Rural practice preferences among medical students in Ghana: a discrete choice experiment

Margaret E Kruk,[a] Jennifer C Johnson,[b] Mawuli Gyakobo,[c] Peter Agyei-Baffour,[d] Kwesi Asabir,[e] S Rani Kotha,[b] Janet Kwansah,[f] Emmanuel Nakua,[d] Rachel C Snow[g] & Mawuli Dzodzomenyo[h]

Objective To determine how specific job attributes influenced fourth year medical students' stated preference for hypothetical rural job postings in Ghana.

Methods Based on discussions with medical student focus groups and physicians in practice and in the Ministry of Health, we created a discrete choice experiment (DCE) that assessed how students' stated preference for certain rural postings was influenced by various job attributes: a higher salary, free superior housing, an educational allowance for children, improved equipment, supportive management, shorter contracts before study leave and a car. We conducted the DCE among all fourth year medical students in Ghana using a brief structured questionnaire and used mixed logit models to estimate the utility of each job attribute.

Findings Complete data for DCE analysis were available for 302 of 310 (97%) students. All attribute parameter estimates differed significantly from zero and had the expected signs. In the main effects mixed logit model, improved equipment and supportive management were most strongly associated with job preference ($\beta = 1.42$; 95% confidence interval, CI: 1.17 to 1.66, and $\beta = 1.17$; 95% CI: 0.96 to 1.39, respectively), although shorter contracts and salary bonuses were also associated. Discontinuing the provision of basic housing had a large negative influence ($\beta = -1.59$; 95% CI: −1.88 to −1.31). In models including gender interaction terms, women's preferences were more influenced by supportive management and men's preferences by superior housing.

Conclusion Better working conditions were strongly associated with the stated choice of hypothetical rural postings among fourth year Ghanaian medical students. Studies are needed to find out whether job attributes determine the actual uptake of rural jobs by graduating physicians.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

In many low-income countries, health worker shortages hamper progress towards meeting the health-related Millennium Development Goals.[1] Africa is the region of the World Health Organization (WHO) with the lowest health worker density (doctors and nurses or midwives per capita) – 2.3 health workers per 1000 population. Europe has, by comparison, a health worker density of 18.9.[2] Recent projections suggest that while the supply of physicians will approximate demand by 2015 in the world as a whole, the African region will still experience substantial shortages. According to a recent analysis from 12 African countries, at current rates of training and attrition, it would take 36 and 29 years, respectively, to meet the minimum recommended density of physicians and nurses.[3]

In Africa, physicians' tendency to locate in urban areas cause them to be in short supply in rural areas, which are left with insufficient medical coverage. For example, in Zambia there are 20 times more physicians in urban than in rural areas, and in Malawi 97% of all physicians have urban practices, despite the fact that both countries have a predominantly rural population.[4] This highly uneven distribution between urban and rural areas

is rooted in the fact that cities offer better incomes (e.g. the potential for private practice), more opportunities for career progression, better infrastructure and more social amenities than rural areas.[5] While it is difficult to tell just how the recent rise in the number of women entering the medical profession in Africa will affect the supply of physicians in rural areas, evidence from other regions suggests that women prefer urban practice.[5] They may be influenced, for example, by spousal dual career considerations and by the prospects offered by the city of having greater control over their work schedules and more opportunities to work part time.[5]

Relatively little research has been conducted on effective strategies to promote rural practice, particularly in low-income countries.[6] One promising new area of research is the use of discrete choice experiments (DCEs) to study health workers' stated preferences for certain features of rural practice.[7] DCEs present respondents with a series of hypothetical choices (e.g. job postings) having different attributes (e.g. in terms of salary, housing, contract length). Respondents select their preferred alternative, and the influence of each attribute on their choice is then mathematically estimated. Unlike an analysis of actual choices,

[a] Department of Health Management and Policy, University of Michigan School of Public Health, 1415 Washington Heights M3166 SPH II, Ann Arbor, MI, 48109, United States of America (USA).
[b] University of Michigan Center for Global Health, Ann Arbor, USA.
[c] University of Ghana, Legon, Ghana.
[d] Department of Community Health, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
[e] Human Resource for Health Directorate, Ministry of Health, Accra, Ghana.
[f] Policy, Planning, Monitoring and Evaluation Directorate, Ministry of Health, Accra, Ghana.
[g] Department of Health Behavior and Health Education, University of Michigan School of Public Health, Ann Arbor, USA.
[h] Department of Biological, Environmental and Occupational Health Sciences, University of Ghana School of Public Health, Legon, Ghana.
Correspondence to Margaret E Kruk (e-mail: mkruk@umich.edu).

