Medical and nursing students’ intentions to work abroad or in rural areas: a cross-sectional survey in Asia and Africa

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Introduction

Shortages of physicians and nurses jeopardize health system advances in many low- and middle-income countries (LMIC). Sub-Saharan Africa has only 2 doctors and 11 nurses or midwives per 10,000 people, compared with approximately 30 physicians and 84 nurses or midwives per 10,000 people in high-income countries. Emigration of health professionals from LMIC to countries with less need of such professionals exacerbates the global workforce imbalance. Meanwhile, rural-to-urban migration of those professionals continues to increase provider shortages in rural areas where the need is the greatest.

To address the human resource problems in LMIC’s health sector, the Global Health workforce alliance was formed in 2006 to identify, implement and advocate solutions to the crisis. Then in 2010, the World Health Organization (WHO) issued a global Code of Practice that intended to curb international migration of health professionals. WHO has also published recommendations for attracting, recruiting and retaining health workers in rural areas. Since then, partnerships between governments, institutions and funding organizations have emerged to strengthen LMIC health workforces. New medical and nursing schools have been established and existing ones expanded, while curricular reforms have been instituted to enhance graduate retention.

Yet, these investments have been made without systematic analysis of the students’ migration intentions. We know very little regarding the characteristics of students inclined to work in rural areas or remain in the country in which they train. Without such information, resource-intensive interventions might promote training of graduates with no plans to practice in areas of need. Scholarship-bonding schemes and compulsory service obligations to work in areas with professional shortages struggle to achieve long-term retention, with most of the health-care professionals leaving shortly after required service terms. Greater understanding of factors associated with students’ intentions to work in high-demand regions is needed, and this could help direct admissions’ policies towards selecting individuals most likely to serve in these settings long-term.

Previous studies on health worker retention are mainly from high-income countries and are not applicable to LMIC. Compared to graduates in high-income countries, LMIC graduates face greater resource disparities between rural and urban settings, as well as the additional lure of providing support to family through remitted salaries earned abroad. Assessments from LMIC are limited in size and fail to compare class years, degree programmes, institutions and countries. To

Abstract in Arabic, Chinese, French, Russian, and Spanish at the end of each article.

Objective To assess medical and nursing students’ intentions to migrate abroad or practice in rural areas.
Methods We surveyed 3199 first- and final-year medical and nursing students at 16 premier government institutions in Bangladesh, Ethiopia, India, Kenya, Malawi, Nepal, the United Republic of Tanzania and Zambia. The survey contained questions to identify factors that could predict students’ intentions to migrate. Primary outcomes were the likelihoods of migrating to work abroad or working in rural areas in the country of training within five years post-training. We assessed predictors of migration intentions using multivariable proportional odds models.

Findings Among respondents, 28% (870/3156) expected to migrate abroad, while only 18% (575/3158) anticipated a rural career. More nursing than medical students desired professions abroad (odds ratio, OR: 1.76, 95% confidence interval, CI: 1.25–2.48). Career desires before matriculation correlated with current intentions for international (OR: 4.49; 95% CI: 3.21–6.29) and rural (OR: 4.84; 95% CI: 3.52–6.66) careers. Time spent in rural areas before matriculation predicted the preference for a rural career (20 versus 0 years: OR: 1.53, 95% CI: 1.19–1.98) and against work abroad (20 versus 0 years: OR: 0.69, 95% CI: 0.50–0.96).

Conclusion A significant proportion of students surveyed still intend to work abroad or in cities after training. These intentions could be identified even before matriculation. Admissions standards that account for years spent in rural areas could promote greater graduate retention in the country of training and in rural areas.

References

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address this research gap, we conducted a multinational assessment of medical and nursing students’ migration intentions in LMIC by surveying first- and final-year students at leading government institutions (Appendix, available from: http://biostat.mc.vanderbilt.edu/StudentMigration).

**Methods**

**Study Design**

We considered countries in sub-Saharan Africa and south-east Asia that were classified by WHO as having a critical shortage of health service providers (less than 2.28 physicians, nurses, or midwives per 1000 population). To avoid confounding effects of language on migration intentions and because most health professional emigration is to English-speaking nations, we included only countries where English is the language of instruction. To limit the influence of conflict and political turmoil on the results, we excluded countries with an active United Nations peacekeeping mission or bottom-decile rank in either the Global Peace Index or World Bank Worldwide Governance Indicators.

