Nonacademic Attributes Predict Medical and Nursing Student Intentions to Emigrate or to Work Rurally: An Eight-Country Survey in Asia and Africa

David M. Silvestri,^{1*} Meridith Blevins,^{1,2} Kenneth A. Wallston,^{1,5} Arfan R. Afzal,^{6,7} Nazmul Alam,⁷ Ben Andrews,^{1,3,8} Miliard Derbew,⁹ Simran Kaur,^{10,11} Mwapatsa Mipando,¹² Charles A. Mkony,¹³ Philip M. Mwachaka,¹⁴ Nirju Ranjit,¹⁵ and Sten H. Vermund^{1,3,4}

¹Vanderbilt University Institute for Global Health, Nashville, Tennessee; ²Department of Biostatistics, Vanderbilt University School of Medicine, Nashville, Tennessee; ³Department of Medicine, Vanderbilt University School of Medicine, Nashville, Tennessee; ⁴Department of Pediatrics, Vanderbilt University School of Medicine, Nashville, Tennessee; ⁵Vanderbilt University School of Nursing, Nashville, Tennessee; ⁶International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, Bangladesh; ⁷Department of Mathematics and Statistics, University of Calgary, Calgary, Alberta, Canada; ⁸Department of Internal Medicine, University of Zambia School of Medicine, Lusaka, Zambia; ⁹Department of Surgery, Addis Ababa University School of Medicine, Addis Ababa, Ethiopia; ¹⁰Department of Physiology, Maulana Azad Medical College, Bahadur Shah Zafar Marg, Delhi, India; ¹¹Department of Physiology, All India Institute of Medical Sciences, Ansari Nagar, Delhi, India; ¹²University of Malawi College of Medicine, Blantyre, Malawi; ¹³Department of Surgery, Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania; ¹⁴Department of Human Anatomy, University of Nairobi, Nairobi, Kenya; ¹⁵Department of Anatomy, Tribhuvan University Institute of Medicine, Maharajgunj, Kathmandu, Nepal

Abstract. We sought to identify independent, nonacademic predictors of medical and nursing student intent to migrate abroad or from rural to urban areas after graduation in low- and middle-income countries (LMIC). This was a cross-sectional survey of 3,199 first- and final-year medical and nursing students at 16 training institutions in eight LMIC. Questionnaires assessed demographics, career intentions, and preferences regarding selected career, location, and work-related attributes. Using principal component analysis, student preferences were reduced into four discrete categories of priorities: 1) work environment resources, 2) location livability, 3) altruistic job values, and 4) individualistic job values. Students' preferences were scored in each category. Using students' characteristics and priority scores, multivariable proportional odds models were used to derive independent predictors of intentions to emigrate for work outside the country, or to work in a rural area in their native country. Students prioritizing individualistic values more often planned international careers (adjusted odds ratio [aOR] = 1.44, 95% confidence interval [CI] = 1.16–1.78), whereas those prioritizing altruistic values preferred rural careers (aOR = 1.82, 95% CI = 1.50–2.21). Trainees prioritizing high-resource environments preferentially planned careers abroad (aOR = 1.38, 95% CI = 1.12–1.69) and were unlikely to seek rural work (aOR = 0.60, 95% CI = 0.49–0.73). Independent of their priorities, students with prolonged prior rural residence were unlikely to plan emigration (aOR = 0.67, 95% CI = 0.50–0.90) and were more likely to plan a rural career (aOR = 1.53, 95% CI = 1.16–2.03). We conclude that use of nonacademic attributes in medical and nursing admissions processes would likely increase retention in high-need rural areas and reduce emigration “brain drain” in LMIC.

INTRODUCTION

The growth in noncommunicable diseases and emergence of pandemic threats like Ebola have highlighted the need to strengthen health systems worldwide.^{1–3} Nowhere is this need greater than in low- and middle-income countries (LMIC), where global disease burden remains concentrated. Central to any effective health system are health workers.¹ Nevertheless, regions most affected by disease still have greatest health professional shortages.^{4,5} Sub-Saharan Africa hosts 3% of the global health workforce yet bears 26% of the world's burden of disease.^{6,7} South Asia has 8% of the health workforce, yet claims 27% of global morbidity.^{6,7} Rural areas suffer the greatest health workforce deficits in LMIC, with just over one-third of physicians, nurses, and midwives working in rural areas that host two-thirds of the population.⁶ High-income nations, by contrast, account for 11% of global disease and are home to 37% of all health-care professionals.^{6,7}

Inequity in distribution of health professionals represents a global challenge.^{1,4,5} The 2010 World Health Organization (WHO) Code of Practice on the International Recruitment of

Health Personnel has not slowed the efflux of medical graduates from low-resource to high-resource settings.^{8,9} Meanwhile, international collaborations formed to strengthen LMIC health workforce, including the Medical and Nursing Education Partnership Initiatives (MEPI and NEPI) and the Consortium of New Southern African Medical Schools (CONSAMS),^{10–12} have not curbed the outflow of health graduates, despite successes in other areas.^{13–15} Local interventions implemented to build human resource capacity have been similarly disappointing; while LMIC medical and nursing education has expanded,^{16,17} the efflux of new graduates after training continues.¹⁸ Of the roughly 10,000 sub-Saharan African medical students who graduate yearly,¹⁶ up to one quarter will emigrate within 5 years of graduation^{16,19}—costing \$2 billion in lost educational investments²⁰ and an unknown burden more from excess regional morbidity. Only 16% of graduates may work rurally longer than 5 years.^{16,19}

Although it remains crucial to address factors motivating graduates' international and urban migration,^{4,5,21} growing investments in LMIC health education have also intensified the need to consider which mix of students are granted limited training spots in the first place.²² Admissions to medical and nursing school in LMIC are typically determined by applicant academic merit. Yet data from both high-income nations and LMIC suggest that student geographic origin and/or exposure to rural areas may influence ultimate practice locations.^{19,23–26} Less is known about the

*Address correspondence to David M. Silvestri, Department of Emergency Medicine, Brigham and Women's Hospital, 75 Francis Street, Boston, MA 02115. E-mail: david.m.silvestri@gmail.com

influence of other demographic, personality, and motivational factors—collectively referred to here as nonacademic attributes—on student migration decisions. Such understanding could help guide admissions reforms, identifying students most likely to work in high-need areas.

We previously reported medical and nursing student characteristics associated with intended international or rural practice in eight South Asian and sub-Saharan African nations.¹⁹ Here we explore students' preferred job values and work environment priorities as predictors of their plans to work in rural areas or emigrate from their countries after graduation.