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DCEs make it possible to include features that have not actually been implemented and thus provide information about the potential effectiveness of various policy options. DCEs have proved easy to administer and have demonstrated good test–retest reliability.[8,9] Furthermore, there is evidence that the stated preferences obtained from DCEs approximate actual choices, although DCEs' predictive validity depends on a strong experimental design.[9]

Ghana is a low-income country in western Africa. It is listed by the United Nations as having medium human development and as ranking 135th among 177 countries on the basis of life expectancy, adult literacy, educational enrolment and per capita income.[10] Of Ghana's population of 22.2 million, 62% live in rural areas.[11] Substantial urban–rural disparities exist in infrastructure and access to health services. For example, 80% of urban households have electricity as opposed to 31% of rural households, and 86.0% of urban women deliver in a health facility compared with 39% of rural women.[12]

In 2009, 2442 physicians were working in Ghana,[13] a country with one of the highest physician emigration rates in the world.[14] One study reports that 61% of those who graduated from medical school between 1985 and 1994 emigrated, primarily to the United Kingdom of Great Britain and Northern Ireland and the United States of America (USA), although emigration appears to have slowed recently.[15,16] Around 69% of Ghanaian physicians practise either in the Greater Accra region or in the Komfo Anokye teaching hospital in Kumasi, Ghana's second largest city.[13] As a result, the physician to population ratio in the Greater Accra region is 1:5000, whereas in the largely rural Northern region, home to over 2 million people, it is 1:92 000.[17] Health worker shortages in rural areas have been identified as one of the biggest challenges to the health sector and a barrier to reaching the country's health-related Millennium Development Goal targets.[18]

In this paper, we use a DCE to examine the job attributes that influence the stated preferences of fourth year medical students in Ghana for rural "deprived area" postings. The study involved all fourth year medical students in Ghana. We are aware of only two DCE studies of medical students or physicians that addressed similar questions.[19,20] This study specifically explores a set of factors that are amenable to policy change to assist policy-makers in designing potential interventions for attracting health workers to rural areas. Given the increasing number of women entering medicine in Ghana, we also explore differences in preferences between men and women. Lastly, we suggest policy and research directions based on the findings.

Methods

Setting and sample

Medical education in Ghana consists of three years of basic sciences and paraclinical studies, followed by three years of clinical rotations in a teaching hospital and a two-year housemanship in which students rotate through general medicine, obstetrics and gynaecology, surgery and paediatrics. There are four medical schools in Ghana: the University of Ghana (UG), Kwame Nakrumah University of Science and Technology (KNUST), University for Development Studies (UDS) and University of Cape Coast (UCC). The UCC medical school began accepting students in 2007 and had no fourth year students yet. At the time of the study, all fourth year students from UDS were training in teaching hospitals at UG or KNUST.

We selected fourth year medical students because they had experienced the clinical environment and were considering career options but had not yet made their placement decisions. All fourth year students in Ghana (from UG, KNUST and UDS) were invited to participate in the study. The study was conducted at the UG medical school in Accra and the KNUST medical school in Kumasi. We obtained ethics approval from the Ghana Health Service Ethical Review Committee; the UG Medical School; the KNUST Committee on Human Research, Publications and Ethics; and the University of Michigan Institutional Review Board. Informed consent was obtained from individual respondents before participation in the DCE, the survey and the associated focus group discussions.