To enhance similarity between study institution governance structure and founding principles, we excluded countries without both a government medical and nursing school, or in which either school was established after 1993. This date corresponds to a period of increased attention to health sector reform in developing countries that may have affected guiding missions of health training institutions established thereafter.26,27 Three nations meeting selection criteria were excluded due to study resource constraints, leaving eight countries: Bangladesh, Ethiopia, India, Kenya, Malawi, Nepal, the United Republic of Tanzania and Zambia (Appendix). In each country, we selected one government medical school and affiliated government nursing school in the nation’s capital or major commercial city. In countries with multiple qualifying institutions, we used commonly accepted rankings to choose a highly reputed school where institutional approval could also be obtained. Affiliated nursing schools were selected to minimize confounding differences in institutional values, resources and faculty. We focused exclusively on premier government institutions, since they profess a longstanding mission to train future national leaders to address domestic health challenges and employ public funds towards this mission.

The 16 study sites selected are listed in Table 1. Research ethics committee approval was obtained from all sites and from the Vanderbilt University Institutional Review Board.

**Procedures**

We conducted the study from September 2011 to April 2012. Students eligible for our study were first- or final-year students enrolled in medical (Bachelor of Medicine and Surgery; Medical Doctor) or nursing (Bachelor of Science) degree programmes. At each institution, a self-administered questionnaire was given to all eligible students attending a mandatory class lecture. Written informed consent was obtained before survey administration. Survey items assessed student background characteristics such as socioeconomic status and place of origin, attitudes towards rural and international careers and student career intentions (Appendix). Questions, derived from literature review (Appendix), consisted largely of multiple-choice items and five-point Likert scales. Surveys were in English. To minimize potential bias from variable English proficiency, official language translations were provided as an aide alongside the English questions in five countries (Bangladesh, Ethiopia, Malawi, Nepal and the United Republic of Tanzania) where English is not an official language. Translations were validated using independent back-translation. Field testing was performed in each country and country-specific

Table 1. Response rates in an eight-country survey of medical and nursing students, 2011–2012

| Study site | Total | Medical programme | | | Nursing programme | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | First year | Final year | First year | Final year |
| Bangladesh | 444/538 (83) | 152/180 (84) | 157/180 (87) | 54/80 (68) | 81/98 (83) |
| Ethiopia | 438/577 (76) | 180/272 (66) | 156/178 (88) | 52/73 (71) | 50/54 (93) |
| India | 434/493 (88) | 221/250 (88) | 158/180 (88) | 34/38 (89) | 21/25 (84) |
| Kenya | 634/775 (82) | 340/394 (86) | 150/225 (67) | 78/84 (93) | 66/72 (92) |
| Malawi | 394/457 (86) | 87/105 (83) | 52/59 (88) | 169/194 (87) | 86/99 (87) |
| Nepal | 203/220 (92) | 108/120 (90) | 59/63 (94) | 19/19 (100) | 17/18 (94) |
| United Republic of Tanzania | 355/411 (86) | 176/204 (86) | 128/149 (86) | 38/43 (88) | 13/15 (87) |
| Zambia | 297/351 (85) | 105/129 (81) | 53/65 (82) | 108/125 (86) | 31/32 (97) |
| Total | 3199/3822 (84) | 1369/1654 (83) | 913/1099 (83) | 552/656 (84) | 365/413 (88) |
| Total by programme | – | 2282/2753 (83) | | 917/1069 (86) |

Note: Number of respondents analysed does not include 18 questionnaires discarded due to incompleteness.

* The 16 study sites included: Dhaka Medical College and Nursing Institute (Bangladesh); Addis Ababa University Schools of Medicine and Nursing (Ethiopia); Maulana Azad Medical College and Ahilya Bai College of Nursing (India); University of Nairobi Schools of Medicine and Nursing Sciences (Kenya); University of Malawi College of Medicine and Kamuzu College of Nursing (Malawi); Tribhuvan University Institute of Medicine and Maharajgunj Nursing Campus (Nepal); Muhimbili University of Health and Allied Sciences Schools of Medicine and Nursing (United Republic of Tanzania), and University of Zambia School of Medicine and its Department of Nursing Sciences (Zambia).

* Class sizes at the time of surveying are as reported by two or more of the following sources for each country: institution registrars, administrators, department heads and student class representatives.

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Table 1

Medical and nursing students' intentions to migrate in Africa and Asia

| Country                  | Students Reporting Intention | Percentage |
|--------------------------|------------------------------|------------|
| Sub-Saharan Africa       | 3217                         | 28%        |
| South Asia               | 902                          | 36%        |
| East Asia                | 848                          | 18%        |
| North Asia               | 2254                         | 16%        |

Table 2

Multivariable analysis showed that nursing students were more likely than medical students to intend careers abroad (OR: 1.76; 95% CI: 1.25–2.48). Final-year students were less likely to plan international careers than first-year counterparts (OR: 0.83; 95% CI: 0.70–0.99; Table 4). The location of a student's extended family did not correlate with international migration preferences. However, the longer that students had resided in rural settings, the less likely they were to want to work abroad (20 versus 0 years: OR: 0.69; 95% CI: 0.50–0.96; Table 4).