MATERIALS AND METHODS

Study design and procedures. Details of study methods are presented elsewhere.¹⁹ In brief, between September 2011 and May 2012, we conducted a cross-sectional survey of 3,199 medical and nursing students in the first and final years of training at 16 government training institutions in eight LMIC: Bangladesh, India, Nepal, Ethiopia, Kenya, Malawi, Tanzania, and Zambia. Among nations in continental South Asia and sub-Saharan Africa with critical health worker shortages,⁴ these eight were systematically selected to minimize the influence of differences in language, political instability, and institutional training philosophy and founding date (Supplemental Figure 1). All use English as the language of instruction, met cutoffs for political stability (absence of United Nations peacekeeping mission or bottom-decile rank in Global Peace Index or Worldwide Governance Indicators),^{26–29} and have a government medical and affiliated nursing school established before 1993.³⁰ To achieve the most comparable cohort of students across institutions and nations, one highly reputed government medical school and affiliated nursing school was selected in the capital or major commercial city of each nation (Table 1). At each one, we enrolled first- and final-year medical (MBBS/MD/MBChB) and nursing (BSc) degree students to complete a self-administered questionnaire. All sites granted research ethics committee approval, as did the Vanderbilt University Institutional Review Board.

In addition to assessing 36 student background characteristics, survey items sought to monitor trainees' professional priorities by having them assign levels of importance

(using 5-point Likert scales) to 19 job, location, and work environment attributes (Table 2). The two primary outcomes assessed were self-reported likelihood of choosing to work outside the country (emigration) or in a rural setting inside the country within 5 years after training.

Questionnaires were field tested prior to administration, and supplemental official language translations provided (Bengali, Nepali, Amharic, Chichewa, and Kiswahili) where English was not also an official language. Test–retest reliability of responses was assessed using a cohort of 60 students. Questionnaire results were entered electronically, and data entry audited in each country to ensure a data entry error rate < 5% with 95% confidence. Questionnaires with > 25% of responses missing were excluded from analysis.

Statistical analysis. Student priorities regarding 19 job, location, and work environment attributes were reduced to a smaller number of discrete priority categories using exploratory principal component analysis (PCA). PCA helps condense heterogeneously related variables (in this case, priorities regarding 19 attributes) into fewer independent groups (priority categories). Cronbach's α was used to estimate internal consistency of each resulting category. Students were then assigned a score for each priority category based on the mean of their responses to the corresponding constituent attributes, and scores for each category were then normalized to a 100-point scale for subsequent analysis.

Multivariable linear regression models were used to estimate the relationship between 12 selected student characteristics (chosen a priori) and student scores for each priority category. Subsequently, proportional odds models were used to estimate the relationship between 14 selected student characteristics (10 background characteristics chosen a priori, as well as four category scores derived from PCA) and student self-reported likelihood to work internationally or rurally (each collected as a category ordinal measure). The number of characteristics selected was computed using the distribution of the ordinal outcomes and the smallest country sample size.³¹ Missing values were accounted for using multiple imputation,³² and continuous variables were expanded using restricted cubic splines to avoid assumptions of linearity.³¹ Country-specific odds ratios (ORs) were combined using a meta-analytic random effects method making no assumption of homogeneity across institutions.³³ We used

TABLE 1
Institutions included in eight-country survey of migration intentions

Country	City	Institution
Bangladesh	Dhaka	Dhaka Medical College
	Dhaka	Dhaka Nursing Institute
India	Delhi	Maulana Azad Medical College
	Delhi	Ahilya Bai College of Nursing
Nepal	Kathmandu	Tribhuvan University Institute of Medicine
	Kathmandu	Tribhuvan University Maharajgunj Nursing Campus
Ethiopia	Addis Ababa	Addis Ababa University School of Medicine
	Addis Ababa	Addis Ababa University School of Nursing
Kenya	Nairobi	University of Nairobi School of Medicine
	Nairobi	University of Nairobi School of Nursing Sciences
Malawi	Blantyre	University of Malawi College of Medicine
	Lilongwe	University of Malawi Kamuzu College of Nursing
Tanzania	Dar es Salaam	Muhimbili University of Health and Allied Sciences School of Medicine
	Dar es Salaam	Muhimbili University of Health and Allied Sciences School of Nursing
Zambia	Lusaka	University of Zambia School of Medicine
	Lusaka	University of Zambia School of Medicine Department of Nursing Sciences

TABLE 2
Nonacademic student attributes assessed in eight-country survey of migration intentions

Demographic characteristics	
Degree program (MV)	Degree of religiosity¶
Class year (MV)	Maternal tertiary education (MV)
Age	Paternal tertiary education
Gender (MV)	Number of grandparents with tertiary education
Number of languages spoken conversationally (MV)	Relationship status
Primary language (MV)	Marital status
Tribe/ethnicity	Frequency of contact with immediate family
Country(ies) of citizenship*	Frequency of contact with extended family
Country in which majority of childhood was spent (MV)	Location of immediate family‡
Region/province/state of upbringing†	Location of extended family‡ (MV)
Location of primary school‡	Immediate or extended family members living abroad
Location of secondary school‡	Family socioeconomic status (MV)
Longest duration spent in a rural setting (MV)	Primary means for financing education
Prior foreign travel	Secondary means of financing education
Number of countries visited§	Financial debt expected upon graduation
Longest duration spent abroad§	Degree of concern regarding debt
Number of trips abroad§	Number of expected dependents (MV)
Religious affiliation	Type of expected dependents**
Career desires and intentions	
Pre-matriculation desire for rural career (MV)	Likelihood of pursuing further postgraduate training (MV)
Pre-matriculation desire for international career (MV)	
Career priorities	
Job attributes: <i>How important is it for you in your career to...</i>	
Advance medical research	Be well respected by people in authority
Earn a large income	Help improve your nation
Mentor/teach others	Manage your own practice
Care for the poor/disadvantaged	
Location attributes: <i>How important is it for you to work in a location that...</i>	
Is desirable for your spouse/partner	Has high-quality educational opportunities for children
Is close to family	Has a stable and trustworthy political system
Is safe from crime/violence	Has a community of people with your religion
Is easy to access from capital/commercial capital	Has diverse opportunities for entertainment
Work environment attributes: <i>How important is it for you to work in an environment that has...</i>	
The best available infrastructure	A highly efficient and adequately sized support staff
Whatever supplies you need in stock	Opportunities for career development

(MV) Variable was chosen a priori for inclusion in multivariable proportional odds model assessing predictors of rural or international work intentions. A total of 14 variables were included. The number of characteristics selected was computed using the smallest country sample size.³¹

*Name(s) of countries in which student holds citizenship.