DCE design and fielding

To determine what attributes and rural incentive packages were appropriate for the DCE, we conducted seven focus groups with third and fifth year medical students at UG and KNUST. We solicited volunteers through announcements in class. The focus groups (6–8 participants) were led by trained facilitators and involved a standard script that included questions on rural experiences, career plans, motivation for rural practice, and perceived barriers and preferred incentives for rural practice. Specifically, the students were asked to suggest important attributes and conditions for rural practice and to rank a list of attributes and levels identified through a literature review and discussions with physicians from the Ministry of Health and practising physicians. Based on the results of the focus groups, we identified a set of attributes and levels for the DCE that were relevant in the Ghanaian context and were amenable to policy development. The final attributes included salary bonuses; allowances for children's education; improved infrastructure, equipment and supplies; supportive management style; fewer years of work before study leave; free housing; and a utility car (for work and personal use) (Box 1). The seven attributes produced a full factorial design of 384 possible alternatives (job postings). As this presented respondents with too many choices, we then selected 11 of the 384 job postings for the DCE per respondent using an experimental process that maximized level balance (inclusion of levels in similar proportions) and orthogonality (no correlation between levels of different attributes) and minimized overlap among attribute levels within one task – this is known as an efficient design.[21] Respondents were then asked to select their preferred job from each pair of 12 tasks (11 random and 1 fixed).

We took the Ministry of Health's working definition for a rural or deprived area: one that lacks socioeconomic development and has few amenities such as good schools, roads, piped water, etc. The choice in this DCE was between two rural posts, rather than between rural and urban posts, because we were interested in learning what rural practice attributes were valued by students, even those who were more likely to select urban jobs. This approach was also intended to reduce any social desirability bias that could lead respondents to select rural postings with artificially high frequency and allowed us to test a broader range of rural-specific attributes.

The survey accompanying the DCE included questions about respondents' demographic characteristics, educational background, international and rural experiences, and future career plans. The full

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instrument was pretested with 14 medical students and minor revisions were made. The final instrument contained 60 questions. The survey was programmed using S SI Web CAPI (Sawtooth Software Inc., Sequim, WA, USA) and administered on computers in campus computer laboratories in May 2009. Study personnel explained the DCE and were available throughout to answer questions.

Statistical analysis

Data were cleaned (typographical errors corrected, variables recoded as necessary) and transferred to Stata v.11 (StataCorp LP, College Station, TX, USA). We calculated means and standard deviations for the demographic and rural exposure characteristics of the students using Stata's univariate descriptive statistics commands. While choice data have been traditionally analysed using standard logistic regression, such as multinomial and conditional logistic regression, the use of mixed logit models is increasing. The models allow attribute coefficients to vary between respondents. Thus, they account for heterogeneity in preferences and improve the behavioural realism of the results.[22] A mixed logit model also permits modelling of repeated choices by the same individual, as is the case in this and most DCEs. Mixed logit models have been used extensively in transportation and environmental economics and are increasingly used in health.[22] They have typically achieved better model fit than standard models.[22] Mixed logit models can account for the demographic characteristics of respondents through the inclusion of interaction terms between a demographic variable and an attribute.[21] We analysed the data in this study using a mixed logit model based on the equations shown below.

All discrete choice models, including mixed logit models, stem from random utility theory, which posits that the true latent but unobservable utility (i.e. measure of individual value or benefit) of alternative i (U_i) for individual n in a situation involving a choice of alternatives can be depicted as:

$$U_i = V_{in} + \varepsilon_{in}$$

where $V_{in} = V(X_{in}, Z_n)$ is the systematic component of the utility for individual n with individual characteristics Z_n of a scenario with a vector of alternatives with attributes X_{in} and where ε_{in} is unobserv-

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Box 1. **Rural posting attributes used in discrete choice experiment on rural posting attributes influencing students' stated job preferences**

Salary[a]
Base salary
Base salary plus 30%
Base salary plus 50%
Two times base salary

Children's education
No allowance for children's education
Allowance for children's education

Infrastructure, equipment, supplies
Basic (e.g. unreliable electricity, X-ray, intermittent drug supply)
Advanced (e.g. reliable electricity, ultrasound, constant drug supply)

Management style
Supportive workplace and management
Unsupportive workplace and management

Years of work before study leave
Study leave after 5 years of service
Study leave after 2 years of service

Housing
Free basic housing provided (e.g. 2 bedrooms, 1 bathroom, kitchen)
Housing not provided
Free superior housing provided (e.g. 3+ bedrooms, 2 bathrooms, internet, television)

Transportation
Utility car not provided
Utility car provided

[a] For analysis, salary was treated as a continuous variable. All other attributes were dummy-coded with the lowest category as the reference, except for housing, for which basic housing was the reference. Basic housing is currently offered to physicians relocating to rural areas.

