Do Medical Schools that Admit the Academic 'Cream of the Crop' Exacerbate Medical Brain Drain?

Following up the Graduates of Nepal's First Medical College

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A Collaborative Study of Nepal's Institute of Medicine and the Nick Simons Institute

Abstract

Background

Increasingly, international policy makers are taking steps to address the problem of health care worker migration from under-served to better-served geographic locations. Most published evidence is derived from the developed world. This study set out to find the practice location of doctors who had graduated from Nepal's first medical college and to determine medical student characteristics associated with their migration pattern.

Methods

Data was collected on doctors, 4 to 26 years post-graduation, from the first 22 classes of Nepal's Institute of Medicine (graduating 1983 – 2004). Subjects were recruited using print and internet advertisements, personal contacts, phone calls, and social networking websites. We also determined practice location by using cross-validated reports that classmates provided.

Results

Out of a total of 727 doctors, 436 (60%) filled in full data forms and 286 (39%) were identified by classmates' reports (12 had expired); only 5 students were not found. Of the 710 living and located, 27.2% were presently working in Nepal in districts outside the capital city Kathmandu, 36.8% were working in Kathmandu, and 36.1% were working in foreign countries. Seventy three percent of those working abroad were in the USA. Later graduating classes were more likely to be working in foreign countries ($p<0.01$). Students who were academically in the lower third of their medical school class were twice as likely to be working in Nepal as those from the upper third ($p < 0.001$). Compared to students with pre-medical college science background, those with paramedical background were 3 times more likely to be working in Nepal and 3.5 times more likely to be in rural Nepal ($p < 0.001$). In a model with other factors, rural birthplace or rural high school education were independent factors associated with a doctor staying to work in Nepal. Gender and age were found to not be significant independent factors associated with practice location.

Conclusions

Lower academic rank, paramedical background, and rural upbringing were all factors significantly associated with a doctor's remaining in Nepal, and moreover, with working outside the capital city. These factors could inform a medical school admission policy so as to favor doctors working in less-served areas.

Background

Many health care workers migrate from medically less-served to better-served areas. This paradoxical flow occurs over a continuum that includes both internal migration (usually from rural to urban) and external migration (from developing to developed countries) and it results in adverse patient outcomes [1-3]. The World Health Organization (WHO) recently published two policy documents that address these interlinked areas – one on improving access to health care workers in rural areas [4], the other on international recruitment [5].

There is evidence that doctors are more likely to practice in rural areas of their country if they have rural upbringing, are male, or have expressed an early preference for rural service. Most of this evidence is derived from medical colleges in the developed world [4,6,7].

Regarding international migration, the WHO and others [8-13] seek a reduction in the brain drain from medically impoverished countries. The WHO's Code on international migration includes standards of practice for member states and recruiters, and calls for strengthening of research processes [5]. Of note, most of the data on external migration is derived from registries in destination countries and less pertains to emigration from Asia [14-21]. We have not found any studies of developing world doctors that compare migration with medical student characteristics.

Nepal is an Asian country with roughly half the population of the United Kingdom whose mountainous topography and poverty (annual GDP per capita $300) pose barriers to adequate health care. According to WHO parameters it ranks near the bottom of countries in the region [22] and it faces the same problems of health care worker maldistribution as the rest of the 'two thirds' world [23]. It's estimated that the doctor:population density in the capital city Kathmandu is 40 times that of rural Nepal [24]. Many doctors leave Nepal to work abroad, though the magnitude of this migration has not been quantified.

In 1978 the Nepal government established its first medical college, the Institute of Medicine (IOM), with the intention of producing doctors to serve the entire country of Nepal. IOM's founders set in place admission policies to influence practice towards the underserved: these included preference for rural upbringing and for students with a paramedical training background [25]. In subsequent years, due to pressure to conform to international norms, IOM reversed its original policies and today almost all its students come from a pre-medical science background and have no previous clinical or rural experience.

We undertook a study to track the first 22 classes of IOM graduates, indexed from the college's registry. Our study located doctors in their eventual practices and assigned these locations to one of three categories: Nepal/outside the capital Kathmandu; Nepal/in Kathmandu; and outside Nepal. We compared that practice location with a number of variables that were present prior to medical school graduation: gender, rural upbringing, pre-medical education background, and medical school class rank.