†Name of country region, province, or state in which student spent the majority of his/her childhood.

‡Five location options were provided, ranging from rural village to very large city. An additional option ("outside the country") was included for items assessing family location.

§Responses contingent upon student having prior foreign travel.

¶Five-question item assessing religiosity, derived from validated Duke University Religion Index.³⁴

|| Means of financing education include scholarships (with or without service obligation), loan, family or personal savings, other.

**Types of expected dependents include spouse, children, parents, siblings, nieces/nephews, aunts/uncles, cousins, grandparents.

R-software 2.15.1 (www.r-project.org) for data analyses. For multivariable models, adjusted OR (aOR) and 95% confidence intervals (CIs) are presented.

RESULTS

Of 3,822 students enrolled in first- or final-year medical or nursing degree classes, 599 (16%) were absent during questionnaire administration, six (< 1%) declined participation, and 18 (< 1%) were excluded due to incomplete questionnaires, leaving 3,199 (84%) for analysis, 99.3% of the 3,223 students approached for the study. Descriptive characteristics of this population are detailed elsewhere.¹⁹ Data entry audits yielded low error rates for all sites (range = 0.02–0.6%). Test–retest reliability demonstrated strong reliability ($K = 0.90$).

Prioritization of career attributes. Using PCA, student rankings regarding 19 independent career attributes reduced into four distinct categories of priorities (Table 3). These categories included prioritization of 1) attributes related to work environment resources (infrastructure, support staff, supply availability, and career development opportunities), 2) attributes related to location livability (location desirability to

spouse/partner, proximity to family, safety, access from capital city, educational opportunities for children, local political system, local religious communities, and entertainment opportunities), 3) altruistic job attributes (advancing research, mentoring others, caring for the poor, improving the nation), and 4) individualistic job attributes (large income, respect from authority figures, and managerial autonomy). Cronbach's α for each category of priorities is shown in Table 3.

On multivariable analysis, several student characteristics emerged as independently associated with higher scores for various priority categories, though the numerical score difference (on a 100-point scale) attributable to any given student characteristic remained small (Table 3). Compared with their medical peers, nursing students placed higher importance on both a high-resource work environment (score differential = +2.0 points, 95% CI = 0.1–3.8) and optimal location (score differential = +2.1 points, 95% CI = 0.0–4.1), and were also more polar in their prioritization of both altruistic and individualistic career attributes (score differentials = +1.9 and +5.8 points, respectively; 95% CI = 0.0–3.8 and 2.4–9.1, respectively; Table 3). Females also prioritized a high-resource work environment slightly more strongly than

TABLE 3
Differences in scoring of four career priority categories, by student characteristic

	High-resource work environment (Cronbach's $\alpha = 0.73$)	Location livability (Cronbach's $\alpha = 0.75$)	Altruistic career values (Cronbach's $\alpha = 0.59$)	Individualistic career values (Cronbach's $\alpha = 0.50$)
Score differentials on 100-point scale* (95% CI)				
Degree program				
Medical (ref)	0	0	0	0
Nursing	+2.0 (0.1 to 3.8)	+2.1 (0.0 to 4.1)	+1.9 (0.0 to 3.8)	+5.8 (2.4 to 9.1)
Class year				
First year (ref)	0	0	0	0
Final year	+1.5 (−0.5 to 3.5)	+3.2 (0.4 to 6.1)	−2.6 (−4.0 to −1.2)	−0.8 (−3.1 to 1.5)
Gender				
Male (ref)	0	0	0	0
Female	+1.5 (0.2 to 2.8)	+2.0 (−0.1 to 4.1)	+0.4 (−0.7 to 1.4)	+0.3 (−1.2 to 1.7)
Age				
20 years (ref)	0	0	0	0
40 years	+1.2 (−4.0 to 6.4)	+4.6 (−1.1 to 10.3)	−2.7 (−11.3 to 5.8)	+6.7 (−4.1 to 17.6)
Primary Language				
Non-majority (ref)	0	0	0	0
Majority†	−0.8 (−2.2 to 0.6)	−0.2 (−1.7 to 1.4)	+0.4 (−1.7 to 2.4)	+1.6 (−1.2 to 4.4)
Longest time spent in rural area				
0 years (ref)	0	0	0	0
5 years	+0.7 (−0.7 to 2.2)	−0.8 (−3.1 to 1.6)	+0.8 (−0.3 to 1.9)	+0.3 (−1.4 to 2.1)
10 years	+0.7 (−1.1 to 2.5)	−0.9 (−4.1 to 2.3)	+1.2 (−0.3 to 2.6)	+0.2 (−1.8 to 2.3)
20 years	−0.1 (−2.4 to 2.1)	−1.2 (−4.6 to 2.2)	+1.6 (−0.6 to 3.8)	+0.2 (−2.7 to 3.2)
Location of primary school‡				
Rural (ref)	0	0	0	0
Semi-urban	0.0 (−2.1 to 2.1)	+3.1 (0.2 to 6.0)	−0.2 (−2.2 to 1.8)	+0.9 (−1.0 to 2.8)
Urban or international	+1.3 (−1.7 to 4.3)	+1.9 (−0.6 to 4.5)	+1.0 (−1.2 to 3.2)	+2.0 (−0.3 to 4.3)
Prior international travel				
None (ref)	0	0	0	0
One country	+0.7 (−1.0 to 2.4)	+1.4 (−0.4 to 3.2)	+1.1 (−0.9 to 3.0)	+0.7 (−1.4 to 2.7)
Two or more countries	−0.3 (−2.9 to 2.3)	−1.3 (−3.6 to 0.9)	−1.1 (−3.3 to 1.1)	−1.0 (−4.1 to 2.2)
Economic status¶				
Poor or below average (ref)	0	0	0	0
Average	−1.4 (−3.0 to 0.1)	−1.1 (−2.8 to 0.5)	−1.3 (−2.6 to −0.1)	−0.9 (−2.8 to 0.9)
Above average	−0.9 (−3.0 to 1.3)	+0.1 (−2.8 to 3.0)	−1.8 (−3.4 to −0.2)	−0.7 (−3.0 to 1.6)
Wealthy	−0.6 (−5.0 to 3.7)	+1.5 (−3.7 to 6.8)	−1.4 (−4.3 to 1.5)	+2.1 (−2.9 to 7.1)
Maternal tertiary education	0.0 (−1.7 to 1.7)	+0.7 (−0.9 to 2.4)	0.0 (−1.1 to 1.1)	−0.3 (−1.9 to 1.3)
Relationship status				
Single (ref)	0	0	0	0
Recently entered relationship	+1.3 (−0.1 to 2.7)	+1.3 (−0.5 to 3.0)	−0.3 (−1.5 to 0.9)	+1.1 (−0.6 to 2.8)
Long-term relationship	+1.1 (−0.9 to 3.1)	+1.4 (−1.2 to 4.0)	−0.6 (−2.1 to 0.9)	+0.5 (−1.7 to 2.7)
Intrinsic religiosity§				
Low religiosity (ref)	0	0	0	0
Medium religiosity	+1.6 (−0.3 to 3.6)	+2.6 (1.2 to 4.0)	+0.8 (−0.9 to 2.6)	−0.4 (−2.6 to 1.9)
High religiosity	+3.3 (0.0 to 6.6)	+5.0 (2.6 to 7.4)	+1.6 (−1.2 to 4.4)	0.0 (−3.8 to 3.8)
Very high religiosity	+5.0 (2.1 to 7.8)	+7.5 (4.0 to 11.0)	+4.2 (0.4 to 8.0)	+2.3 (−2.5 to 7.1)

