814

Sarah.larkins@jcu.edu.au

Dr Kristien Michielsen

The Training for Health Equity Network and Ghent University, Belgium

Professor Jehu Iputo

School of Medicine,

Walter Sisulu University

Umtata, South Africa

A/Professor Salwa Elsanousi

School of Medicine, Gezira University, Sudan

Dr Marykutty Mammen

School of Medicine

Walter Sisulu University,

South Africa

A/Professor Lisa Graves

Northern Ontario School of Medicine,

Sudbury, Ontario, Canada

And University of Toronto, Toronto, Ontario, Canada

Assistant Professor Sara Willems

Faculty of Medicine and Health Sciences, Ghent University, Belgium

Professor Fortunato L. Cristobal

Ateneo de Zamboanga School of Medicine,

Zamboanga, Mindanao, The Philippines.

Dr Rex Samson,

Ateneo de Zamboanga School of Medicine,

Zamboanga, Mindanao, The Philippines.

Dr Rachel Ellaway,

Northern Ontario School of Medicine,

Sudbury, Ontario, Canada

Ms Simone Ross,

School of Medicine and Dentistry, James Cook University, Australia

Ms Karen Johnston,

School of Medicine and Dentistry, James Cook University, Australia

Associate Professor Anselme Derese,

Faculty of Medicine and Health Sciences, Ghent University, Belgium

Dr André-Jacques Neusy

Training for Health Equity Network (THEnet)

Disclaimers

The authors have no conflicts of interest to report.

Sources of support

The work reported in this paper was funded by Atlantic Charities Trust and the support of the Arcadia Foundation received through the Build Project 501(c3.)

Running head (no more than 40 characters including spaces)

Selection for equity in medical education

Abstract

Introduction

Socially accountable medical schools aim to reduce health inequalities by training a workforce responsive to priority health needs of underserved communities. One key strategy is recruiting learners from underserved and unequally represented communities, given they may be more likely to return and address local health priorities. This study describes the effect of different selection strategies of socially accountable medical schools on the representation of students from underserved communities in medical education and learner practice intentions.

Methods

A cross-sectional questionnaire was administered to learners starting medical education in five institutions with a social accountability mandate in five countries. The questionnaire assessed learners' background characteristics, rurality of background, and practice intentions (location, discipline of practice and population to be served). Results were compared to characteristics of learners entering medical education in schools with standard selection procedures and publically available socioeconomic data.

Results

The selection processes of all five schools include more than just academic achievement. Four distinct strategies were identified: quota system; selection based on personal attributes; community involvement and school marketing strategies.

Questionnaire data from 944 learners shows that learners at these five schools are highly likely to be of non-urban origin, of lower socio-economic status or from underserved groups. 407/810 (50.2%) of all students indicate an intention to practice in a non-urban area after graduation, with the likelihood of this increasing with increasing rurality of primary schooling ($p=0.000$). Those of rural origin are statistically less likely to express an intention to work abroad ($p=0.003$).

Discussion

We continue to follow our students to assess how their intent translates into actual practice. Nevertheless, selection strategies that ensure that members of underserved communities can pursue medical careers seem effective in achieving a fair and equitable representation of underserved communities within the student body. They also appear to be producing a cohort of diverse medical students with strong intentions to work with underserved populations, a critical component of health equity. The identification of unique selection strategies that have been successfully implemented offers a structure for furthering our understanding of the success of these strategies.

Key words: Selection, health equity, underserved populations, practice intentions, social accountability, medical education

Introduction

The world suffers from staggering health inequities, within and between countries, exacerbated by a shortage and maldistribution of health professionals.[1] The World Health Organization (WHO) estimates that an additional 2.4 million doctors, nurses and midwives are needed worldwide.[1] Globally, more than a billion people lack access to quality health services and a large contributor to this is the shortage, skills mix imbalance and uneven geographical distribution of professionally qualified health workers such as doctors, nurses and midwives. Yet the locations of training institutions for doctors and other health professionals do not reflect health needs.[2] In the case of medical education, worldwide, 2420 medical schools produce doctors. As Frenk and Chen outline, four countries (China, India, Brazil and the USA) each have more than 150 medical schools, whereas there are 36 countries which have none at all.[2] Twenty-six countries in sub-Saharan Africa have only one or no medical schools. With such stark imbalances, it is not surprising that the number of medical schools reflects neither the population or each country nor its burden of disease. Improvement is hampered by the limited opportunities for students from underserved communities to enter into medical education.[2]

The under-representation or certain social and cultural group in higher education is a worldwide phenomenon and top-down approaches to widening participation have had limited success in addressing the issue.[3] Selection is one mechanism that can effect change but there has been increasing recognition of the inequity of current selection processes for higher education (including medicine), and a recognition that broader strategies are necessary to ensure wider participation of students from a range of demographics in medical education.[4, 5] However, to date, there is very limited good

quality evidence about the impact of these broader selection strategies on health workforce distribution.[6]

The mismatch between health professional education and the needs of the local health system and service delivery is an inevitable consequence of limited collaboration between the health and education sectors, as well as weak links between educational institutions and the health systems which employ graduates. It is generally accepted that simply adding more qualified health workers into the mix without addressing issues of distribution will have little impact on the burden of disease.[6, 7] When insufficient numbers of health workers, from a narrow subset of population demographics, are trained in narrow disciplinary silos, the health system is extremely unlikely to reach the goal of universal health coverage.[8] In recognition of the importance of addressing the representativeness of the health workforce to meeting the Millennium Development Goals, the WHO has recently passed resolution WHA66.23 urging member states to reflect on and assess health workforce education.[9]