Table 3

International career intentions

Of all students, 28% (870/3156) reported being very likely to choose work abroad within five years of completing training (Table 3). International careers were anticipated by 24% (542/2254) of all medical students (26% in sub-Saharan Africa, 36% in South Asia, 48% in South Asia, 48% in South Asia). Only 15% (481/3156) of students reported being very unlikely to migrate. Such students were outnumbered by those expecting to leave in seven of eight countries (Appendix).

Multivariable analysis showed that nursing students were more likely than medical students to intend careers abroad (OR: 1.76; 95% CI: 1.25–2.48). Final-year students were less likely to plan international careers than first-year counterparts (OR: 0.83; 95% CI: 0.70–0.99; Table 4). The location of a student's extended family did not correlate with international migration preferences. However, the longer that students had resided in rural settings, the less likely they were to want to work abroad (20 versus 0 years: OR: 0.69; 95% CI: 0.50–0.96; Table 4).

Table 4

Final-year students were less likely to choose rural careers after training than first-years (OR: 0.67; 95% CI: 0.55–0.82; Table 4). Students who spent longer durations in a rural setting were more likely to anticipate seeking a rural practice (20 versus 0 years: OR: 1.53; 95% CI: 1.19–1.98; Table 4). Sex, economic status, number of languages spoken, primary language, the mother’s education, number of expected dependents and the wish for an international career before starting studies were not independent predictors of rural career intentions.

As with international migration intentions, individuals who upon school entry had desired a rural career were now nearly five times more likely to plan one (OR: 4.84; 95% CI: 3.52–6.66; Table 4). Final-year students who had originally sought rural careers remained over three times more likely to choose one (OR: 3.26, 95% CI: 1.94–5.47; Appendix).

Discussion

Our data suggest that in nations with critical shortages of health professionals,
nearly a quarter of medical students and over a third of nursing students surveyed felt very likely to leave their country within five years post-training. Meanwhile, less than one fifth of students anticipated a rural career. Much of this intent appears suggested by characteristics evident even before enrolment.

Our findings extend data from LMIC that students who have spent significant time in rural settings are more likely to practice in their country and in rural areas. We found new estimates suggesting 19–23% of African medical graduates had migrated within five years post-training. Among medical students we surveyed, 26% in sub-Saharan Africa and 21% in South Asia were planning to seek international careers. This resembles the higher rate of intended international migration that we observed in the same period (13%). Estimates of nurse migration are more elusive. Some report 5–11% of all sub-Saharan African nurses (16%) and regional population data (13%). The asso-
ciation between desire for post-graduate education and intended emigration may be due to the limited supply of specialty training opportunities in many countries studied and indicates the need to strengthen these post-graduate training programmes, while carefully considering which students receive scholarships for additional training. Although we measured student intentions, our results closely parallel actual rates of migration observed among Asian and African health professionals. Among medical students we surveyed, 26% in sub-Saharan Africa and 21% in South Asia were planning to seek international careers. This resembles school administrative data indicating that 28% of recent sub-Saharan African medical graduates had migrated within five years post-training, and population estimates suggesting 19–23% of Africa-trained physicians work abroad. Among South Asian medical graduates – for whom data are limited – 11% work in just four developed countries: Australia, Canada the United Kingdom of Great Britain and Northern Ireland and the United States of America. Likewise, the 16% of sub-Saharan African medical students planning rural careers in our survey mirrors observed rural practice rates reported by school administrators (16%) and regional population data (13%). Estimates of nurse migration are more elusive. Some report 5–11% of all sub-Saharan African nurses (from diploma or degree training programmes) presently practice abroad. The higher rate of intended international migration that we observed in the same region (32%) likely reflects a greater opportunity among bachelor-degree students to move abroad compared to diploma-only graduates. Similarly, the nursing students we surveyed had