CI = confidence interval.

*Categories of career priorities were generated through exploratory principal component analysis from a set of 19 career attributes rated in importance by survey respondents. Student scores for each category (on a 100-point scale) reflect the mean of scores for all attributes in that category. The score differentials reported above are derived from multivariable linear regression analysis and signify the difference in mean score (on a 100-point scale) independently associated with a given student characteristic for each priority category.

†Majority of languages are national official languages and include Bengali (Bangladesh), Nepali (Nepal), Hindi and English (India), Amharic (Ethiopia), Kiswahili and English (Kenya), Kiswahili (Tanzania), Bemba and English (Zambia), Chichewa (Malawi).

‡Rural (population < 50,000), semi-urban (population 50,000–200,000), urban (population > 200,000).

¶Self-reported socioeconomic status of one's family compared with the rest of people in the country.

§Intrinsic religiosity as measured by the Duke University Religion Index, a validated tool for epidemiologic use. Intrinsic religiosity is calculated by DUREL on a 15-point scale (minimum 3 and maximum 15), with labels added here: low (6/15 points), medium (9/15 points), high (12/15 points), very high (15/15 points) religiosity.

males (score differential = +1.5 points, 95% CI = 0.2–2.8), but were otherwise similar in their preferences (Table 3). Age had little independent effect on career preferences, though final-year students appeared more likely to prioritize optimal location (score differential = +3.2 points, 95% CI = 0.4–6.1) and less likely to prioritize altruistic career values (score differential = −2.6 points, 95% CI = −4.0 to −1.2) than their first-year peers (Table 3).

We did not detect an association between students' self-reported socioeconomic status, prior international travel, and exposure to rural settings and any category of priorities. However, students with very high intrinsic religiosity (as measured by the Duke University Religion Index³⁴) preferentially prioritized altruistic career attributes compared with less reli-

gious peers (score differential = +7.5, 95% CI = 4.0–11.0; Table 3), while also considering location livability (including “having a community of people with your religion”) more important (score differential = +4.2, 95% CI = 0.4–8.0; Table 3).

Intent to practice abroad. We previously noted high rates of intended international migration among students surveyed, with 24% of medical students and 36% of nursing students anticipating emigrating abroad within 5 years of graduation.¹⁹ After controlling for differences in career priorities, several student characteristics remained independently associated with international practice intentions (Table 4). Notably, students who desired careers abroad before matriculation remained more likely to intend to migrate (aOR = 4.34, 95% CI = 3.04–6.19), whereas those with

TABLE 4
Odds of intending an international or rural career, by student characteristics

	Likelihood of choosing an international career within 5 years of completing training	Likelihood of choosing a rural career within 5 years of completing training
	Odds ratio (95% CI)	Odds ratio (95% CI)
Degree program		
Medical (ref)	1	1
Nursing	1.60 (1.03–2.48)	0.91 (0.69–1.21)
Class year		
First year (ref)	1	1
Final year	0.75 (0.59–0.95)	0.76 (0.63–0.92)
Gender		
Male (ref)	1	1
Female	0.87 (0.73–1.04)	0.99 (0.85–1.15)
Primary language		
Non-majority (ref)	1	1
Majority*	1.03 (0.86–1.22)	1.32 (1.08–1.61)
Longest time spent in rural area		
0 years (ref)	1	1
5 years	0.92 (0.76–1.11)	1.22 (1.01–1.47)
10 years	0.81 (0.65–1.02)	1.35 (1.07–1.70)
20 years	0.67 (0.50–0.90)	1.53 (1.16–2.03)
Location of primary school†		
Rural	1	1
Semi-urban	0.96 (0.76–1.22)	0.79 (0.62–1.01)
Urban or international	0.76 (0.57–1.02)	0.96 (0.75–1.23)
Economic status‡		
Poor or below average (ref)	1	1
Average	0.87 (0.64–1.18)	0.99 (0.72–1.37)
Above average	0.83 (0.56–1.22)	0.95 (0.62–1.45)
Wealthy	0.88 (0.43–1.78)	0.81 (0.40–1.62)
Likely to pursue postgraduate study	1.23 (0.92–1.64)	0.89 (0.62–1.28)
Initially desired rural career§	0.88 (0.76–1.02)	4.61 (3.26–6.51)
Initially desired international career§	4.34 (3.04–6.19)	0.98 (0.84–1.14)
Work environment resource prioritization¶		
Score of 100 (vs. 75)	1.38 (1.12–1.69)	0.60 (0.49–0.73)
Location livability prioritization¶		
Score of 100 (vs. 75)	1.19 (0.89–1.59)	0.97 (0.76–1.24)
Altruistic job values prioritization¶		
Score of 100 (vs. 75)	0.99 (0.68–1.43)	1.82 (1.50–2.21)
Individualistic job values prioritization¶		
Score of 100 (vs. 75)	1.44 (1.16–1.78)	0.86 (0.66–1.12)

CI = confidence interval; OR = odds ratio. The combined odds ratios and 95% CIs were computed based on the proportional odds model results of the country-specific ORs using the meta-analysis approach of DerSimonian and Laird.³³

*Majority of languages are national official languages and include Bengali (Bangladesh), Nepali (Nepal), Hindi and English (India), Amharic (Ethiopia), Kiswahili and English (Kenya), Kiswahili (Tanzania), Bemba and English (Zambia), and Chichewa (Malawi).