If such associations were found, these might be used to construct an admission policy favoring eventual medical practice in a relatively less-served area.

Methods

This study was conducted in partnership with the Institute of Medicine's Dean's Office, Research Department, and Examination Control Division. Data were collected continuously from August 2008 through July 2010 (24 months) in three phases: IOM records review, written questionnaire from graduates, and classmate reporting. The study depended on extensive cooperation from the IOM and its alumni network.

We chose to include the 22nd class as our study's last graduating class, thereby leaving a minimum of 4 years of post-graduation follow-up. This was to allow for 'settling' in a doctor's practice location. We derived data from three sources:

(1) IOM Records

The Examination Control Division provided complete lists of the first 22 entering classes of its MBBS doctor students. Data included class number, name, gender, and pre-med education background, as well as graduation year and academic class rank.

(2) Questionnaire from Graduates

A standardized 3-page questionnaire was developed and uploaded for on-line response. We recruited respondents through newspaper advertisements, *NepalNews* internet site, and personal contacts. If no response came through internet or email, we conducted phone interviews to complete questionnaires. Data included each doctor's class number, demographic information, place of high school, pre-medical training (paramedical or intermediate science); spouse's place of birth; post-graduate work history, location, and degrees; perceived personal factors influencing career practice location; and contact information for classmates.

Because after one year we had only received filled questionnaires on just over half of all graduates, we conducted a 'mop-up' phase which relied on the reports of classmates. This final phase took an additional 12 months to complete.

(3) Classmate Reports

For those doctors who did not complete questionnaires, we used a number of methods to receive 'proxy' information from fellow graduates: All questionnaire respondents were sent a list of non-responders from their class and from the four nearest classes. Some non-respondents had email addresses on FaceBook and IOM magazine, and we used this to seek their direct information. We also re-contacted questionnaire respondents by phone to ask about classmates. In each class, multiple graduates were interviewed to provide cross-validation. Data in this phase included only current practice location.

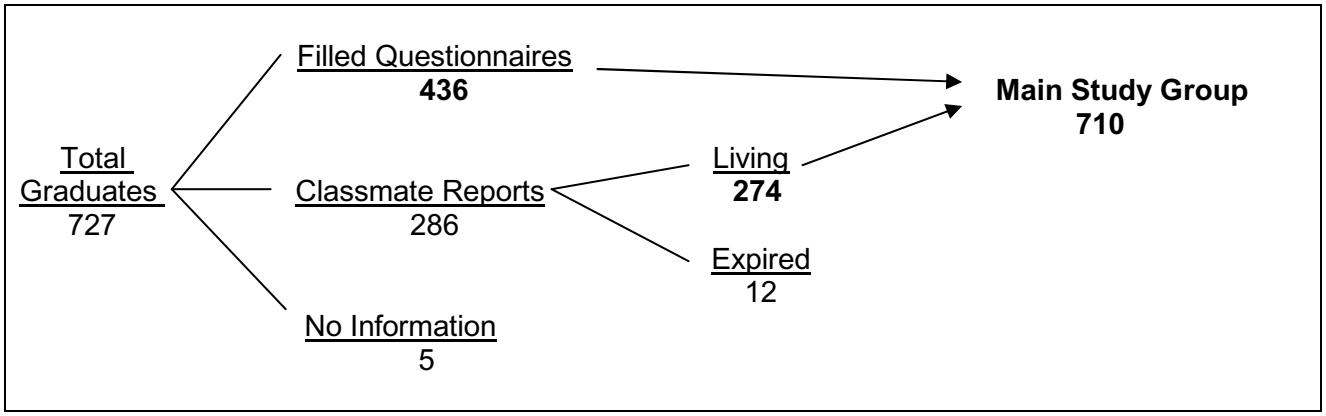
Results

The first 22 classes of Nepal's Institute of Medicine had 727 graduates. Of this total, we obtained filled data questionnaires from 436 (60.0%), classmate reports on an additional 286 (39.3%), and no information on 5 (0.7 %). Twelve were reported to have expired.