| Characteristic | Overall | Bangladesh | Ethiopia | India | Kenya | Malawi | Nepal | United Republic of Tanzania |
|---------------|---------|------------|----------|-------|-------|--------|-------|-----------------------------|
| Sex, no. (%)b |         |            |          |       |       |        |       |                             |
| Male          | 1635 (51) | 141 (32)   | 294 (67) | 224 (52) | 303 (48) | 124 (32) | 139 (68) | 249 (71) | 161 (55) |
| Female        | 1544 (49) | 303 (68)   | 142 (33) | 210 (48) | 322 (52) | 266 (68) | 64 (32)  | 103 (29) | 134 (45) |
| Economic Status, no. (%)b |         |            |          |       |       |        |       |                             |
| Poor or below average | 643 (20) | 100 (23)   | 112 (26) | 20 (5)  | 83 (14) | 147 (38) | 21 (10) | 85 (24)  | 75 (26) |
| Average       | 1587 (51) | 205 (47)   | 244 (57) | 176 (41) | 306 (51) | 171 (44) | 130 (64) | 207 (59) | 148 (51) |
| Above average | 757 (24)  | 114 (26)   | 62 (14)  | 179 (41) | 184 (30) | 61 (16)  | 45 (22)  | 51 (15)  | 61 (21)  |
| Wealthy       | 150 (5)   | 20 (5)     | 12 (3)   | 59 (14)  | 32 (5)   | 10 (3)   | 6 (3)    | 6 (2)    | 5 (2)    |
| Majority of childhood in country of study, no. (%)b | 3116 (98) | 438 (99)   | 433 (99) | 433 (100) | 618 (99) | 384 (98) | 180 (90) | 341 (97) | 289 (98) |
| Longest time spent in rural area before studies (years), median (IQR) | 0 (0–10) | 0 (0–12)  | 0 (0–10) | 0 (0–0)  | 0 (0–10) | 3 (0–10) | 1 (0–3)  | 4 (0–14) | 2 (0–10) |
| Initial desire (before school) for international career, no. (%b) |         |            |          |       |       |        |       |                             |
| Strongly desired | 1140 (36) | 200 (46)   | 159 (37) | 78 (18) | 245 (39) | 162 (42) | 51 (25) | 124 (35) | 121 (41) |
| Neutral differently | 1657 (52) | 201 (46)   | 223 (52) | 286 (66) | 323 (51) | 184 (47) | 121 (60) | 188 (53) | 131 (44) |
| Strongly opposed | 371 (12)  | 34 (8)     | 50 (12)  | 68 (16)  | 61 (10)  | 43 (11)  | 29 (14)  | 43 (12)  | 43 (15)  |
| Initial desire (before school) for rural career, no. (%)b |         |            |          |       |       |        |       |                             |
| Strongly desired | 577 (18)  | 138 (32)   | 85 (20)  | 50 (12)  | 56 (9)   | 66 (17)  | 50 (25) | 74 (21)  | 58 (20)  |
| Neutral differently | 2010 (63) | 248 (57)   | 258 (60) | 325 (75) | 419 (67) | 224 (58) | 138 (67) | 211 (59) | 187 (63) |
| Strongly opposed | 583 (18)  | 50 (11)    | 88 (20)  | 57 (13)  | 154 (24) | 98 (25)  | 15 (7)   | 70 (20)  | 51 (17)  |

IQR: interquartile range.

a Most relevant variables selected to describe the study population.
b Percentages for each characteristic are computed using the number of students with a non-missing value. The number of missing values is: gender: 20; economic status: 62; majority of childhood in country of study: 20; longest time spent in rural area before studies: 139; initial desire for international career: 31; initial desire for rural career: 29.
c Self-reported economic status of one’s family compared to the rest of the country’s population.
d Combined responses for slightly desired, neutral, and slightly opposed.
e The sum of the percentages for each characteristic may not equal 100 due to rounding.

Table 2. Characteristics of medical and nursing students in eight low- and middle-income countries, 2011–2012
lower rural practice intentions (24%) than the observed rural practice rates in sub-Saharan Africa (49%) or South Asia (31%). This indicates either a stronger urban preference among bachelor-degree nurses or an increasing trend among students to value urban careers more highly than their predecessors.

This study has several strengths. It is large and comprehensive, with 3199 students surveyed from 32 classes in eight countries (Appendix). Our aggregate class response rate is high (84%). Our study is systematic, employing rigid yet relevant selection criteria to identify study sites. All participating nations face significant health worker shortages and ongoing emigration, but possess stable environments where retention policies are not superseded by larger systemic sociopolitical motivators of migration.

We independently analysed 14 student characteristics to identify predictors for a career in the country or in rural areas. Our results have implications for education and health-care policy-makers in LMIC and donor nations.

