Impact of selection strategies on representation of underserved populations and intention to practise: international findings

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CONTEXT Socially accountable medical schools aim to reduce health inequalities by training workforces responsive to the priority health needs of underserved communities. One key strategy involves recruiting students from underserved and unequally represented communities on the basis that they may be more likely to return and address local health priorities. This study describes the impacts of different selection strategies of medical schools that aspire to social accountability on the presence of students from underserved communities in their medical education programmes and on student practice intentions.

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

RESULTS The selection processes of all five schools included strategies that extended beyond the assessment of academic achievement. Four distinct strategies were identified: the quota system; selection based on personal attributes; community involvement, and school marketing strategies. Questionnaire data from 944 students showed that students at the five schools were more likely to be of non-urban origin, of lower socio-economic status and to come from underserved groups. A total of 407 of 810 (50.2%) students indicated an intention to practise in a non-urban area after graduation and the likelihood of this increased with increasing rurality of primary schooling ($p = 0.000$). Those of rural origin were statistically less likely to express an intention to work abroad ($p = 0.003$).

CONCLUSIONS Selection strategies to ensure that members of underserved communities can pursue medical careers can be effective in achieving a fair and equitable representation of underserved communities within the student body. Such strategies may contribute to a diverse medical student body with strong intentions to work with underserved populations.

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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, largely because of the shortages, skills mix imbalances and uneven geographical distributions 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 care needs.[2] In the case of medical education, worldwide 2420 medical schools produce doctors. As Frenk *et al.*[2] outline, four countries (China, India, Brazil and the USA) each have more than 150 medical schools, whereas 36 countries have none at all. 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 of each country nor its burden of disease. Improvement is hampered by the limited opportunities for students from underserved communities to enter medical education.[2]

The under-representation of certain social and cultural groups 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 by which change can be effected and there is increasing acknowledgement of the inequity of current selection processes for higher education (including medicine), and recognition that broader strategies are necessary to ensure the wider participation in medical education of students from a range of demographic backgrounds.[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, compounded by weak links between educational institutions and the health systems that employ their 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 achieve the goal of universal health care coverage.[8] In recognition of the importance of addressing the representativeness of the health workforce to meeting the Millennium Development Goals, the WHO 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 workforces that are responsive to the priority health needs of underserved communities.[11] One of the key strategies for social accountability in medical education is the active recruitment of students from underserved and unequally represented communities[12] as they have been shown to be more likely to return to their communities of origin and address local health priorities.[13] Each THEnet school has independently developed innovative selection strategies in an attempt to create a student profile more representative of its reference population, which, in turn, is expected to produce a more evenly distributed health workforce better aligned with population needs. We define underserved populations as those that lack access to health services because of geography, socio-economic status (SES) 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. The mechanisms and relationships in the programme theory act as a series of interconnected hypotheses. The 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 represent in order to address health inequities, and
2 medical students from underserved populations have practice intentions that are more focused on returning to serve those populations in comparison with those of students from other populations.

This paper therefore aims to answer the following research questions:

1 What kinds of selection strategy 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 which has been tracking students throughout their training and for up to 10 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 drawn from five THEnet medical schools from around the world. Contextual information on the participating schools and countries is set out in Table 1.

The quantitative data presented here have been augmented by qualitative exploration and economic impact analysis as part of the larger evaluation project (not reported here). For the component presented in this manuscript, an analysis of each school's selection process was carried out using the school's institutional and programme documentation and by correspondence with its senior personnel. Student characteristics and practice intentions were gathered using a questionnaire administered to students entering medical training at each participating institution.

All students entering the participating medical schools were invited to complete the questionnaire within the first semester of their course. The questionnaire assessed students' 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 (CMSQ),[15] and modified through discussions held between THEnet partner schools that defined the various dimensions of disadvantage of the populations they served. These were assimilated and a classification for disadvantage that could be adapted for different contexts was developed. The modified questionnaire instrument was reviewed by medical education leaders from THEnet schools for content and construct validity. The instrument was piloted at both a high-income and a low-income school, which resulted in minor revisions of its wording.