Current career location data was, therefore, available on 710 graduates (99.3% of all living graduates). This number constituted the study sample for this report. We also analyzed certain features of the Filled Questionnaire Group.

We compared the two groups, those with filled questionnaires and those whose data came through classmate reports. Although the two data groups were different in era of study, paramedical background, and eventual practice location, when we compared model analyses run with and without data that had come from classmate reports, the results were similar. Thus, we report here analyses that include both proxy and non-proxy data.

Figure 1. Study Respondents



Practice Location

Out of 710 living graduates, 193 (27.2%) worked in Nepal districts outside of Kathmandu, 261 (36.8%) in Kathmandu, and 256 (36.1%) outside of Nepal.

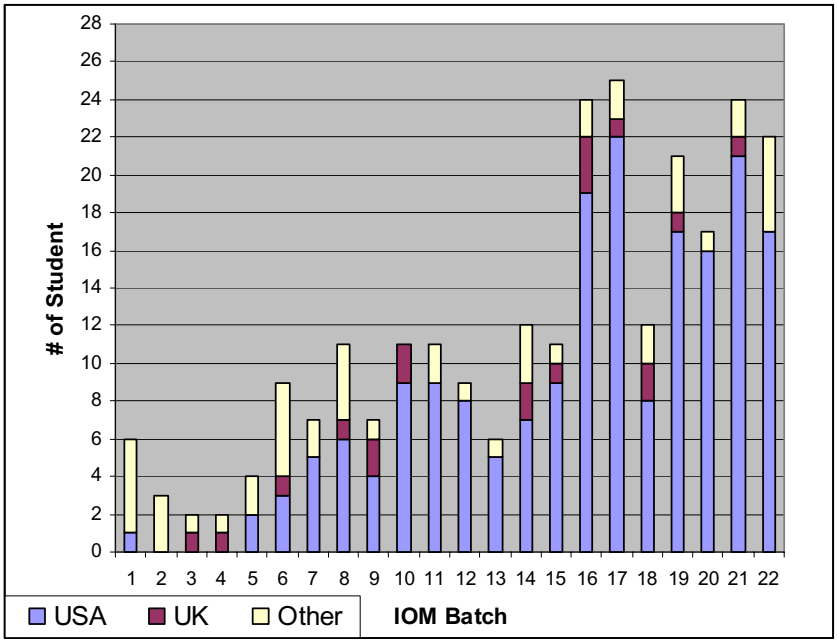
Of the 256 graduates who were reported to be working in foreign countries, we were able to receive reports on the current country of all of them (100%): 188 (73%) were working in USA, 18 (7.4%) in U.K., 8 (3.1%) in Australia, 8 (3.1%) in South Africa and 34 (13.3%) in other countries (Table 1 below).

Figure 2 below shows the proportion of doctors presently located in countries outside of Nepal by graduating class. The numbers of graduates going to the USA increased during this period. Fewer IOM graduates went to the UK and to other countries and no other appreciable trends occurred over the span of 22 classes. We noted some 'clustering' of graduates within an era: for example, a group of graduates in the early classes went to South Africa and a later group went to China.

Table 1. Foreign Country Location

Country	#	Percent
USA	188	73.4
UK	18	7.4
Australia	8	3.1
South Africa	8	3.1
China	7	2.7
Canada	4	1.6
Japan	4	1.6
Bangladesh	2	0.8
India	2	0.8
New Zealand	2	0.8
Sweden	2	0.8
Brunei	1	0.4
Cambodia	1	0.4
Holland	1	0.4
Hong Kong	1	0.4
Korea	1	0.4
Maldives	1	0.4
Myanmar	1	0.4
Norway	1	0.4
Scotland	1	0.4
Sri Lanka	1	0.4
Total	**256**	**100.0**

Figure 2. Foreign Country Location by Class



Factors Associated with Practice Location

Over the span of 22 graduating classes, we found an increase in the proportion of each class that left Nepal to work in foreign countries and a decrease in those working in Nepal outside of Kathmandu. IOM's doctor education can be divided into eras, based on the Institute's prevailing entrance criteria: Era 1 (1983-87) when only paramedicals were admitted; Era 2 (1988-2002) when both paramedicals and science graduates were admitted; and Era 3 (after 2002) when only science graduates were admitted. Table 2 (Section 2.1) segregates graduates into these eras and shows practice location. At the time of this study, only 13.7% of graduates from the first two eras were overseas, while 53.5% of the third era graduates were overseas. In this two-way table, era and current practice location were statistically associated (χ^2 =11.5, df=2, p=0.003).