Our sample cannot be generalized to areas where internal conflict or political turmoil may drive migration regardless of student characteristics, nor can it be extrapolated to non-Anglophone countries. Sub-Saharan African countries have comparable physician emigration rates regardless of national language, indicating that different languages may not impede migrants’ mobility. However, languages do influence the destination that the migrants select, and possibly rural retention rates of graduates. The effect of languages on students’ migration plans warrants further research.

Our data suggest that students’ career desires before matriculating may persist into the last year of training. Although our study design cannot exclude recall bias, the direction of recall error is unclear and should be further investigated through longitudinal assessment. Similarly, under-reporting of true migration intentions due to perceived values of the school professionals might create a social bias. However, if such bias is present it would strengthen our results, since the true number of students intending to migrate may be higher and those planning to work in rural areas even lower than we report. Social bias was mitigated by survey anonymity and

Table 3. Career intentions within five years after training among medical and nursing students in eight low- and middle-income countries, 2011–2012

| Study site                  | Intention to pursue an international career | Intention to pursue a rural career |
|-----------------------------|---------------------------------------------|----------------------------------|
|                             | Very likely, no. (%)                          | Neutral, no. (%)                           | Very unlikely, no. (%)                          |
|                             | (Very likely, no. (%)                          | Neutral, no. (%)                           | Very unlikely, no. (%)                          |
| South Asia                  |                                             |                                                |                                                |
| Medical                     |                                             |                                                |                                                |
| First year                  | 287 (27)                                    | 659 (62)                                     | 124 (12)                                        |
| Final year                  | 106 (22)                                    | 321 (67)                                     | 53 (11)                                         |
| Total                       | 180 (21)                                    | 550 (65)                                     | 118 (14)                                        |
| Nursing                     |                                             |                                                |                                                |
| First year                  | 63 (48)                                     | 66 (50)                                      | 3 (2)                                           |
| Final year                  | 44 (49)                                     | 43 (48)                                      | 3 (3)                                           |
| Total                       | 107 (48)                                    | 109 (49)                                     | 6 (3)                                           |
| Sub-Saharan Africa          |                                             |                                                |                                                |
| Medical                     |                                             |                                                |                                                |
| First year                  | 243 (28)                                    | 499 (57)                                     | 131 (15)                                        |
| Final year                  | 119 (22)                                    | 309 (58)                                     | 105 (20)                                        |
| Total                       | 362 (26)                                    | 808 (57)                                     | 236 (17)                                        |
| Nursing                     |                                             |                                                |                                                |
| First year                  | 147 (34)                                    | 214 (49)                                     | 74 (17)                                         |
| Final year                  | 74 (30)                                     | 124 (51)                                     | 47 (19)                                         |
| Total                       | 221 (33)                                    | 338 (50)                                     | 121 (18)                                        |
| Overall                     | 870 (28)                                    | 1805 (57)                                    | 481 (15)                                        |

Notes: The sum of the percentages for each study site may not equal 100 due to rounding. Results by country see Appendix, available from http://biostat.mc.vanderbilt.edu/StudentMigration.

References:
1. Percentages are computed using the number of students with a non-missing value. A total of 43 questionnaires lacked responses regarding international migration intentions, while 41 questionnaires were missing responses regarding rural work intentions.
2. Combined responses for slightly likely, neutral, and slightly unlikely.
3. The effect of languages on students’ migration plans warrants further research.

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is unlikely to have affected class years differently. Our cross-sectional questionnaire of students’ intentions is not validated for predicting actual migration behaviour. Nonetheless, the similarity of our results to existing migration statistics suggests that students’ intentions may resemble such behaviour.1,3,7,13,22,38,39

Therefore intention could be a feasible measure for migration and does not require long-term follow-up. Formal validation through longitudinal design is warranted.

Further research is needed to understand the migration intentions of students. Our study focused on students at premier public schools, where institutional missions focus on producing practitioners for domestic service and health-care leadership, and where public funds offset educational expenses. Migration ambitions may differ at private or newly-established public institutions with varying school resources, values and admissions standards. Also, longitudinal analysis is needed to discern whether differences in career plans between first- and final-year classes represent an evolution of students’ preferences during the schooling period or a change in class composition resulting from recent enrolment expansions at many institutions studied. Finally, additional migration routes of health professionals in LMIC remain to be studied: from public to private sector and from clinical to administrative sector. This is important research since health professionals’ movements from clinical public-sector work threaten already fragile public-health systems.1,2