Students completed the questionnaire in the first months of their training during 2012 and 2013. One school administered the survey electronically and the others used a paper format. The surveys were identical at each participating school except that variations of the descriptors for quintiles of SES and rurality were developed with the assistance of local experts from each country. One school, in Ghent, translated the survey into Flemish, using standard methods of translation and back-translation to assess the fidelity of translation. Each school used the same codebook. Data files were merged into a Microsoft Excel file for cleaning and then analysed using IBM SPSS Statistics for Windows Version 20.0 (IBM Corp., Armonk, NY, USA). One school entered two cohorts of students into the study; an analysis of their results revealed a high degree of homogeneity between the two cohorts, which were then combined to increase the data available for analysis.

Comparison data for each country were obtained from a variety of sources. In Australia, data were sourced from the MSOD CMSQ 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 socio-economic comparison data for Sudan, South Africa and the Philippines were obtained from the World Bank, although these were limited to income share data rather than quintiles of SES.[17–19] A comparison was also made with US data on the SES of US medical students.[20–22]

Students' characteristics (socio-economic and demographic profiles) were compared with those of the population in the area of the school. Where possible, results (including practice intentions) were compared with predictors of improved service and health equity, and with data on the characteristics of students 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 (CIs). Chi-squared comparisons were performed where appropriate.

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

School	Training structure	Year 1 students in 2013, n	Priority population	Selection procedure	Medical education context of country*	Participants, n *(time)*	Response rate
James Cook University School of Medicine, Townsville, Queensland, Australia, founded in 2000 (JCU)	6-year undergraduate MBBS 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/km^2 19 medical schools Physician density 3.85/1000	219 (March 2013)	93%
Walter Sisulu University Faculty of Health Sciences, Umtata, Eastern Cape, South Africa, founded in 1985 (WSU)	6-year undergraduate programme, rural experiences in Years 1–3 and 6 months in Year 5	120	Rural underserved areas of Eastern Cape and Kwa Zulu Natal Provinces of South Africa	Students are shortlisted based on 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/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% of 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 medical school places are reserved for students from underprivileged deprived areas of Gezira State	Population density 16.4/km^2 18 medical schools Physician density 0.28/1000	234 (April 2013)	87%
Faculty of Medicine and Health Sciences,	3 years Bachelor 3 years Master	266	Low socio-economic status, migrant population	Regional entry examination (Flemish universities)	Population density 363.6/km^2	221 (Oct–Dec 2012)	83%

Table 1 (Continued)

School	Training structure	Year 1 students in 2013, n	Priority population	Selection procedure	Medical education context of country*	Participants, n *(time)*	Response rate
Ghent University, Ghent, Belgium, founded in 1817 (Ghent)			including undocumented migrants	Successful candidates attend the school of their choice Marketing strategy to attract socially minded students	10 medical schools Physician density 3.78/1000		
Ateneo de Zamboanga University School of Medicine, Zamboanga City, Mindanao, 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, Philippines, especially Zamboanga peninsula and outlying islands	Preferentially selects postgraduate students from the region Ranked according to academic performance (50%), interview by panel (20%; includes two community members), written examination 10% and written essay 15% Little weight placed on National Medicine Admission Test	Population density 330.6/km^2 40 medical schools Physician density 1.15/1000	45	96%

* From World Health Organization Global Health Observatory (http://apps.who.int/gho/data/node.main.A1444)
† Data for Walter Sisulu University refer to two incoming cohorts of students

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

Selection strategies used by socially accountable medical schools

Although different schools apply different selection strategies, these strategies have one thing in common: enrolment is based on more than just the demonstration of appropriate academic skills. We distinguished four different types of strategy (Table 1).

Quota-based strategies

At the Faculty of Medicine of the University of Gezira in Sudan, 50% of places were reserved for students from underprivileged deprived areas of Gezira State. At Walter Sisulu University (WSU) in South Africa, a quota system ensured that 80% of the intake was drawn from the indigenous African population and that 75% of African students came from the rural areas of Eastern Cape Province.

Selection criteria

Students at WSU 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 in a protocol endorsed by village household heads and the local government authority. Questionnaire data from this school is not included. Ateneo de Zamboanga University School of Medicine (ADZU) involved two community members in interview panels for selection.