†Rural (population < 50,000), semi-urban (population 50,000–200,000), urban (population > 200,000).

‡Self-reported socioeconomic status of one's family compared with the rest of people in the country.

§Initial desire prior to entering medical/nursing school.

¶Student priorities regarding 19 job, location, and work environment attributes were reduced to four discrete priority categories using exploratory principal component analysis, and students were assigned a score (100-point scale) for each category based on the mean of their responses to the corresponding constituent attributes.

prolonged exposure to rural settings were less likely to plan work abroad (0 versus 20 years: aOR = 0.67, 95% CI = 0.50–0.90; Table 4). Interestingly, the desire for postgraduate training itself was no longer significantly associated with planned international migration (aOR = 1.23, 95% CI = 0.92–1.64) after accounting for priorities in job values, location livability, and work environment resources (Table 4).

Regardless of their background characteristics, students who prioritized individualistic career attributes were more likely to plan international careers (aOR = 1.44, 95% CI = 1.16–1.78; Table 4). Similarly, those who strongly valued high-resource work environments were more likely to intend practice abroad (aOR = 1.38, 95% CI = 1.12–1.69), though prioritizing an optimal work location was not associated with intended emigration (aOR = 1.19, 95% CI = 0.89–1.59; Table 4).

Intent to practice in a rural setting. Only 18% of students (16% of medical and 24% of nursing) intended to practice rurally within their nation within 5 years of graduation. Several background characteristics previously found to be associated with intended rural practice remained predictive

after controlling for differences in students' career priorities.¹⁹ Students who desired a rural career before matriculation had over four times higher odds of intending one later in their educations (aOR = 4.61, 95% CI = 3.26–6.51), while prolonged exposures to rural settings continued to show higher odds of intending a rural career (0 versus 20 years: aOR = 1.53, 95% CI = 1.16–2.03; Table 4).

Students who prioritized altruistic career values had nearly two times higher odds of choosing rural careers (aOR = 1.82, 95% CI = 1.50–2.21), regardless of their background characteristics. Conversely, those who prioritized a high-resource work environment had nearly half the odds of seeking rural careers (aOR = 0.60, 95% CI = 0.49–0.73). Prioritization of optimal location attributes was not associated with rural practice intent (aOR = 0.97, 95% CI = 0.76–1.24).

DISCUSSION

Our study strengthens the growing body of literature suggesting a predictable profile of the health professional

student inclined to remain in country and work rurally in LMIC.^{19,25,26} Our data suggest identifiable patterns in how students prioritize job values, location preferences, and work environment attributes in their intended careers. These non-academic patterns may help predict students' professional intentions regarding practice location and could be incorporated into medical and nursing school admissions criteria.

In our study population, students who prioritized altruistic job values were over twice as likely to plan rural careers in their home nation, whereas those with individualistic priorities were twice as likely to plan to leave their countries to practice abroad. That these associations were independent of students' background characteristics suggests a potential role for evaluating applicants' career motivations and priorities. Identifying and preferentially admitting applicants with altruistic job preferences or rural backgrounds may increase the proportion of students working in areas of need in LMIC. Similarly, because students who prioritize high-resource work environments or have strong individualistic aspirations disproportionately intend urban and/or international careers, selecting students with experience in or personality traits most adapted to lower-resource settings (e.g., self-direction, resourcefulness, empathy, optimism, confidence, and extroversion^{35,36}) may increase retention in the LMIC.

Reported career desires prior to matriculation remained most strongly associated with students' practice intentions at the time of our survey. Independent of their career priorities, students who reported desiring a rural career prior to enrollment remained over four times more likely to prefer one during their training, while those who initially wanted to work abroad were similarly as likely to intend to seek international careers. We cannot exclude recall bias, but it is unclear whether the direction of recall error (and, thus, bias generated) would weaken or strengthen these findings.¹⁹ Data from high-income nations support an association between students' pre-matriculation career plans and eventual practice outcomes.³⁷ Additional longitudinal and mixed-method studies from LMIC are needed both to further confirm the association between pre-matriculation intentions and ultimate practice decisions and to explain any evolution in student intentions during their education. Cross-sectional assessments from LMIC suggest final-year students preferentially plan international and urban careers compared with younger peers, but by design are unable to confirm whether these differences represent individual changes in students' preferences or rather a cohort effect from changes in class composition (e.g., from enrollment expansions) or curricula.^{19,38}

This study further strengthens recommendations that admission standards for health professional training programs in LMIC should prioritize acceptance of students with prolonged rural exposures.^{19,22} Although other studies have evaluated the effect of rural birthplace or upbringing (irrespective of the duration of rural residence),^{21,39–45} we show that the likelihood of seeking in-country or rural work increases with longer rural exposures. That this correlation is independent of students' altruistic or individualistic job preferences is noteworthy, suggesting the influence of rural exposure may be independent of student personality or job value priorities. In identifying those applicants most likely to work remotely, evaluating the duration and nature of their rural experiences may be more helpful than assessing place of origin alone.

Strengths and limitations. This study is unique for its large scope, its high aggregate class response rate, its systematic sampling methodology, and the broad set of variables examined (Supplemental Table 1). To our knowledge, the present report represents the first time students' career priorities have been evaluated alongside background characteristics in a multinational study of migration intentions. Our use of PCA helps shed light on patterns of career priorities held by health professional students in LMIC. Our findings have actionable implications for LMIC health education policies, while also suggesting novel areas for future research.