Increased demand for health professionals in developed countries is projected to attract even more LMIC graduates,41-43 and is enabled by slow legislative uptake of WHO recommendations on health personnel recruitment.34,45 Given the human resource needs in LMIC, migration between countries and from rural to urban settings deserves attention from policymakers both in countries with health worker shortages and partnering nations that provide technical and financial resources.46 Multiple approaches have been recommended by WHO, such as education strategies, regulatory interventions, financial incentives and personal and professional support (Table 5). They must be combined for an effective outcome.47 Simply increasing student volume without considering student selection ignores the labour-market dynamics after training,47 and may also threaten education quality. Holding graduates in the country or in rural areas with compulsory service schemes does not seem to work in the long term,47 since students who migrate leave promptly after such obligations end.46 Additional curricular

Table 4. Odds of intending an international or rural career within five years after training among medical and nursing students in eight low- and middle-income countries, 2011–2012

| Characteristic                          | Likelihood of choosing an international career OR (95% CI) | Likelihood of choosing a rural career OR (95% CI) |
|----------------------------------------|----------------------------------------------------------|--------------------------------------------------|
| **Degree programme**                   |                                                          |                                                  |
| Medical (ref)                          | 1.00                                                     | 1.00                                             |
| Nursing                               | 1.76 (1.25–2.48)                                         | 0.96 (0.76–1.22)                                 |
| **Class year**                         |                                                          |                                                  |
| First year (ref)                       | 1.00                                                     | 1.00                                             |
| Final year                            | 0.83 (0.70–0.99)                                         | 0.67 (0.55–0.82)                                 |
| **Sex**                                |                                                          |                                                  |
| Male (ref)                             | 1.00                                                     | 1.00                                             |
| Female                                | 0.90 (0.76–1.07)                                         | 0.96 (0.83–1.12)                                 |
| **No. of languages spoken conversationally** |                                                      |                                                  |
| 2 (ref)                                | 1.00                                                     | 1.00                                             |
| 3                                     | 1.02 (0.82–1.27)                                         | 1.09 (0.93–1.28)                                 |
| **Primary language**                  |                                                          |                                                  |
| Non-official (ref)                     | 1.00                                                     | 1.00                                             |
| Official                               | 1.00 (0.83–1.22)                                         | 1.24 (0.99–1.56)                                 |
| **Longest time spent in rural area (years)** |                                                    |                                                  |
| 0 (ref)                                | 1.00                                                     | 1.00                                             |
| 5                                     | 0.93 (0.78–1.11)                                         | 1.22 (1.02–1.46)                                 |
| 10                                    | 0.83 (0.67–1.02)                                         | 1.36 (1.11–1.67)                                 |
| 20                                    | 0.69 (0.50–0.96)                                         | 1.53 (1.19–1.98)                                 |
| **Mother completed tertiary education** |                                                      |                                                  |
| Rural (ref)                            | 1.00                                                     | 1.00                                             |
| Semi-urban                            | 0.96 (0.75–1.23)                                         | 1.16 (0.91–1.48)                                 |
| Urban or international                 | 1.04 (0.79–1.37)                                         | 0.87 (0.73–1.04)                                 |
| **Economic status**                   |                                                          |                                                  |
| Poor or below average (ref)            | 1.00                                                     | 1.00                                             |
| Average                               | 0.87 (0.68–1.12)                                         | 1.07 (0.78–1.47)                                 |
| Above average                         | 0.82 (0.58–1.17)                                         | 1.02 (0.70–1.50)                                 |
| Wealthy                               | 0.89 (0.48–1.65)                                         | 0.97 (0.52–1.83)                                 |
| **Number of expected dependents after graduation** |                                |                                                  |
| 2 (ref)                                | 1.00                                                     | 1.00                                             |
| 4                                     | 1.00 (0.92–1.07)                                         | 1.05 (0.97–1.13)                                 |
| 8                                     | 0.95 (0.79–1.13)                                         | 1.17 (0.98–1.39)                                 |
| **Likely to pursue post-graduate study** |                                                      |                                                  |
| Prematriculation desire for rural career | 1.36 (0.96–1.93)                                         | 0.92 (0.64–1.32)                                 |
| Prematriculation desire for international career | 0.85 (0.71–1.01)                                         | 4.84 (3.52–6.66)                                 |
| Lived majority of childhood in country | 4.49 (3.21–6.29)                                         | 0.89 (0.77–1.02)                                 |

CI: confidence interval; NA: not applicable; OR: Odds ratio.

a Rural population < 50 000 people, semi-urban population 50 000–200 000 people, urban population > 200 000 people.

b Self-reported economic status of one’s family compared to the rest of the country’s population.

c For the rural career outcome, the characteristic majority of childhood in country was not selected a priori before analysis.

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Therefore intention could be a feasible measure for migration and does not require long-term follow-up. Formal validation through longitudinal design is warranted.