Marketing of the school

In Belgium, all those passing the regional entry examination were able to enrol in the school of their choice. Ghent University tried to attract specific types of student by stressing its community-based and -engaged curriculum.

Some schools used a combination of these strategies. For example, at James Cook University (JCU) in Queensland, Australia, personal attributes were assessed in interviews, community members participated in the selection process, academic scores were adjusted for rurality, a separate selection process was applied for Aboriginal and Torres Strait Islander students, and the school marketed its commitment to rural, remote, Indigenous and tropical health issues. Likewise, ADZU put minimal weight on the National Medical Admission Test, but, rather, prioritised selection from local rural areas and used a composite selection strategy including academic review, the assessment of personal attributes through an interview with a panel that included two community members, and a written essay.

Representation of underserved populations in the medical student body

We analysed 944 student surveys from 5 schools (for response rates and school characteristics, see Table 1). Overall response rates were high, largely influenced by the face-to-face administration of the survey in class time. Survey results describing the characteristics and practice intentions of students entering medical education, and the proportion of those who came from underserved groups (together with comparison data where available) are summarised in Tables 2 and 3.

In general, the demographic profiles of the medical student bodies at these schools were more representative of the populations of their respective countries than those at other medical schools, although comparison data are limited. For example, at WSU, the proportion of students who described themselves as coming from underserved populations (mostly Black South Africans) was extremely high at 90.2%, which indicates an over-representation of this group, which accounts for 79.2% of the national population, but is in line with the population of Eastern Cape Province.[23] Likewise, the population of students who self-identified as Indigenous at JCU (3.7%) was much closer to (and exceeded) national population demographics. Student self-described SES (measured according to reported family income in the previous 12 months) was relatively widely distributed; in fact those schools with explicit quota systems for students of low SES showed an over-representation of students from the lowest two quintiles (Fig. 1). For example, in the two schools with quotas for low-income students, 107 of 218 (49.1%) students came from the bottom two quintiles for self-reported family income, whereas in the three schools without quotas, 65 of 370 (17.6%) students came from these bottom two quintiles (Pearson's $\chi^2 = 65.83$, d.f. = 1, $p < 0.001$). When the data were combined, THEnet schools included a total of 172 of 588 (29.3%) domestic students from the bottom two quintiles for self-reported SES (Table 2). By contrast, recent data for a cohort of 13 681 medical graduates from a range of US schools indicated that only 1231 (9.0%) came from the lowest two quintiles for SES (odds ratio [OR] 4.18, 95% CI 3.47–5.04; $p < 0.0001$).[22] However, in Belgium, all those who passed a regional entrance examination were able to gain direct entry to the school of their choice. The student demographic for Ghent University therefore reflected a considerably higher SES than those of other schools in the study.

Overall, although definitions of quintiles of rurality differed greatly according to context, 570 of 817 (69.8%) students reported having completed the majority of their primary schooling in a rural or regional area (Fig. 2).

The most useful comparison data available for medical student background and intent referred to

Table 2 Composition of the student populations in the participating schools

	JCU (Australia)	WSU (South Africa)	Gezira (Sudan)	Ghent (Belgium)	ADZU (Philippines)	Comparison data all Australia[16]	Comparison data Flanders‡
Age, years, mean ± 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%) (55.3–68.3)	132/215 (61.4%) (54.9–67.9)	138/234 (59.0%) (52.7–65.3)	140/221 (63.3%) (56.9–69.7)	29/47 (61.7%) (47.8–75.6)	1813/3562 (50.9%) (49.3–52.5)	420/664 (63.3%) (59.6–67.0)
Lowest two SES quintiles	38/128 (29.7%) (21.8–37.6)	76/102 (74.5%) (66.0–83.0)	31/116 (26.7%) (18.6–34.7)	19/214 (8.9%) (5.1–12.7)	8/28 (28.6%) (11.9–45.3)	N/A	10/617 (1.6%) (0.6–2.6)
Neither parent completed tertiary studies	26/215 (12.1%) (7.7–16.5)	64/173 (37.0%) (29.8–44.2)	68/226 (30.1%) (24.1–36.1)	14/216 (6.5%) (3.2–9.8)	0/47	N/A	66/616 (10.7%) (8.3–13.1)
Domestic students*	163/217 (75.1%) (69.3–80.9)	214/215 (99.5%) (98.6–100)	182/219 (83.1%) (78.1–88.1)	213/213 (100%)	45/47 (95.7%) (89.9–100)	N/A	589/664 (88.7%) (86.3–91.1)
Identify with underserved group	19/189 (10.1%) [7/189 Indigenous] (5.8–14.4) (3.7%) (1.0–6.4) Indigenous	184/204 (90.2%) (86.1–94.3)	18/215 (8.4%) (4.7–12.1)	60/207 (29.0%) (22.8–35.2)	8/47 (17.0%) (6.3–27.7)	69/3552 Indigenous (1.9%) (1.5–2.3) Indigenous	N/A
Majority of primary school in rural/regional town†	102/163 (62.6%) (55.2–70.0)	195/214 (91.1%) (87.3–94.9)	87/182 (47.8%) (40.5–55.1)	175/213 (82.2%) (77.1–87.3)	11/45 (24.4%) (11.8–36.9)	960/3034 (31.6%) (29.9–33.3)	N/A