Limitations include potentially limited generalizability in non-Anglophone nations or areas where internal conflict or political turmoil may affect student career priorities or drive migration regardless of student characteristics.⁴⁶ Admissions reform in unstable nations may be less effective than political reform in eliciting graduate retention. Similarly, we focused on premier government training institutions, since they carry a longstanding mission to train national leaders to address domestic health challenges and use public funds to this end. Hence, our findings may not generalize to students at private, rural, or newly established institutions, nor particularly to schools with a social accountability mandate, where graduates may be more likely to work in areas of need.^{47,48} Nevertheless, although career preference patterns may vary with institution type, it remains unclear whether or how factors independently associated with student practice plans would differ, if at all. Although unique in geographic scope, our survey was correspondingly exposed to geographically and culturally mediated differences in student terminology interpretation. Where present, we aimed to minimize their effect through field testing and standardizing key terminology. Additionally, we evaluated self-reported migration intentions, which may not correlate with ultimate relocation decisions. Our cross-sectional design precluded our ability to follow up students' ultimate career decisions. However, as previously described,¹⁹ our results closely parallel actual rates of migration observed among Asian and African health professionals. For example, rates of intended international (26%) and rural (16%) migration among sub-Saharan African medical students surveyed strongly resembled observed graduate practice settings (28% international and 16% rural) reported by school administrators from the same region.^{16,19} This suggests students' intentions may resemble ultimate behavior. Finally, although students' questionnaire responses may have been influenced by the desire to please study personnel (often school faculty), such social desirability bias would only strengthen study findings by leading to under- and overreporting of international and rural career intentions, respectively.

Our questionnaire did not specifically assess the types, quantity, or location of in-country postgraduate specialty training opportunities available to student respondents. Where such postgraduate opportunities do not exist or remain relatively scarce, the desire to pursue advanced specialty training can be a major motivator for student migration abroad.⁴⁹ Although we identified no significant independent association between postgraduate training plans and career location preferences, it remains possible that certain student subgroups exist for which desire for advanced specialty education was a primary driver of international or urban career preferences regardless of origin or

career priorities. Development of high-quality in-country advanced specialty training opportunities should remain a priority in nations facing health workforce shortages.

Policy considerations. Our data support the potential value of using nonacademic assessment tools in medical and nursing school admissions in LMIC. Although not without challenges, such instruments have served an invaluable role in medical and nursing school admissions in high-income nations, revealing candidates' personal qualities through combined assessment of transcript demographics, personal statements, letters of reference, and in particular structured interviews.^{50,51} At the time of surveying, most LMIC public training institutions (including all 16 that we studied) admitted students primarily on scholastic merit, and sometimes on entrance examination score alone. As evidence mounts, academic merit-based admissions in LMIC medical and nursing schools must be recognized as falling short of best educational practices.

In considering LMIC medical and nursing school admissions reform, a role for prioritized selection of rural-origin students seems vital,²² now supported by research from both high-income nations and LMIC.^{19,21,23,24} Entrance essays would help elucidate students' preenrollment career desires, motivations, and personality attributes, while also helping identify national language proficiency, previously identified as independently predictive of rural career intent.¹⁹ Structured interviews may be similarly useful, and can be conducted by trained nonfaculty interviewers where faculty shortages limit participation.⁵⁰ Interviews by partnering rural community leaders may help identify applicant characteristics suited to rural work.⁵² Although altruistic and individualistic career priorities predicted rural and international vocational plans, respectively, we must identify those interview tools best adapted to uncover such intrinsic student values. Brief personality tests within the application process may provide a rapid and low-cost means of identifying desired nonacademic traits in large applicant pools.^{50,52} Letters of reference are notorious for their variability and potential bias toward those from higher-resource settings, but could prove more useful if standardized to account for rural and urban disparities.⁵⁰ We also recognize the risk of "gaming the system," if prospective students recognize that nonacademic criteria are being considered; reporting trivial rural exposures, exaggerating indicators of altruism, and manipulating résumés could be attempted to enhance admissions likelihood.

Addressing critical shortages of health professionals in LMIC will require a multifaceted approach that must include greater admissions policy reform to stem "brain drain." With growing investments in new schools, expanded enrollments, and curricular reform, resources will be most effective if spent on students most likely to remain in-country and work in areas of need. Compulsory service obligations alone appear to be weak in eliciting long-term retention,⁵³ as graduates often migrate shortly after service terms end.^{8,18} Using nonacademic attributes—in particular, prior rural experience, higher altruistic and lower individualistic career aspirations, and tolerance of lower work resources—in medical and nursing admissions processes in LMIC may help reduce emigration "brain drain" and increase the number of graduates who practice where they are needed most.

Received September 16, 2016. Accepted for publication January 21, 2017.

Published online March 20, 2017.

Note: Supplemental appendix, table, and figure appear at www.ajtmh.org.

Acknowledgments: We thank the following individuals for their invaluable assistance in data collection: R. D. Adhikari, A. Asaminew, A. Banerjee, L. Basu, E. Belay, M. Bhusal, E. Bomani, H. El-Busaid, F. Chaula, J. Chemere, E. Erai, B. Gillis, D. Hailemariam, W. John, K. K'Orimba, E. Malaba, S. Manandhar, R. Mlay, M. Mtsinje, M. Mulatu, E. Muthumbi, P. Mweemba, T. Pokharel, H. Saidi, J. Samwel, S. Semotine, N. Sedi, H. Sharma, N. P. Singh, T. Tesfaye, E. Watli, and T. Zeray.

Financial support: This study was financially supported by the Vanderbilt University School of Medicine Medical Scholars Program.

Disclaimer: All authors declare no financial or non-financial relationships with any organizations that might have an interest in the submitted work, and no other relationships or activities that may have influenced the submitted work.

Authors' addresses: David M. Silvestri, Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA, E-mail: david.m.silvestri@gmail.com. Meredith Blevins and Ben Andrews, Vanderbilt University Institute for Global Health, Nashville, TN, E-mails: meredith.blevins@vanderbilt.edu, lauandrews@yahoo.com. Kenneth A. Wallston, Vanderbilt University School of Nursing, Nashville, TN, Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA, and Harvard Affiliated Emergency Medicine Residency, Boston, MA, E-mail: ken.wallston@vanderbilt.edu. Arfan R. Afzal, Department of Mathematics and Statistics, University of Calgary, Calgary, Alberta, Canada, E-mail: nafzal@isrt.ac.bd. Nazmul Alam, International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh, E-mail: nazmul@icddr.org. Miliard Derbew, Department of Surgery, Addis Ababa University School of Medicine, Addis Ababa, Ethiopia, E-mail: miliardderbew@gmail.com. Simran Kaur, Department of Physiology, All India Institute of Medical Sciences, Ansari Nagar, Delhi, India, E-mail: simranmamc@gmail.com. Mwapatsa Mipando, University of Malawi College of Medicine, Blantyre, Malawi, E-mail: mipando@medcol.mw. Charles A. Mkony, Department of Surgery, Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania, E-mail: charles_mkony@yahoo.com. Philip M. Mwachaka, Department of Human Anatomy, University of Nairobi, Nairobi, Kenya, E-mail: pmaseghe@gmail.com. Nirju Ranjit, Department of Anatomy, Tribhuvan University Institute of Medicine, Maharajgunj, Kathmandu, Nepal, E-mail: nirju_r@yahoo.com. Sten H. Vermund, Yale School of Public Health, New Haven, CT, E-mail: sten.vermund@yale.edu.