The Training for Health Equity Network (THEnet) is a growing global community of practice currently involving 11 medical schools with an explicit social accountability mandate.[10] Socially accountable medical schools aim to reduce health inequalities by training a workforce that is responsive to the priority health needs of underserved communities.[11] One of the key strategies for social accountability is actively recruiting learners from underserved and unequally represented communities to enter into medical school,[12] given that they will be more likely to return to their community of origin and address local health priorities.[13] THEnet schools have independently developed innovative selection strategies in an attempt to create a student profile more

representative of their reference populations, which in turn is expected to produce a more evenly distributed health workforce more aligned with population needs . We define underserved populations as those that lack access to health services because of geography, socioeconomic status or disadvantage based on ethnicity/culture or caste.[12]

THEnet schools are developing a programme theory of the factors that influence the expression of social accountability in medical education programmes, based on the consensus evaluation framework previously developed by THEnet.[12] The mechanisms and relationships in the programme theory act as a series of interconnected hypotheses. The derived hypotheses for this study were derived from this programme theory, namely that:

1. Medical schools with a social accountability mandate employ selection strategies that are more inclusive of members of the underserved populations they serve, in order to address health inequities.
2. Medical students from underserved populations have practice intentions that more focused on returning to serve those populations when compared with those of students from other populations.

This paper therefore aims to answer the following research questions:

1. What kinds of selection strategies are used by socially accountable medical schools?
2. To what extent are underserved populations represented in the medical student intake of these schools?
3. What are the future practice intentions of students at the time of selection into these programmes?

Methods

This study was part of the THEnet graduate outcome survey; a multi-country prospective cohort study in schools with a social accountability mandate that has been tracking learners throughout their training and up to ten years into practice. This forms part of the longitudinal impact assessment of socially accountable medical education as described in THEnet's Evaluation Framework.[12, 14] The data presented were from five THEnet medical schools from around the world. Contextual information on the participating schools and countries is set out in Table 1.

[TABLE 1 ABOUT HERE]

The quantitative data presented here is supplemented by qualitative exploration and economic impact analysis as part of the larger evaluation project. For this study, documentation of selection processes was done from institutional and programme profiles and directly through documentation from senior personnel; learner characteristics and practice intentions were gathered using a questionnaire administered to learners entering medical training at each participating institution.

All learners entering medical school were invited to participate in the questionnaire within the first semester of their course. The questionnaire assessed learners' background characteristics (socio-economic and demographic profile), rurality of primary schooling, choice of medical school and practice intentions (location, discipline of practice and population to be served). It was created based on the widely used Australian Medical Students Outcomes Database (MSOD) Commencing Medical Students Questionnaire,[15] and modified through discussions held between THEnet partner schools, defining the various dimensions of disadvantage of populations served

by their schools. These were grouped and a method for classifying for disadvantage that could be adapted for different contexts was developed. The modified instrument was reviewed by medical education leaders from THEnet schools for both content and construct validity. The instrument was piloted at a high-income and a low-income school, resulting in minor revisions in wording.

At each school, the students completed the questionnaire in the first months of their course between 2012 and 2013 in either paper or electronic format, depending on the preferences and resources of their school. Only one school completed the survey electronically. The surveys were identical, with the exception of variations of the descriptors for quintiles for socio-economic status and rurality developed with the assistance of local experts from each country. One school, Ghent, translated the survey into Flemish, using standard methods of translation and back-translation to assess fidelity of translation. Each school used the same codebook, and data files were merged into a Microsoft Excel file for cleaning and then analyzed using SPSS (Version 20, IBM - www.ibm.com/software/analytics/spss). One school had two cohorts of students included – an analysis of results revealed a high degree of homogeneity, thus they were combined to increase data available for this study.

Comparison data for each country were obtained from a variety of sources. For example, in Australia, this was sourced from the MSOD Commencing Medical Students Questionnaire report which provides aggregated data from 18 Australian medical schools.[16] In Belgium, the same questionnaire was used at all other Flemish-speaking medical schools in Flanders. Some socioeconomic comparison data for Sudan, South Africa and the Philippines were obtained from the World Bank, although this was

limited to income share data rather than quintiles of SES.[17-19] Comparison is also made with US data about socio-economic status of medical students.[20-22]

Learners' characteristics (socio-economic and demographic profile) were also compared to the population in the area of the school. Where possible, results (including practice intentions) were compared to predictors of improved service and health equity alongside the characteristics of learners entering medical education in schools with standard selection procedures (survey data or publicly available data). Results are reported in terms of numbers, percentages and 95% confidence intervals, with Chi-square comparisons performed where appropriate.

Approval for the study was obtained from the ethics committees at James Cook University, Ghent University Hospital and Walter Sisulu University and from senior academic leadership at the other schools. Informed consent was obtained from all participants.

Results

1. Selection strategies used by socially accountable medical schools

Whilst different schools apply different selection strategies, they have one thing in common: enrolment is based on more than just the demonstration of appropriate academic skills. We distinguish four different approaches (Table 1).

- *Quota*: at the Faculty of Medicine of the University of Gezira in Sudan, 50% of the seats are reserved for students from underprivileged deprived areas of the Gezira State and at Walter Sisulu University (WSU), a quota ensured that 80% of the intake was from the indigenous African population and 75% of the

African students came from the rural areas of the Eastern Cape province of South Africa.