* Domestic students defined here as those who completed the majority of their primary schooling in the country of medical schooling
† Defined as quintiles 2–5 of rurality
‡ Unpublished data
JCU = James Cook University School of Medicine; WSU = Walter Sisulu University School of Medicine; ADZU = Ateneo de Zamboanga University School of Medicine; SD = standard deviation; 95% CI = 95% confidence interval; SES = socio-economic status

students in Australia.[16] The most useful comparison data for medical student SES were sourced from the USA.[22] For example, the OR for being of rural origin (based on completing the majority of primary schooling in a non-urban location) for JCU students compared with all Australian medical students was 3.61 (95% CI 2.61–5.01; $p < 0.0001$), and JCU students were almost twice as likely as Australian medical students overall to identify themselves as Indigenous Australians (3.7% versus 1.9%).

Students' future practice intentions

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

Table 3 Graduate intentions: likelihood that clinical work will involve working with the following groups (domestic students only)

Intention to practise	JCU (Australia) n (%) (95% CI)	WSU (South Africa) n (%) (95% CI)	Gezira (Sudan) n (%) (95% CI)	Ghent (Belgium) n (%) (95% CI)	ADZU (Philippines) n (%) (95% CI)	Australian MSOD data†[16] n (%) (95% CI)	Comparison data Flanders‡ n (%) (95% CI)
With urban disadvantaged populations*	79/163 (48.5%) (40.8–56.2)	76/206 (36.9%) (30.3–43.5)	76/173 (43.9%) (36.5–51.3)	152/212 (71.7%) (65.6–77.8)	17/44 (38.6%) (24.2–53.0)	N/A	412/566 (72.8%) (69.1–76.5)
With Indigenous/ Aboriginal populations*	75/162 (46.3%) (38.6–54.0)	65/198 (32.8%) (26.3–39.3)	16/151 (10.6%) (5.7–15.5)	135/212 (63.7%) (57.2–70.2)	27/44 (61.4%) (47.0–75.8)	N/A	379/566 (67.0%) (63.1–70.9)
With rural and remote populations*	86/162 (53.1%) (45.4–60.8)	130/207 (62.8%) (56.2–69.4)	54/161 (33.5%) (26.2–40.8)	–	29/44 (65.9%) (51.9–79.9)	N/A	N/A
With refugee or immigrant groups*	35/163 (21.5%) (15.2–27.8)	43/203 (21.2%) (15.6–26.8)	36/167 (21.6%) (15.4–27.8)	66/212 (31.1%) (24.9–37.3)	14/44 (31.8%) (18.0–45.6)	N/A	208/566 (36.7%) (32.7–40.7)
With homeless or mentally ill populations*	41/162 (25.3%) (18.6–32.0)	74/201 (36.8%) (30.1–43.5)	69/166 (41.6%) (34.1–49.1)	59/212 (27.8%) (21.8–33.8)	15/44 (34.1%) (20.1–48.1)	N/A	192/565 (34.0%) (30.1–37.9)
In a small/remote village (most rural quintile)	10/162 (6.2%) (2.5–9.9)	16/212 (7.5%) (4.0–11.0)	18/173 (10.4%) (5.9–14.9)	0/124	3/45 (6.7%) (−0.6–14.0)	105/3373 (3.1%) (2.5–3.7)	0
In a small rural town (second most rural quintile)	24/162 (14.9%) (9.4–20.4)	77/212 (36.3%) (29.8–42.8)	14/173 (8.1%) (4.0–12.2)	19/124 (15.3%) (9.0–21.6)	14/45 (31.1%) (17.6–44.6)	176/3373 (5.2%) (4.5–5.9)	91/346 (26.3%) (21.7–30.9)
In a regional centre or large town (middle quintile)	46/162 (28.4%) (21.5–35.3)	59/212 (27.8%) (21.8–33.8)	21/173 (12.1%) (7.2–17.0)	46/124 (37.1%) (28.6–45.6)	13/45 (28.9%) (15.7–42.1)	351/3373 (10.4%) (9.4–11.4)	105/346 (30.3%) (25.5–35.1)
In a large urban centre (second most urban quintile)	32/162 (19.8%) (13.7–25.9)	25/212 (11.8%) (7.5–16.1)	5/173 (2.9%) (0.4–5.4)	59/124 (47.6%) (38.8–56.4)	11/45 (24.4%) (11.9–36.9)	368/3373 (10.9%) (9.8–12.0)	150/346 (43.4%) (38.2–48.6)
In a large city (most urban quintile)	41/162 (25.3%) (18.6–32.0)	25/212 (11.8%) (7.5–16.1)	102/173 (59.0%) (51.7–66.3)	0/124	4/45 (8.9%) (0.6–17.2)	2298/3373 (68.1%) (66.5–69.7)	0