Reprint requests: Sten H. Vermund, Vanderbilt Institute for Global Health, 2525 West End Avenue, Suite 750, Nashville, TN 37203, E-mail: sten.vermund@vanderbilt.edu, Tel: 1-615-322-9374.

REFERENCES

- Collins FS, Glass RI, Whitescarver J, Wakefield M, Goosby EP, 2010. Public health: developing health workforce capacity in Africa. *Science* 330: 1324–1325.
- Samb B, Desai N, Nishtar S, Medis S, Bekedam H, Wright A, Hsu J, Martiniuk A, Celletti F, Patel K, Adshead F, McKee M, Evans T, Alwan A, Etienne C, 2010. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low-income and middle-income countries. *Lancet* 376: 1785–1797.
- Kruk ME, Myers M, Varpilah ST, Dahn BT, 2015. What is a resilient health system? Lessons from Ebola. *Lancet* 385: 1910–1912.
- World Health Organization (WHO), 2006. *The World Health Report 2006: Working Together for Health*. Geneva, Switzerland: WHO.
- Joint Learning Initiative, 2004. *Human Resources for Health: Overcoming the Crisis*. Cambridge, MA: Harvard University.
- World Health Organization (WHO), 2014. *Global Health Workforce Statistics, 2014 Update*. Geneva, Switzerland: WHO. Available at: <http://www.who.int/hrh/statistics/hwfstats/>. Accessed October 20, 2015.

7. WHO, 2014. *Global Health Estimates 2014 Summary Tables: Deaths by Cause, Age and Sex by WHO region, 2000–2012*. Geneva, Switzerland: WHO. Available at: http://www.who.int/healthinfo/global_burden_disease/en/. Accessed October 20, 2015.
8. Tankwanchi ABS, Vermund SH, Perkins DD, 2014. Has the WHO Global Code of Practice on the International Recruitment of Health Personnel been effective? *Lancet Glob Health* 2: e390–e391.
9. Tankwanchi ABS, Vermund SH, Perkins DD, 2015. Monitoring sub-Saharan African physician migration and recruitment post-adoption of the WHO code of practice: temporal and geographic patterns in the United States. *PLoS One* 10: e0124734.
10. Mullan F, Frehywot S, Omaswa F, Sewankambo N, Talib Z, Chen C, Kiarie J, Kiguli-Malwadde E, 2012. The Medical Education Partnership Initiative: PEPFAR's effort to boost health worker education to strengthen health systems. *Health Aff (Millwood)* 31: 1561–1572.
11. Middleton L, Howard AA, Dohrn J, Von Zinkernagel D, Parham Hopson D, Aranda-Naranjo B, Hall C, Malata A, Bvumbwe T, Chabela A, Molise N, El-Sadr WM, 2014. The Nursing Education Partnership Initiative (NEPI): innovations in nursing and midwifery education. *Acad Med* 89 (Suppl): S24–S28.
12. Eichbaum Q, Nyarango P, Bowa K, Odonkor P, Ferrão J, Mashalla Y, Vainio O, Vermund SH, 2012. "Global networks, alliances and consortia" in global health education—the case for south-to-south partnerships. *J Acquir Immune Defic Syndr* 61: 263–264.
13. Talib ZM, Kiguli-Malwadde E, Wohltjen H, Derbew M, Mulla Y, Olaleye D, Sewankambo N, 2015. Transforming health professions' education through in-country collaboration: examining the consortia among African medical schools catalyzed by the Medical Education Partnership Initiative. *Hum Resour Health* 13: 1.
14. Olapade-Olaopa EO, Baird S, Kiguli-Malwadde E, Kolars JC, 2014. Growing partnerships: leveraging the power of collaboration through the Medical Education Partnership Initiative. *Acad Med* 89 (Suppl): S19–S23.
15. Eichbaum Q, Bowa K, Pires P, Vanio O, Nyarango P, 2014. Challenges and opportunities for new medical schools in Africa: the Consortium of New Southern African Medical Schools (CONSAMS). *Acad Med* 89 (Suppl): S108–S109.
16. Mullan F, Frehywot S, Omaswa F, Buch E, Chen C, Greysen SR, Wassermann T, Abubakr DEE, Awases M, Boelen C, Diomande MJ-MI, Dovlo D, Ferro J, Haileamlak A, Iputo J, Jacobs M, Koumaré AK, Mipando M, Monekosso GL, Olapade-Olaopa EO, Rugarabamu P, Sewankambo NK, Ross H, Ayas H, Chale SB, Cyprien S, Cohen J, Haile-Mariam T, Hamburger E, Jolley L, Kolars JC, Kombe G, Neusy A-J, 2011. Medical schools in sub-Saharan Africa. *Lancet* 377: 1113–1121.
17. Mokone GG, Kebaetse M, Wright J, Kebaetse MB, Makgabana-Dintwa O, Kebaabetswe P, Badlangana L, Mogodi M, Bryant K, Nkomazana O, 2014. Establishing a new medical school: Botswana's experience. *Acad Med* 89 (Suppl): S83–S87.
18. Tankwanchi ABS, Ozden C, Vermund SH, 2013. Physician emigration from sub-Saharan Africa to the United States: analysis of the 2011 AMA physician masterfile. *PLoS Med* 10: e1001513.
19. Silvestri DM, Blevins M, Afzal AR, Andrews B, Derbew M, Kaur S, Mipando M, Mkony CA, Mwachaka PM, Ranjit N, Vermund S, 2014. Medical and nursing students' intentions to work abroad or in rural areas: a cross-sectional survey in Asia and Africa. *Bull World Health Organ* 92: 750–759.
20. Mills EJ, Kanters S, Hagopian A, Mtambo A, Bourgeault IL, Luboga S, 2011. The financial cost of doctors emigrating from sub-Saharan Africa: human capital analysis. *BMJ* 7031: 1–13.
21. Lehmann U, Dieleman M, Martineau T, 2008. Staffing remote rural areas in middle- and low-income countries: a literature review of attraction and retention. *BMC Health Serv Res* 8: 19.
22. World Health Organization (WHO), 2010. *Increasing Access to Health Workers in Remote and Rural Areas Through Improved Retention*. Geneva, Switzerland: WHO.
23. Grobler L, Marais BJ, Mabunda S, 2015. Interventions for increasing the proportion of health professionals practising in rural and other underserved areas. *Cochrane Database Syst Rev* 6: CD005314.
24. Dolea C, Stormont L, Braichet J-M, 2010. Evaluated strategies to increase attraction and retention of health workers in remote and rural areas. *Bull World Health Organ* 88: 379–385.
25. De Vries E, Reid S, 2003. Do South African rural origin medical students return to rural practice? *S Afr Med J* 93: 789–793.
26. Zimmerman M, Shakya R, Pokhrel BM, 2012. Medical students' characteristics as predictors of career practice location: retrospective cohort study tracking graduates of Nepal's first medical college. *BMJ* 345: e4826.
27. United Nations (UN), 2012. *List of Peacekeeping Operations: 1948–2012*. UN. Available at: <http://www.un.org/en/peacekeeping/documents/operationslist.pdf>. Accessed September 24, 2013.
28. Institute for Economics and Peace, 2011. *Global Peace Index: 2011 Methodology, Results, and Findings*. Sydney, New South Wales: Institute for Economics and Peace.
29. World Bank, 2012. *Worldwide Governance Indicators*. The World Bank Group. Available at: <http://www.govindicators.org>. Accessed September 23, 2013.
30. World Bank, 1993. *World Development Report 1993: Investing in Health*. Washington, DC: The World Bank Group.
31. Harrell FE, 2001. *Regression Modeling Strategies With Applications to Linear Models, Logistic Regression, and Survival Analysis*. New York, NY: Springer.
32. Little RJA, Rubin DB, 1987. *Statistical Analysis with Missing Data*. New York, NY: Wiley.
33. DerSimonian R, Laird N, 1986. Meta-analysis in clinical trials. *Control Clin Trials* 7: 177–188.
34. Koenig HG, Büssing A, 2010. The Duke University Religion Index (DUREL): a five-item measure for use in epidemiological studies. *Religions (Basel)* 1: 78–85.
35. Eley D, Young L, Przybeck TR, 2009. Exploring temperament and character traits in medical students; a new approach to increase the rural workforce. *Med Teach* 31: e79–e84.
36. Royston PJ, Mathieson K, Leafman J, Ojan-Sheehan O, 2012. Medical student characteristics predictive of intent for rural practice. *Rural Remote Health* 12: 2107.
37. Rabinowitz HK, Diamond JJ, Markham FW, Santana AJ, 2012. The relationship between matriculating medical students' planned specialties and eventual rural practice outcomes. *Acad Med* 87: 1086–1090.
38. Huntington I, Shrestha S, Reich NG, Hagopian A, 2012. Career intentions of medical students in the setting of Nepal's rapidly expanding private medical education system. *Health Policy Plan* 27: 417–428.
39. Kotha SR, Johnson JC, Galea S, Agyei-Baffour P, Nakua E, Asabir K, Kwansah J, Gyakobo M, Dzodzomenyo M, Kruk ME, 2012. Lifecourse factors and likelihood of rural practice and emigration: a survey of Ghanaian medical students. *Rural Remote Health* 12: 1898.
40. Johnson JC, Nakua E, Dzodzomenyo M, Agyei-Baffour P, Gyakobo M, Asabir K, Kwansah J, Kotha SR, Snow RC, Kruk ME, 2011. For money or service? A cross-sectional survey of preference for financial versus non-financial rural practice characteristics among Ghanaian medical students. *BMC Health Serv Res* 11: 300.
41. Blaauw D, Erasmus E, Pagaiya N, Tangcharoensathien V, Mullei K, Mudhune S, Goodman C, English M, Lagarde M, 2010. Policy interventions that attract nurses to rural areas: a multicountry discrete choice experiment. *Bull World Health Organ* 88: 350–356.
42. Semeels P, Montalvo JG, Pettersson G, Lievens T, Butera JD, Kidanu A, 2010. Who wants to work in a rural health post? The role of intrinsic motivation, rural background and faith-based institutions in Ethiopia and Rwanda. *Bull World Health Organ* 88: 342–349.
43. Kruk ME, Johnson JC, Gyakobo M, Agyei-Baffour P, Asabir K, Kotha SR, Kwansah J, Nakua E, Snow RC, Dzodzomenyo M, 2010. Rural practice preferences among medical students in Ghana: a discrete choice experiment. *Bull World Health Organ* 88: 333–341.
44. Leon BK, Riise Kolstad J, 2010. Wrong schools or wrong students? The potential role of medical education in regional imbalances of the health workforce in the United Republic of Tanzania. *Hum Resour Health* 8: 3.