- *Selection criteria:* students at Walter Sisulu University were selected on the basis of their personal attributes (e.g. interpersonal relationship strategies; empathy; community awareness and motivation) in equal measure to their academic achievements.
- *Community involvement:* the University of the Philippines Manila-School of Health Sciences preferentially recruited students from rural, remote and underserved areas in the Philippines that were endorsed by village household heads and the local government authority. Ateneo de Zamboanga University School of Medicine (ADZU) involved two community members in interview panels for selection.
- *School marketing:* in Belgium, all those passing the regional entry exam could enroll into the school of their choice. Ghent University in Belgium tried to attract specific students, by stressing its community-based and -engaged curriculum.

Some schools used a combination of these strategies. For example, at James Cook University (JCU), interviews assess personal attributes, community members participate in the selection process, academic scores are adjusted for rurality, there is a separate selection process for Aboriginal and Torres Strait Islander students and the school markets its commitment to rural, remote, Indigenous and tropical health issues. Likewise, ADZU puts minimal weight on the National Medical Admission Test, but rather prioritizes selection from local rural areas and has a composite selection strategy including academic review, interview assessment of personal

attributes through a panel interview (including two community members) and a written essay.

2. Representation of underserved populations in the medical student body

We analyzed 944 student surveys from five schools (for response rates and school characteristics, see Table 1). Overall response rates were high, largely influenced by face-to-face administration of the survey in class time. Survey results, describing characteristics and practice intentions of students entering medical education, and the proportion of these who come from underserved groups (together with comparison data where available) are summarized (Table 2 and Table 3).

TABLE 2 ABOUT HERE

In general, the demographic profiles of the medical students from these schools were more representative of the population of the country than those from other medical schools, although comparison data are limited. For example, at WSU, the proportion of students who self-report as coming from underserved populations (mostly black South Africans) was extremely high at 90.2%; an over-representation compared with the national population proportion of 79.2%, but in line with the population of Eastern Cape Province.[23] Likewise, the population of students that self-identify as Indigenous at JCU (1.9%) was much closer to (and exceeds) national population demographics. Student self-described socio-economic status (as measured through reported family income in previous 12 months) was relatively widely distributed, and in fact, those schools with an explicit quota system for students from low-socioeconomic status had an over-representation of students from the lowest two quintiles (Figure 1). For example, the two schools with a quota for low-income students had 107/218 (49.1%) of students in

the bottom two quintiles for self-reported family income and the three schools without quotas had 65/370 (17.6%) from these bottom two quintiles (Pearson Chi-square 65.83; df=1; p<0.001). When combined, the THEnet schools had a total of 172/588 domestic students (29.3%) from the bottom two quintiles of self-reported SES (Table 2). By contrast, recent data reporting on a cohort of 13,681 medical graduates from a range of US schools reported that only 1231 (9%) were from the lowest two quintiles of SES (Odds Ratio 4.18; 95% CI 3.47-5.04; p<0.0001).[22] However, in Belgium, all those who pass a regional entrance exam can gain direct entry to the school of their choice. The student demographic for Ghent therefore reflects a considerably higher SES than for other schools in the study.

Overall, although definitions of quintiles of rurality differ greatly according to context, 570/817 (70%) reported having completed the majority of their primary schooling in a rural or regional area (Figure 2).

The most useful comparison data for medical student background and intent was available for Australia[16] and for medical student socio-economic status from the US.[22] For example, the odds ratio for being of rural origin (judged by majority of primary schooling in non-urban location) for JCU students compared with all Australian medical students is 3.31 (95% CI 2.39-4.57; p<0.0001), and JCU students were almost twice as likely to identify as Indigenous Australians when compared with Australian medical students overall (3.7% versus 1.9%).

3. Students' future practice intentions

In terms of practice intentions, high proportions of students from all schools reported an intention to practice with underserved communities. When combining data from all

schools, there was a statistically significant association between non-urban origin and both intention to work with Indigenous/Aboriginal populations (Pearson Chi-square 6.572; df=1; p=0.01) and intention to practice with rural and remote populations (Pearson Chi-square 18.027; df=1; p=0.000). Again, the best comparison data are available for Australia. Data from the 2012 MSOD Commencing Medical Students' Questionnaire (CMSQ),[16] with 3373 respondents across Australian medical schools, reported that 3.1% (95% CI 2.8-3.4) intended to practice in the most remote locations (defined as less than 10,000 population). By contrast, of JCU domestic students 6.2% (95% CI 4.3-8.1) reported intending to work in the most remote definition (using an even tighter classification of less than 5,000 population; Odds Ratio 2.04; p=0.04). Furthermore, CMSQ responses suggested 68.1% intended to practice in a capital city, compared with 25.5% of JCU students (Odds Ratio 0.16; 95% CI of OR 0.11-0.23; p<0.0001).

When the findings from THEnet study schools are combined, there is a statistically significant association between coming from a more rural origin and intention to practice with underserved populations; an intention to practice in rural locations; and importantly, an inverse association with intention to practice abroad (Chi square for trend=16.025, df=4, p=0.003; Figure 3).

Discussion

Selection strategies applied by these THEnet schools use a range of indicators beyond academic ability to select a student cohort that is more diverse, with characteristics that more closely align with population characteristics in the region when compared with other medical schools. A further critical factor demonstrated in selection strategies that

aspire to be more socially accountable is the shift in focus from learner to community. Fairness to applicants is therefore tempered by the need to address health inequalities and a social contract or responsibility to the communities the school serves. To this end, we have described different selection strategies that can be used either individually or in various combinations and the impact that they have on enhancing representativeness of the student profile.