Further research is needed to understand the migration intentions of students. Our study focused on students at premier public schools, where institutional missions focus on producing practitioners for domestic service and health-care leadership, and where public funds offset educational expenses. Migration ambitions may differ at private or newly-established public institutions with varying school resources, values and admissions standards. Also, longitudinal analysis is needed to discern whether differences in career plans between first- and final-year classes represent an evolution of students’ preferences during the schooling period or a change in class composition resulting from recent enrolment expansions at many institutions studied. Finally, additional migration routes of health professionals in LMIC remain to be studied: from public to private sector and from clinical to administrative sector. This is important research since health professionals’ movements from clinical public-sector work threaten already fragile public-health systems.1,2

Increased demand for health professionals in developed countries is projected to attract even more LMIC graduates,41-43 and is enabled by slow legislative uptake of WHO recommendations on health personnel recruitment.34,45 Given the human resource needs in LMIC, migration between countries and from rural to urban settings deserves attention from policymakers both in countries with health worker shortages and partnering nations that provide technical and financial resources.46 Multiple approaches have been recommended by WHO, such as education strategies, regulatory interventions, financial incentives and personal and professional support (Table 5). They must be combined for an effective outcome.47 Simply increasing student volume without considering student selection ignores the labour-market dynamics after training,47 and may also threaten education quality. Holding graduates in the country or in rural areas with compulsory service schemes does not seem to work in the long term,47 since students who migrate leave promptly after such obligations end.46 Additional curricular
Table 5. **WHO recommendations to improve attraction, recruitment, and retention of health workers in rural areas**

| Recommendation                                                                 | Quality of evidence | Recommendation strength |
|--------------------------------------------------------------------------------|---------------------|-------------------------|
| **Education**                                                                  |                     |                         |
| Target admission of students with rural backgrounds                            | Moderate            | Strong                  |
| Locate health training programmes closer to rural areas                         | Low                 | Conditional             |
| Expose health students to rural experiences or rotations                        | Very low            | Conditional             |
| Revise health curricula to include rural health topics                           | Low                 | Strong                  |
| Design continuing education programmes targeted to and accessible by rural health workers | Low                 | Conditional             |
| **Regulatory interventions**                                                    |                     |                         |
| Introduce and regulate enhanced scopes of practice in rural areas to promote job satisfaction | Very low           | Conditional             |
| Introduce different types of health workers with appropriate training and regulation for rural practice | Low                 | Conditional             |
| Ensure compulsory service requirements in rural areas are accompanied with support and incentives | Low                 | Conditional             |
| Tie education subsidies to mandatory rural service                               | Low                 | Conditional             |
| **Financial incentives**                                                        |                     |                         |
| Use bundled incentives (allowances, housing, transport, etc.) to increase financial attractiveness of living in rural areas | Low                 | Conditional             |
| **Personal and professional support**                                            |                     |                         |
| Invest in infrastructure and services to boost living conditions for rural health workers | Low                 | Strong                  |
| Ensure workplace environment is safe and has appropriate equipment, supplies, supervision, and mentorship | Low                 | Strong                  |
| Facilitate interaction between urban and rural health workers                    | Low                 | Strong                  |
| Design career ladders for rural health workers                                   | Low                 | Strong                  |
| Support exchange of knowledge through rural health professional networks and journals | Low                 | Strong                  |
| Adopt public recognition measures to raise the public profile of rural health workers | Low                 | Strong                  |

a Quality of evidence rated as high, moderate, low or very low. Data sources derived largely from high-income nations, with inclusion of data from low- and middle-income countries where available.

b Strength of WHO recommendation for each intervention was determined by considering several factors including: quality of evidence, absolute magnitude and durability of effect, balance of advantages versus disadvantages, intensity of resource use required, feasibility globally, and degree of variability in the importance ascribed to the intervention outcome by relevant stakeholders.

Data source: World Health Organization, 2010.

reforms incorporating rural coursework may be inadequate to attract students to rural areas, as our data suggest short rural exposures have minimal impact compared with selection of students raised in these areas.

With nearly 64% of people in sub-Saharan Africa and 69% in South Asia residing in rural areas, it is imperative to boost the long-term attractiveness of rural careers among students or change admissions’ criteria to select students more likely to prefer rural work in the first place. Targeted admissions of rural applicants has been a key component of comprehensive education reforms in developed countries, where schools instituting such policies have increased rural retention from 3–9% to 53–64% of graduates. However, despite 2010 WHO recommendations supporting such reforms, all 16 sites we studied admit students based on academic merit, with insufficient consideration of students’ geographic origin. Our data suggest that altering admissions policies in LMIC to favour rural-origin applicants or those desiring to stay in the country will help governments to succeed in retaining health-care professionals where they are most needed, and to avoid spending public and donor resources on training physicians and nurses most likely to leave.