45. Clemens M, Pettersson G, 2008. New data on African health professionals abroad. *Hum Resour Health* 6: 1.
46. Larkins S, Michielsen K, Iputo J, Elsanousi S, Mammen M, Graves L, Willems S, Cristobal FL, Samson R, Ellaway R, Ross S, Johnston K, Derese A, Neusy AJ, 2015. Impact of selection strategies on representation of underserved populations and intention to practise: international findings. *Med Educ* 49: 60–72.
47. Sen Gupta T, Murray R, Hays R, Woolley T, 2013. James Cook University MBBS graduate intentions and intern destinations: a comparative study with other Queensland and Australian medical schools. *Rural Remote Health* 13: 2313.
48. Bailey N, Mandeville KL, Rhodes T, Mipando M, Muula AS, 2012. Postgraduate career intentions of medical students and recent graduates in Malawi: a qualitative interview study. *BMC Med Educ* 12: 87.
49. Albanese MA, Snow MH, Skochelak SE, Huggett KN, Farrell PM, 2003. Assessing personal qualities in medical school admissions. *Acad Med* 78: 313–321.
50. Parry J, Mathers J, Stevens A, Parsons A, Lilford R, Spurgeon P, Thomas H, 2006. Admissions processes for five year medical courses at English schools review. *BMJ* 332: 1005–1009.
51. Stagg P, Rosenthal DR, 2012. Why community members want to participate in the selection of students into medical school. *Rural Remote Health* 12: 1954.
52. Lumsden MA, Bore M, Millar K, Jack R, Powis D, 2005. Assessment of personal qualities in relation to admission to medical school. *Med Educ* 39: 258–265.
53. Frehywot S, Mullan F, Payne PW, Ross H, 2010. Compulsory service programmes for recruiting health workers in remote and rural areas: do they work? *Bull World Health Organ* 88: 364–370.