* This item (How likely is it that you will work with [this population] in the future?) was answered using a scale of 1–5. Responses of 4 (very likely) and 5 (extremely likely) were grouped together
† Domestic and international respondents included
‡ Unpublished data
JCU = James Cook University School of Medicine; WSU = Walter Sisulu University School of Medicine; ADZU = Ateneo de Zamboanga University School of Medicine; MSOD = Medical Students Outcomes Database; 95% CI = 95% confidence interval

from all schools were combined, statistically significant associations emerged between non-urban origin and both intention to work with Indigenous or Aboriginal populations (Pearson's $\chi^2 = 6.572$, d.f. = 1, p = 0.01) and intention to practise in rural and remote populations (Pearson's $\chi^2 = 18.027$, d.f. = 1, p = 0.000). Again, the best comparison data were available for Australia. Data from the

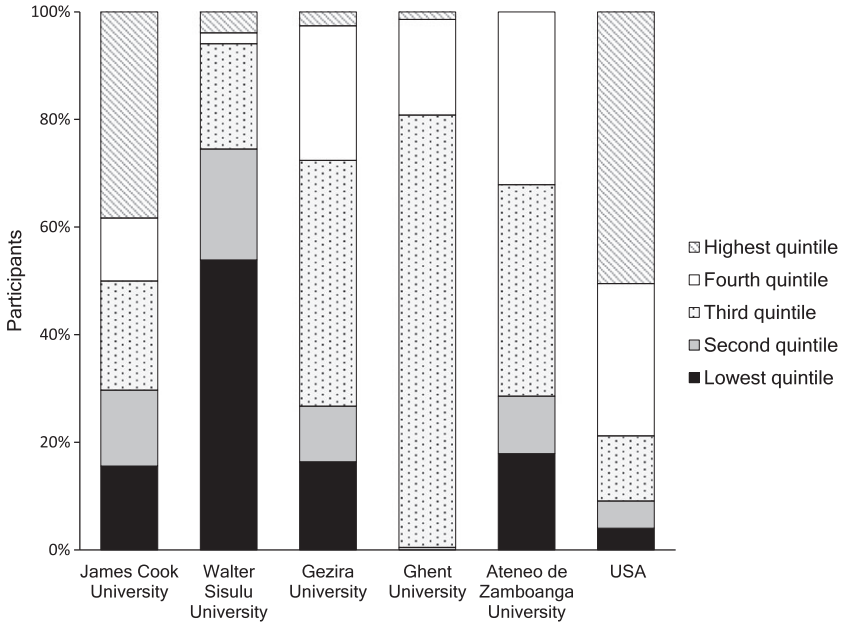

Figure 1 Student-reported family socio-economic status in quintiles for each participating school compared with that of students at US medical schools.[22] There are significant variations among the five schools studied: more than 70% of students at Walter Sisulu University but fewer than 5% of students at Ghent University come from the bottom two quintiles[20]