At JCU, we are able to demonstrate that schools using these selection strategies have demonstrably different student profiles than other Australian medical schools (with more similarity to reference population characteristics).[24] Achieving this often requires partnerships between the medical school and both community and government. For example, at WSU students from poor families are able to be admitted because the local government guarantees an educational subsidy for them. In Belgium, students are free to choose their medical schools, thus Ghent University must rely on marketing to attract students that share their mission and socially accountable medical education to influence the practice intention of its students.

Students at these THEnet schools have different practice intentions in terms of future practice with underserved populations and both size of community and location of future practice; these are more likely to result in a workforce distributed according to population need. There is now good evidence for the so-called “rural pipeline”, that students of rural background who are trained in rural and regional areas and have targeted regional postgraduate pathways are more likely to continue to work with rural and remote populations.[6, 7] This study supports such an approach, suggesting that a more representative student profile overall may enhance intentions to work with underserved populations after graduation. This suggests that through selection criteria

that prioritize students from underserved communities, together with appropriate education and placements, medical schools are able to make a real contribution to addressing the health equity gap. This is likely to occur through addressing the critical issues of health workforce maldistribution,[9, 15] in addition to the production of medical professionals with knowledge, attitudes and skills equipping them to address the priority health needs of local populations. As this longitudinal study progresses we will be able to assess the degree to which these intentions are reflected in actual practice location and discipline – prospective cohort data from James Cook University suggests that this is indeed the case.[24]

Traditional medical schools have been criticized as being academically elite and inaccessible to those from disadvantaged backgrounds.[8] To illustrate this, a report using data from US medical schools demonstrated that overall more than 75% of medical students were from the top two quintiles of socio-economic status, whilst less than 10% were from the bottom two quintiles.[20, 21] By contrast, of students from these five THEnet schools 52.0% were from the top two quintiles and 29.3% were from the bottom two quintiles of socio-economic status, reflecting a considerably less privileged cohort.

A particular strength of this study was using the same questionnaire in different countries to look at learner characteristics and practice intentions, with minor modifications made at school level to modify descriptors for quintiles of remoteness and socio-economic disadvantage for the local context. A further strength was the extremely high response rate and low rate of missing data – limiting the role of response bias in our findings.

A limitation was the lack of good quality comparison data from other medical schools in several countries, limited information about population demographics for some countries and the fact that two cohorts of data from one school are included. However, analysis of these two cohorts indicates a degree of homogeneity, thus our decision to combine them. We also acknowledge that the contexts in which we work are complex and that only the major anticipated contributing factors were assessed in this study. It is possible that other factors may be involved in practice intent, and as ever, further research will help uncover these issues.

Although not a limitation *per se*, we should note the difference between widening participation strategies that are for the benefit of the student as a human right and those that are intended to effect societal change with the students as catalyst.[25] This study is clearly rooted in the latter discourse, but we should acknowledge that there are issues of self-actualization that, although we have not explored in this paper, are nevertheless a concern for the individual students, their schools, their communities and the profession as a whole.

Conclusions

Clearly, there are some advantages and disadvantages of different selection strategies and their contribution to equality, diversity and social accountability in medical education is mediated by the context in which they are employed. Our data have demonstrated that selection strategies can play a role in increasing the chances of students from under-represented and underserved populations getting into medical school and that these students have different practice intentions to those from better-served populations.

Students do not necessarily need to come from underserved communities to ultimately serve these communities; indeed we would argue that all medical students considering their career choices should be encouraged to take into account the social contract between their medical schools and the broader communities that they serve. However, there is growing evidence that broadening the population base from which medical students are selected will assist with the aim of producing a medical workforce that is distributed according to population need. This evidence has policy implications, particularly when schools have limited autonomy to modify their recruitment criteria.

The broader implication is that medical schools with a focus on social accountability need to take decisive action on selection processes to increase diversity in their student body if they are to address health equity issues in their reference populations. In doing so, these schools may be able to address both equity of access to medical education on the individual level, and distributive justice in terms of the future distribution of the health workforce.

Acknowledgements

The authors would like to thank all those at participating schools who assisted with data collection, and those colleagues at our schools who have informed our thinking about the graduate outcome study and social accountability in general. In particular, thanks are due to Ms Sarah Bogaert, Dr Torres Woolley, Ms Kristine Bacatan, Ms Margaret Spillman, Professor David Prideaux and Dr Jejunie Rivera. We are grateful to all of the students who completed the survey and to the Deans who facilitated the conduct of the study within their schools.

Conflict of interest

The authors declare no conflict of interest.

Contribution of each author

SL conceived the study, led the data collection process and drafted much of the manuscript.

KM coordinated data collection and oversaw data collection and drafted parts of the manuscript.

JE assisted with the conception of the study, and led data collection in South Africa.

SE assisted with the conception of the study and led data collection in Sudan.

MM assisted with data collection and analysis from South Africa and provided editorial input.

LG assisted with the conception of the study and provided editorial input.

SW assisted with the conception of the study, the development of the survey and led data collection in Belgium.

FC assisted with the conception of the study and led data collection in the Philippines.

RS assisted with the conception of the study and assisted with data collection and analysis in the Philippines.