Table 2. Current Practice Location Compared to Pre-Graduation Factors

	Current Practice Location				**Statistical Significance**
2.1 Graduation Era	**District**	**Kathmandu**	**Foreign**	**TOTAL**	
1 - (1983-1987)	47	60	17	124	p = 0.003
% of Era 1	37.9%	48.4%	13.7%	100.0%	
2 – 1988-2002	140	167	193	500	
% of Era 2	28.0%	33.4%	38.6%	100.0%	
3 – 2003-2004	6	34	46	86	
% of Era 3	7.0%	39.5%	53.5%	100.0%	
2.2 Academic Class Rank	**District**	**Kathmandu**	**Foreign**	**TOTAL**	
Upper Third	44	84	121	249	p < 0.001
% of Upper	17.7%	33.7%	48.6%	100.0%	
Middle Third	70	87	82	239	
% of Middle	29.3%	36.4%	34.3%	100.0%	
Lower Third	79	90	53	222	
% of Lower	35.6%	40.5%	23.9%	100.0%	
2.3 Pre-Medical Education	**District**	**Kathmandu**	**Foreign**	**TOTAL**	
Paramedical	155	157	71	383	p < 0.001
% of Paramedical	40.5%	41.0%	18.5%	100.0%	
ISc	38	104	185	327	
% of ISc	11.6%	31.8%	56.6%	100.0%	
Total	**193**	**261**	**256**	**710**	
% of TOTAL	**27.2%**	**36.8%**	**36.1%**	**100.0%**	

According to IOM records, the members of each graduating class are ranked academically by their final examination performance. We aggregated academic class rank into thirds (upper, middle, and lower thirds of each class). Overall, doctors who achieved the upper third in their class were more likely to work overseas and less likely to work in Nepal outside Kathmandu. See Table 2 (Section 2.2) above. There was a significant two-fold increase in likelihood of working in a foreign country between the lower and upper thirds, and a one half decrease of working in districts outside Kathmandu. (χ^2=36.1,,df=4, p<0.001).

Table 2 (Section 2.3) shows the difference in practice location (totaled for all classes) of students with paramedical pre-med background compared to those with intermediate Science (ISc) background. Compared to paramedicals, science-background students were 3 times more likely to be working in foreign countries. Paramedicals were 3.5 times more likely to be working in Nepal outside of Kathmandu compared to those with science background. The differences were significant (χ^2=128.8,df=2, p<0.001).

Some of this pre-med education association may have related to historical trends. To minimize this effect, in table 3 we compared practice location by pre-medical education limited to those classes (6 to 20) that admitted mixed classes (both paramedical and science students). In this historical era 2 (1988-2002), we again found a significant difference between paramedical background doctors (of whom 41.7 % practiced in Nepal districts and 20.8 % in foreign countries) and science background doctors (13.3 % practicing in Nepal districts and 57.7 % foreign) (χ^2=82.5,,df=2, p<0.001).

Table 3. Current Practice Location Compared to Pre-med Education for Era 2 (1988-2002)

Pre-Med Education	Current Practice Location				Statistical Significance
	District	Kathmandu	Foreign	TOTAL	
Paramedical % of Para	108 41.7%	97 37.5%	54 20.8%	259 100.0%	p < 0.001
ISc % of ISc	32 13.3%	70 29.0%	139 57.7%	241 100.0%	
Total	**140**	**167**	**193**	**500**	
% of TOTAL	**28.0%**	**33.4%**	**38.6%**	**100.0%**	

In summary, earlier graduation era, lower academic class rank, and paramedical background were all associated with a doctor's remaining in Nepal and with his or her working in areas outside of Kathmandu.