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Medical and nursing students’ intentions to migrate to Africa and Asia

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Objectif Évaluer les intentions des étudiants en médecine et en soins infirmiers concernant la migration à l’étranger ou une pratique dans les zones rurales.

Méthodes Nous avons interrogé 3199 étudiants en première année et en deuxième année de médecine ou de soins infirmiers dans les 16 plus grandes institutions gouvernementales au Bangladesh, en Éthiopie, en Inde, au Kenya, au Malawi, au Népal, en Tanzanie et en Zambie. L’enquête contenait des questions pour identifier les facteurs qui pourraient prédire les intentions d’émigration des étudiants. Les résultats primaires étaient les probabilités d’émigration en vue de travailler à l’étranger ou dans les zones rurales.

Résultats Parmi les répondants, 28% (870/3156) espèrent émigrer à l’étranger, alors que seuls 18% (575/3158) envisagent une carrière en zone rurale. Les étudiants infirmiers désirant pratiquer à l’étranger (rapport des cotes, RC: 1,76; intervalle de confiance à 95%, IC 95%: 1.25–2.48) étaient plus nombreux que les étudiants en médecine. Les souhaits de carrière avant toute installation officielle étaient corréllés avec les intentions actuelles pour les carrières à l’international (RC: 4,49; IC 95%: 3,21–6,29) et dans les zones rurales (RC: 4,84; IC 95%: 3,52–6,66). Le temps passé dans les zones rurales avant installation prédit une préférence pour une carrière rurale (20 contre 0 année: RC: 1,53; IC 95%: 1,19–1,98) et contre le fait de travailler à l’étranger (20 contre 0 année: RC: 0,69; IC 95%: 0,50–0,96).

Conclusion Une part importante des étudiants interrogés continue à vouloir travailler à l’étranger ou dans les villes après la fin de leur formation. Ces intentions pouvaient être identifiées même avant leur installation. Des normes d’admission favorisant les étudiants en médecine et en soins infirmiers avec des origines rurales pourraient favoriser une meilleure rétention des diplômés dans les pays de leur formation et dans les zones rurales.
Резюме

Стремление студентов, обучающихся на врачей и медсестер, работать за границей и в сельской местности: перекрестное исследование в Азии и Африке

Цель
Оценить стремление студентов, обучающихся на врачей и медсестер, переехать за границу или продолжить практику в сельской местности.

Методы
Мы опросили 3199 студентов первого и последнего курсов, обучающихся на врачей и медсестер в 16 лучших государственных образовательных учреждениях Бангладеш, Эфиопии, Индии, Кении, Малави, Непала, Объединенной Республики Танзании и Замбии. Исследование включало вопрос, помогающий определить факторы, влияющие на желание студентов переезжать. Основные результаты определили вероятность переезда за границу или в сельскую местность в стране обучения для работы в течение пятилетнего периода после завершения обучения. Мы оценили факторы, влияющие на стремление переезжать, с помощью многоаспектной пропорциональной модели.

Результаты
Среди опрашиваемых лиц 28% (870/3156) планируют переезд за границу и лишь 18% (575/3158) планируют продолжить карьеру в сельской местности. Будущие медсестры чаще, чем будущие врачи, хотят получить работу за границей (коэффициент вероятности: 1,76; 95% доверительный интервал: 1,25–2,48). Планируемая дальнейшая карьера до поступления в высшее учебное заведение совпадала с текущими стремлениями: для желающих работать за границей (коэффициент вероятности: 4,49; 95% доверительный интервал: 3,21–6,29) и для желающих работать в сельской местности (коэффициент вероятности: 4,84; 95% доверительный интервал: 3,52–6,66). Проживание в сельских районах до поступления в высшее учебное заведение часто предопределяло желание работать в сельской местности (20 лет по отношению к 0 лет: коэффициент вероятности: 1,53; 95% доверительный интервал: 1,19–1,98) по сравнению с желанием работать за границей (20 лет по отношению к 0 лет: коэффициент вероятности: 0,69; 95% доверительный интервал: 0,50–0,96).

Вывод
Значительная часть опрошенных студентов после обучения планируют работать за границей или в городе. Данные цели иногда были определены еще до поступления в высшее учебное заведение. Введение льгот при приеме в учебные заведения для студентов из сельской местности может способствовать удержанию выпускников в стране обучения и сельских регионах.

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