RE assisted with the manuscript and provided editorial input.

SR assisted with the conception of the study and contributed to drafting and reviewing the manuscript.

KJ assisted with data analysis of combined universities' data and drafting the manuscript

AD co-led the data collection and analysis in Belgium and the development of the survey

AJN assisted with the conception of the study and provided editorial input

All authors reviewed and approved the final manuscript.

References

1. World Health Organization. Increasing access to health workers in remote and rural areas through improved retention 2010 23rd December 2010 [cited 2010 23rd December]. Available from: http://www.who.int/hrh/retention/guidelines/en/index.html.

2. Frenk J, Chen L, Bhutta Z, Cohen J, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *The Lancet*. 2010;376(9756):1923-58.

3. Thomas L. Power, assumptions and prescriptions: a critique of widening participation policy-making. *Higher Education Policy*. 2001;14(4):361-76.

4. Osborne M. Increasing or widening participation in higher education? - a European overview. *European Journal of Education*. 2003;38(1):5-24

5. Sales CS, Schlaff AL. Reforming medical education: A review and synthesis of five critiques of medical practice. *Social Science & Medicine*. 2010;70(11):1665-8.

6. Grobler L, Marais B, Mabunda S, Marindi P, et al. Interventions for increasing the proportion of health professionals practising in rural and other underserved areas *Cochrane Database of Systematic Reviews* 2009(1):Art. No.: CD005314. .

7. Murray RB, Wronski I. When the tide goes out: health workforce in rural, remote and Indigenous communities. 2006;185(1):37-8.

8. Murray R, Larkins S, Prideaux D, Ewen S, et al. The medical school as an agent of change: socially accountable medical education *Medical Journal of Australia*. 2012;196(10):doi: 10.5694/mja11.11473.

9. World Heath Organization. Transforming health workforce education in support of universal coverage Geneva: WHO; 2013 [cited 2013 5th December]. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R23-en.pdf.

10. Palsdottir B, Neusy, A-J, Reed, G. Building the evidence base: networking innovative socially accountable medical educational programmes. *Education for Health*. 2008;21(2):1-6.

11. Boelen C, Heck J. Defining and measuring the social accountability of medical schools. Geneva: World Health Organisation, 1995 WHO/HRH/95.7.

12. Larkins S, Preston R, Matte M, Lindemann IC, et al. Measuring social accountability in health professional education: development and international pilot testing of an evaluation framework. *Medical Teacher*. 2013;35(1):32-45.

13. Strasser R, Neusy A-J. Context counts: training health workers in and for rural and remote areas. *WHO Bulletin*. 2010;88:777-82.

14. Training for Health Equity Network. THEnet's evaluation framework for socially accountable health professional education. Version 1.0 Brussels: THEnet; 2011 [cited 2013 5th December]. Available from: http://thenetcommunity.org/wp-content/uploads/2013/05/The-Monograph.pdf

15. Gerber J, Landau L. Driving change in rural workforce planning: the medical schools outcomes database. *Australian Journal of Primary Health*. 2010;16:36-9.

16. Medical Deans Australia and New Zealand. Medical Schools Outcomes Database, Commencing Medical Students Report, 2012. Melbourne: MDANZ; 2013. Available from: http://www.medicaldeans.org.au/msod/publications-resources/data-and-progress-reports.

17. The World Bank. Working for a world free of poverty. World Development Indicators – Data download: Income Share

2009. Available from: http://data.worldbank.org/country/sudan.

18. The World Bank. Working for a world free of poverty. World Development Indicators – Data download: Income Share2009. Available from: http://data.worldbank.org/country/south-africa.

19. The World Bank. Working for a world free of poverty. World Development Indicators – Data download: Income Share 2009. Available from: http://data.worldbank.org/country/philippines.

20. Grbich D, Jones D, Case S. Effective practices for using the AAMC socioeconomic status indicators in medical school admissions Association of American Medical Colleges [Internet]. 2013 [cited 2013 11th November]. Available from: https://www.aamc.org/download/330166/data/seseffectivepractices.pdf.

21. Jolly P. Diversity of U.S. medical students by parental income. Association of American Medical Colleges [Internet]. 2008, January [cited 2013 5th December]; 8(1). Available from: https://www.aamc.org/download/102338/data/.

22. Youngclaus J, Fresne JA. Physician education debt and the cost to attend medical school. 2012 update Association of American Medical Colleges [Internet]. 2013 [cited 2013 19th December]. Available from: https://www.aamc.org/download/328322/data/statedebtreport.pdf

23. South African Government. South African National Census of 2011. Pretoria 2013.

24. Sen Gupta T, Murray R, Hays R, Woolley T. James Cook University MBBS graduate intentions and intern destinations: a comparative study with other Queensland and Australian medical schools. Rural and Remote Health [Internet]. 2013 [cited 2013 17th December]; 13. Available from: http://www.rrh.org.au/articles/showarticlenew.asp?ArticleID=2313.

25. Brennan J, Naidoo R. Higher education and the achievement (and/or prevention) of equity and social justice *Higher Education*. 2008;56:287-302.