Multi-variate Analysis

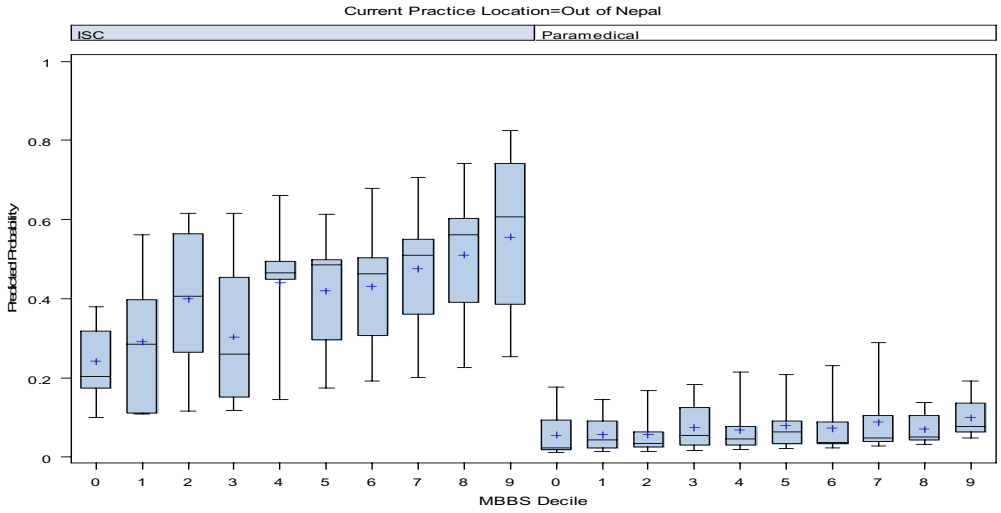
To examine the simultaneous effect of the graduates' pre-medical education and class rank, we used a multilogit model to predict the probability of the current practice location. We included: age, gender, and graduation year as potential confounders and respondents' IOM class rank and pre-medical education were exposures.

In a model with all five factors, gender and age were not significant. The remaining three factors – graduation year, pre-medical education, and class rank – were all independent, significant factors (P <0.05). Based on the multilogit model, Figure 3 shows the predicted probability of a physician's current location being outside of Nepal. For those with a paramedical background, the likelihood of being outside of Nepal remains fairly constant as the class rank increases. Those in the top-most decile of the class may be more likely to emigrate. The overall model fit was significant (Likelihood ratio chi-square 162,df=20, P<0.001).

Regardless of class rank and compared to those with a paramedical background, ISc respondents are more likely to be practicing abroad. Also within the ISc respondents, a trend exists: higher class rank increases the likelihood of practicing abroad. The difference between the lowest and highest deciles is roughly 20 percent. Due to the large variability and limited sample sizes, a formal test for interaction did not show a difference between the ISc and paramedical students. However, in separate analyses stratified by pre-medical background, the association between the likelihood of practicing outside of Kathmandu and class rank was significant for ISc

respondent (df=2, x2=7.29, p=0.03). Class rank was unrelated to practice location for those with a paramedical background.

Figure 3. Probability of Practicing Outside Nepal vs. Pre-medical Education and Class Rank



We also tested whether a doctor's high school location or birthplace might independently impact the likelihood of remaining in Nepal. In post-hoc analyses of nested models, we found that adding either rural high school location or rural place of birth to our model significantly improved the model fit (L.R. > 20, 2 df, P < 0.001). Neither high school location nor birthplace was superior to pre-medical education or class rank as a predictor. Because of missing data, these rural models were fit to a subset of the original data, and the results must be interpreted with caution.

Discussion

In this study, we estimated the geographical distribution of graduates of Nepal's first medical school, creating a picture of their migration across the continuum from rural Nepal to urban Nepal to overseas practice. Four to 26 years post-graduation, we found that these doctors were approximately distributed into thirds in the three geographic categories: 27.2% in Nepal in districts outside the capital city Kathmandu, 36.8% in Kathmandu, and 36.1% in foreign countries. Our data may not represent the pattern of all of Nepal's current 15 medical colleges (most of which emerged in the last decade), but IOM's long,varying history and its prevailing status as the country's foremost medical college provide for a compelling study of doctor migration.