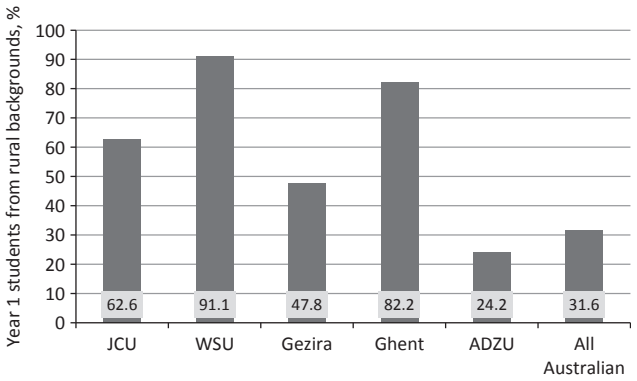

Figure 2 Percentages of Year 1 students from rural origins (defined as completing the majority of primary schooling in a non-urban setting/quintiles 2–5). Comparison data are sourced from Australian Commencing Medical Students' Questionnaire data. JCU = James Cook University School of Medicine; WSU = Walter Sisulu University School of Medicine; ADZU = Ateneo de Zamboanga University School of Medicine

2011 MSOD CMSQ,[16] which referred to 3373 respondents across Australian medical schools, reported that 3.1% (95% CI 2.5–3.7) intended to practise in the most remote locations (defined as areas with populations of fewer than 10 000 people). By contrast, of JCU domestic students, 6.2% (95% CI 2.5–9.9) reported an intention to work in the most remote areas (defined using an even tighter classification of < 5000 population; OR 2.05; p = 0.03). Furthermore, CMSQ responses suggested 68.1% of students intended to practise in a capital city, compared with 25.3% of JCU students (OR 0.16, 95% CI 0.11–0.23; p < 0.0001).

When the findings from THEnet study schools were combined, statistically significant associations emerged between having a rural origin and intention to practise with underserved populations and intention to practise in a rural location. Importantly, being of rural origin was inversely associated with intention to practise abroad (for trend, $\chi^2 = 16.025$, d.f. = 4, p = 0.003; Fig. 3).

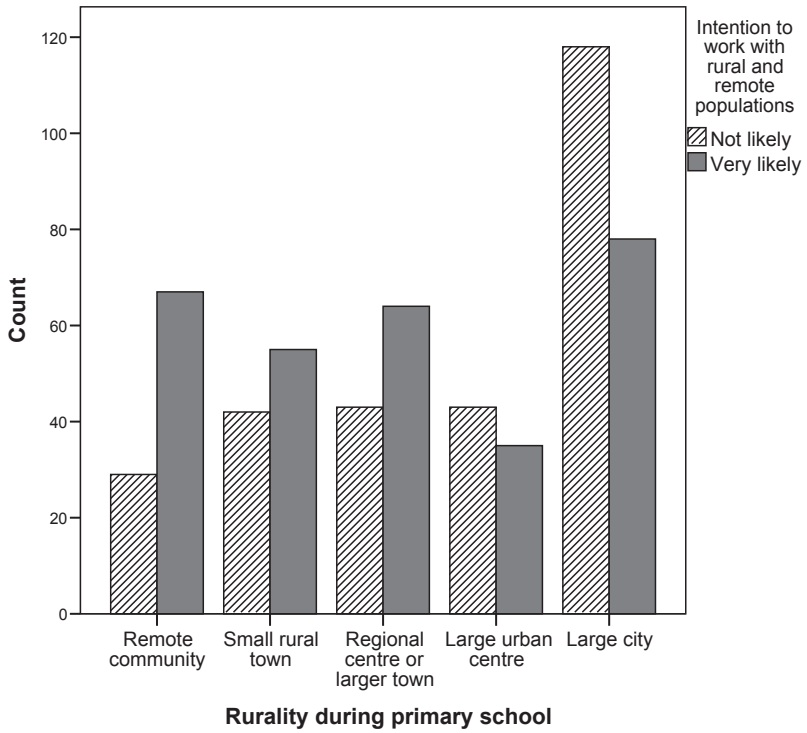

Figure 3 Rurality of students' primary schooling compared with intention to work with rural and remote populations. Data are aggregated for all 5 participating schools