Table 1: Characteristics of schools participating in the study and response rates

School	*Training structure*	*Year 1 students in 2013*	*Priority population*	*Selection procedure*	*Medical education context of country*[1]	*Number of participants (time)*	*Response rate*
James Cook University School of Medicine in Townsville, Northern Australia, founded in 2000 (JCU)	6-year undergraduate MD programme; including 20 weeks in small rural and isolated settings	238	Rural, remote, Aboriginal and Torres Strait Islander populations, and others in tropical Australia	Selection based on academic high-school score (adjusted for rurality); written application; and interview (with panel consisting of a community member, a doctor and an academic).	Population density 2.8 per km^2 19 medical schools Physician density 3.85/1000	219 (March 13)	93%
Walter Sisulu University Faculty of Health Sciences, Umtata-Eastern Cape, South Africa, founded in 1985 (WSU)	6-year MD programme, rural experiences in years 1-3 and six months in year 5	120	Rural underserved areas of Eastern Cape and Kwa Zulu Natal Provinces of South Africa	Students are shortlisted based on their academic merit and subjected to a structured interview for assessment of personal attributes. Quota system to support enrolment of indigenous Africans and those from rural Eastern Cape and KwaZulu Natal.	Population density 42.4 per km^2 8 medical schools Physician density 0.76/1000	225* (Oct 2012 and June 2013)	98%
University of Gezira Faculty of Medicine, Gezira State, Sudan, founded in 1975 (Gezira)	5-year undergraduate training, 20% time allocated to community based education	270	Gezira rural underserved areas	Free competition based on the results of the Sudanese Certificate examination. The Ministry of Higher Education defines the admission criteria. 50% of the seats in the medical school are reserved for students from underprivileged deprived areas of Gezira State.	Population density 16.4 per km^2 18 medical schools Physician density 0.28 /1000	234 (April 2013)	87%

Faculty of Medicine and Health Sciences, Ghent University, Belgium, founded in 1817 (Ghent)	3 years Bachelor 3 years Master	266	Low socio-economic status, migrant population including undocumented migrants	Regional entry exam (Flemish universities), those who pass the exam can go to the school of their choice. Marketing strategy to attract socially-minded students.	Population density 363.6 per km^2 10 medical schools Physician density 3.78/1000	221 (Oct-Dec 2012)	83%
Ateneo de Zamboanga University School of Medicine, Zamboanga City, Mindanao, the Philippines, founded in 1993 (ADZU)	4-year graduate MD training, about 50% community-based. 1-year internship 50% in rural health units, emergency and district hospitals.	48	Rural underserved areas of Mindanao, the Philippines, especially Zamboanga peninsula and outlying islands.	Preferentially select postgraduate students from the region. Ranked according to academic performance (50%), interview by panel (20%; includes 2 community members), written examination 10% and written essay 15%. Little weight placed on National Medicine Admission Test.	Population density 330.6 per km^2 40 medical schools Physician density 1.15/1000	45	96%

* Note Walter Sisulu University data includes two incoming cohorts of students.

[1] From World Health Organization Global Health Observatory http://apps.who.int/gho/data/node.main.A1444

Table 2. Composition of the student population in the participating schools.

	JCU (Aust)		WSU (South Africa)		Gezira (Sudan)		Ghent (Belgium)		ADZU (Philippines)		Comparison data all Australia[16]		Comparison data Flanders***	
Age (SD)	19.9	(3.8)	21.2	(4.5)	18.7	(1.1)	19.3	(1.8)	22.0	(2.0)	22	(5.9)	20.0	(2.4)
	n	**% (95% CI)**	**n**	**% (95% CI)**	**n**	**% (95% CI)**	**n**	**% (95% CI)**	**n**	**% (95% CI)**	**n**	**% (95% CI)**	**n**	**% (95% CI)**
Female	134/217	61.8 (59.1-64.5)	132/215	61.4 (58.1-64.7)	138/234	59.0 (55.8-62.2)	140/221	63.3 (60.1-66.5)	29/47	61.7 (54.6-68.8)	1813/3562	50.9 (50.1-51.7)	420/664	63.3 (61.4-65.2)
Lowest two SES quintiles	38/128	29.7 (25.7-33.7)	76/102	74.5 (70.2-78.8)	31/116	26.7 (22.6-30.8)	19/214	8.9 (5.1-12.7)	8/28	28.6 (20.1-37.1)	N/A	N/A	10/617	1.6 (1.1-2.1)
Neither parent tertiary studies	26/215	12.1 (9.9-14.3)	64/173	37.0 (33.3-40.7)	68/226	30.1 (27.0-33.1)	14/216	6.5 (4.8-8.2)	0/47	0	N/A	N/A	66/616	10.7 (9.5-11.9)
Domestic students*	163/217	75.2 (72.3-78.1)	214/215	99.5 (99.0-100)	182/219	83.1 (80.6-85.6)	213/213	100.0	45/47	95.7 (92.7-98.7)	N/A	N/A	589/664	88.7 (87.5-90.0)
Identify with underserved group	19/189 Incl 7/189 Indigenous	9.9 (7.7-12.1) 3.7 (2.3-5.1) Indigenous	184/204	90.2 (88.1-92.3)	18/215	8.4 (6.5-10.3)	60/207	29.0 (25.8-32.2)	8/47	17.0 (11.5-22.5)	69/3552 Indigenous	1.9 (1.7-2.1) Indigenous	N/A	N/A
Majority of primary school in rural/regional town**	102/163	62.6 (58.8-66.4)	195/214	91.1 (89.2-93.0)	87/182	47.8 (44.1-51.5)	175/213	82.2 (79.6-84.8)	11/45	24.4 (18.0-30.8)	960/3034	31.6 (30.8-32.4)	N/A	N/A

*Domestic students defined here as those who did majority of their primary schooling in country of medical schooling

** Defined as quintiles 2-5 of rurality

*** unpublished data

Table 3: Graduate Intentions: Likelihood that clinical work will involve working with the following groups (Domestic students only).