From the outset, the full cooperation of the IOM Dean's Office and Records Section provided complete student admission and academic records. Over the course of two years of tracking, aided by the close-knit nature of the graduates, we were able to capture the practice locations of 99% of the first 22 classes' doctors. Our second data collection phase of classmates providing practice locations for their batch mates may have introduced some inaccuracies, but we

cross-validated such proxy information and reconciled the few conflicts of data found. Therefore, this is a close enough approximation to enable the conclusions drawn here.

Three quarters of those working abroad are in the U.S, while the U.K. and Australia together add 10% more. Far fewer Nepalese doctors work in the neighboring countries of India or Bangladesh, where competition with the many doctors in those countries limits attractive employment opportunities. More recently graduated doctors are significantly more likely to leave Nepal than those from earlier eras. This may relate to increased positions for post-graduate study in the U.S. as well as to the recent political instability in Nepal.

Dovlo tracked Ghanaian doctor migration using source country medical school records and interviews [20], but we've not found any developing world studies that describe the association between international practice location and medical student characteristics. Published data associating a student's rural background with eventual practice is mainly derived from developed world medical schools.

We found a significant association between a student's lower academic class rank in medical school and their likelihood of working in a less-served area (rural vs. urban Nepal, or Nepal vs. a foreign country). Students ranking in the lower third of their IOM class were twice as likely to eventually practice in Nepal as students in the upper third.

Because foreign migration depends heavily on test-taking ability, this is not surprising. However, the finding raises some interesting questions. Could strict adherence to a 'cream of the crop' medical school selection process worsen the brain drain to foreign countries? Is a class of academic stars less likely to serve in rural areas of their home country? On the other hand, taken to an extreme, does the data advocate for a policy of academic mediocrity in medical education, or even the production of sub-standard clinicians?

The above quandary can be resolved by adjusting medical college entrance criteria to emphasize non-academic qualities, while still maintaining a 'high enough' academic threshold for admission. The eventual quality of clinician does not, after all, depend solely on academic prowess, but on a range of personal qualities and experience, some of which can be estimated on admission to medical school. As the earlier graduating classes of IOM have demonstrated, excellent doctors can be produced from varying stock. IOM doctors now practice across a wide range of careers and locations and their reputation is universally fine.

Our second association was in line with the first. Under pressure to conform to traditional medical school norms, IOM entrance evolved over the years from exclusively paramedical candidates to today's policy of admitting almost all science students. We found that students coming from a background of paramedical education were three times more likely to work in Nepal and, furthermore, to work outside of Kathmandu.

This validates one of the founding principles of IOM. Nepal's paramedicals usually practice for a few years in rural Nepal before entering medical school, which may lead to a doctor more 'at home' in rural Nepal. Other countries (including China, Thailand, and Vietnam) provide entrance to paramedicals along with bridging courses for them to enter the doctor track [4]. Relating to our first conclusion about academic rank, a paramedical student may have somewhat less academic prowess than a science student, but still possess the skills and experience to potentially become a superior doctor – as well as being more likely to work in an under-served area.

For the doctor sub-set that provided complete questionnaires, we found that rural background – both birthplace and high school education – were independently associated with staying in Nepal and in its rural areas. Adding this rural factor to the multivariate analysis did not diminish the independent associations of lower class rank and paramedical background. Contrary to other reports, our data found no significant association between male gender and eventual work in under-served areas.

Our data only pertain to one medical college in Nepal and need to be validated in other settings. Nevertheless, many schools around the world have gradually increased their emphasis on academic prowess but some now seek an admission policy that improves their graduates' national,

and especially rural, retention. We hope that this study prompts medical school policy makers to consider the conclusions and to design interventions that take substantive steps towards addressing the universal problem of doctor maldistribution.

Conclusion

Nepali doctors who possessed certain characteristics as medical students were significantly more likely to stay in Nepal and, within that group, to work in rural Nepal. These independent characteristics were lower academic rank, a paramedical education background, and rural upbringing. Schools and policy makers committed to producing doctors for underserved areas should consider medical admission policies that shift away from a linear 'academic cream of the crop' process and towards a policy that also incorporates criteria such as paramedical education and rural upbringing.

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