DISCUSSION

The selection strategies applied by these THEnet schools indicated that these schools used a range of indicators beyond academic ability to select a student cohort to be more diverse, with characteristics that more closely aligned with those of the population of the region served by the school, than those of other medical schools. A further critical factor demonstrated in selection strategies of schools that aspired to be more socially accountable was the shift in focus from student to community. Fairness to applicants was therefore tempered by the need to address health inequalities and a social contract or responsibility to the communities the school served. We have described different selection strategies and the impacts they have on enhancing the representativeness of the student profile that can be used either individually or in various combinations.

With reference to JCU, we were able to demonstrate that a school using these selection strategies generates a student profile that differs demonstrably from those of other Australian medical schools and shows greater similarity to the characteristics of its reference population.[24] Achieving this outcome often required partnerships between the medical school, community and government. For example, at WSU, students from poor families were able to gain admittance because the local government guaranteed an educational subsidy for them. In Belgium, students were free to choose their medical schools, leaving Ghent University to rely on marketing to attract students who shared its vision of socially accountable medical education.

Students at these THEnet schools had different practice intentions in terms of future practice with underserved populations and both size of community and location of future practice; these were more likely to result in a workforce distributed according to population need. There is now good evidence for the effectiveness of the so-called 'rural pipeline' in 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 prioritise the entry of 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 the knowledge, attitudes and skills that equip 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 JCU suggest that this is indeed the case.[24]

Traditional medical schools have been criticised as being academically elite and inaccessible to those from disadvantaged backgrounds.[8] To illustrate this, a report drawing on data from US medical schools demonstrated that overall more than 75% of medical students came from the top two SES quintiles and fewer than 10% came from the bottom two quintiles.[20,21] By contrast, 52.0% of students from THEnet schools in this study were from the top two quintiles and 29.3% were from the bottom two quintiles for SES, reflecting a considerably less privileged cohort.

A particular strength of this study refers to its use of the same questionnaire in different countries to look at student 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. It is further strengthened by its extremely high response rate and low rate of missing data, which limit the impact of response bias on our findings.

A limitation of the study refers to 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 data for two cohorts of students from one school were included. 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 influence students' practice intentions, and, as ever, further research will help to 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 and fulfil a human right, and those that are intended to effect societal change using students as a catalyst.[25] This study is clearly rooted in the latter discourse, but we should acknowledge that there are issues of self-actualisation which, although we have not explored them in this paper, are nevertheless of concern to 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 contributions to equality, diversity and social accountability in medical education are mediated by the contexts in which they are employed. Our data demonstrate that selection strategies can play a role in increasing the chances of entry to medical school for applicants from under-represented and underserved populations and that these students have practice intentions that differ from 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 school and the broader communities it represents. However, there is growing evidence that broadening the population base from which medical students are selected will contribute towards fulfilling 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 in order to increase diversity in their student bodies 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 at the individual level, and social justice in terms of the future distribution of the health care workforce.

Contributors: SL conceived the study, led the data collection process and drafted much of the manuscript. KM coordinated and oversaw data collection and drafted parts of the manuscript. JI 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 in South Africa and provided editorial input. SW assisted with the conception of the study. SW and AD co-led the development of the survey and led data collection and analysis in Belgium. FLC assisted with the conception of the study and

led data collection in the Philippines. RS assisted with the conception of the study, and with data collection and analysis in the Philippines. RE drafted parts of 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 the analysis of combined universities' data and with drafting the manuscript. LG and A-JN assisted with the conception of the study and provided editorial input. All authors reviewed the paper for critical content and approved the final manuscript for submission.

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