	JCU (Aust)		WSU (South Africa)		Gezira (Sudan)		Ghent (Belgium)		ADZU (Philippines)		Australian MSOD data**[16]	Comparison data Flanders***
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n (%) (95% CI)	n(%) (95% CI)
Intention to practice with urban disadvantaged populations*	79/163	48.5 (44.6-52.4)	76/206	36.9 (33.5-40.3)	76/173	43.9 (40.1-47.7)	152/212	71.7 (68.6-74.8)	17/44	38.6 (31.3-45.9)	N/A	412/566 (72.8) (70.9-74.7)
Intention to practice with Indigenous/Aboriginal populations*	75/162	46.3 (42.4-50.2)	65/198	32.8 (29.5-36.1)	16/151	10.6 (8.1-13.1)	135/212	63.7 (60.4-67.0)	27/44	61.4 (54.1-68.7)	N/A	379/566 (67.0) (65.0-69.0)
Intention to practice with rural and remote populations*	86/162	53.1 (49.2-57.0)	130/207	62.8 (59.4-66.2)	54/161	33.5 (29.8-37.2)	-	-	29/44	65.9 (58.8-73.0)	N/A	N/A
Intention to practice with refugee or immigrant groups*	35/163	21.5 (18.3-24.7)	43/203	21.2 (18.3-24.1)	36/167	21.6 (18.4-24.8)	66/212	31.1 (27.9-34.3)	14/44	31.8 (24.8-38.8)	N/A	208/566 (36.7) (34.7-38.7)
Intention to practice with homeless or mentally ill populations*	41/162	25.3 (21.9-28.7)	74/201	36.8 (33.4-40.2)	69/166	41.6 (37.8-45.4)	59/212	27.8 (24.7-30.9)	15/44	34.1 (27.0-41.3)	N/A	192/565 (34.0) (32.0-36.0)
Intention to practice in small/remote village (most rural quintile)	10/162	6.2 (4.3-8.1)	16/212	7.5 (5.7-9.3)	18/173	10.3 (8.0-12.6)	0/124	0	3/45	6.7 (3.0-10.4)	105/3373 (3.1) (2.8-3.4)	0
Intention to practice in small rural town (second rural quintile)	24/162	14.9 (12.1-17.7)	77/212	36.3 (33.0-39.6)	14/173	8.0 (5.9-10.1)	19/124	15.3 (12.1-18.5)	14/45	31.1 (24.2-38.0)	176/3373 (5.2) (4.8-5.6)	91/346 (26.3) (23.9-28.7)
Intention to practice in regional centre or large town (middle quintile)	46/162	28.4 (24.9-31.9)	59/212	27.8 (24.7-30.9)	21/173	12.1 (9.6-14.6)	46/124	37.1 (32.8-41.4)	13/45	28.9 (22.1-35.7)	351/3373 (10.4) (9.9-10.9)	105/346 (30.3) (27.8-32.8)
Intention to practice in large urban centre (second most urban quintile)	32/162	19.9 (16.8-23.1)	25/212	11.8 (9.6-14.0)	5/173	2.9 (1.6-4.2)	59/124	47.6 (43.1-52.1)	11/45	24.4 (18.0-30.8)	368/3373 (10.9) (10.4-11.4)	150/346 (43.4) (40.7-46.1)
Intention to practice in most urban quintile (large city)	41/162	25.5 (22.1-28.9)	25/212	11.8 (9.6-14.0)	102/173	59.0 (55.3-62.7)	0/124	0	4/45	8.9 (4.7-13.1)	2298/3373 (68.1) (67.3-68.9)	0

* This variable asked on a scale of 1-5 how likely is that you will work with these populations in future – 4 (very likely) and 5 (extremely likely) were grouped.

** Domestic and international respondents included

*** unpublished data

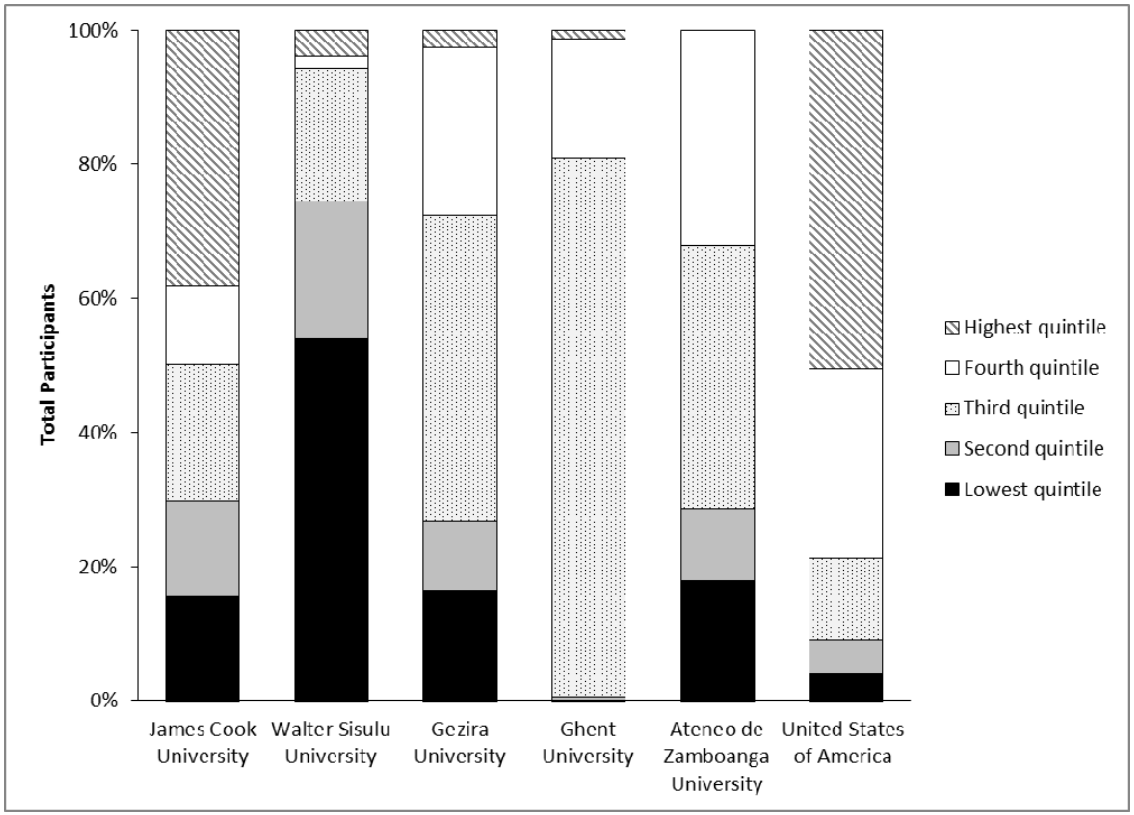

Figure 1: Student self-reported family socio-economic quintiles for each participating school compared with that of students at US medical schools.[22] *There are significant variations between the five schools studied ranging from WSU with more than 70% of its students coming from the bottom two quintiles to Ghent with less than 5% from the bottom two quintiles.*

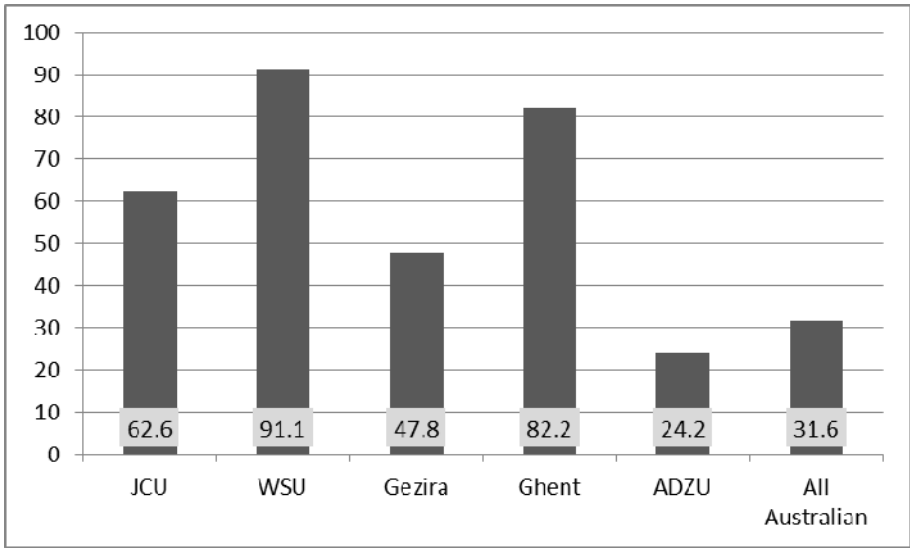

Figure 2. Percentage of first year students from a rural origin (defined as majority of primary school completed in a non-urban setting/quintiles 2-5). Comparison data is from Australian Commencing Medical Students' Questionnaire.

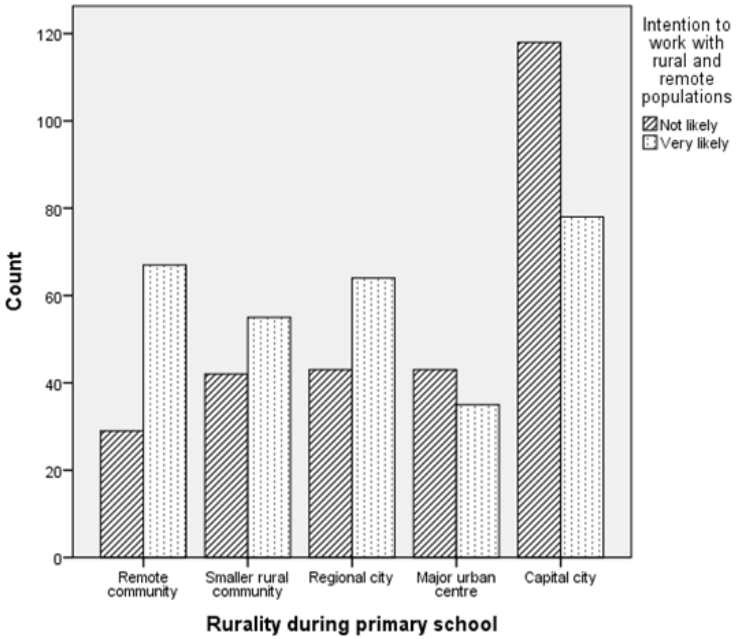

Figure 3: Rurality of students' primary schooling compared with intention to work with rural and remote populations. Data aggregated for all five participating schools.