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able to the researcher and treated as a random component. Allowing $\beta x_{ni} = V_{in}$, the probability of choosing alternative i from J alternatives can be written as the standard logit formula:

$$L_{ni} = \frac{e^{\beta x_{ni}}}{\sum_j e^{\beta x_{nj}}}$$

The modification in mixed logit is that the researcher does not know the value of β_n or ε_{in}. The solution of the equation requires integrating L_{ni} over all the possible values of β weighted by the density selected, usually the standard normal distribution. The unconditional probability of the observed sequence of choices for a given choice set t is given by:

$$P_{nit}(\theta) = \int L_{nit} f(\beta \mid \theta) d\beta$$

The random portion of utility is assumed to be correlated over choice sets and the coefficients are assumed to vary over respondents. A simulated maximum

likelihood estimator is used to estimate the probabilities. The output of a mixed logit model includes mean coefficients (β) representing the relative utility of each attribute conditional on other attributes and standard deviations of the random coefficients (reflecting the degree of heterogeneity among respondents), along with their respective confidence intervals (CIs).

We estimated main effects mixed logit models with DCE attributes as the sole explanatory variables using Stata's mixlogit command.[23] To understand how gender influenced rural job attribute preferences, we also estimated models that allowed gender to interact with job attributes. We calculated the predictive validity of the utility parameter estimates by using the parameters to calculate the probability of each individual's choice of alternative A and alternative B in the fixed task and comparing this to actual choices. We used a similar approach to conduct policy simulations that estimated the proportion of respondents who would prefer rural postings with selected attributes versus the current offering. Lastly,

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Table 1. **Demographic characteristics of fourth year medical students (*n* = 302) in discrete choice experiment on rural posting attributes influencing students' stated job preferences**

Characteristic	Value	
	No.	%
Gender		
Female	118	39
Male	183	61
Rather not say	1	0.3
Marital status		
Married or cohabitating	2	1
Unmarried but in a relationship	117	39
Not in a relationship	176	58
Don't know/rather not say	7	2
Students with children	3	1
Mother's education		
No schooling or basic schooling	64	21
Secondary or technical vocational	89	30
Polytechnic school	42	14
University degree	100	33
Don't know/rather not say	7	2
Father's education		
No schooling or basic schooling	25	8
Secondary or technical vocational	60	20
Polytechnic school	30	10
University degree	170	56
Don't know/rather not say	17	6
Religion		
Christian	270	90
Muslim	20	7
No religion	4	1
Other	8	3
Ethnicity		
Akan	137	45
Ga/Dangme	40	13
Ewe	39	13
Other	57	19
Don't know/rather not say	29	10
Has ever lived in another country[a]	103	34
International student[b]	40	13
Birthplace		
Urban or periurban area	264	87
Rural area	33	11
Don't know	5	2
Has lived in rural area (when ≥ 5 years old)[c]	72	24
Has done outreach or service in rural area while training[d]	142	59
Is obligated to return to work in specific area after graduation[e]	14	5

[a] This includes 40 international students. Of the 63 Ghanaian students who had lived in another country, 28 (45.2%) had lived in the United Kingdom of Great Britain and Northern Ireland, 24 (38.7%) in the United States of America and 39 of the 63 (58.1%) had lived abroad for 1 or more years.

[b] Thirty-six (90%) international students were born in Nigeria.

[c] Sixty (83.3%) students had lived in a rural area for 1 year or more.

[d] Due to skip logic error, only 242 respondents were given this question (reflected in % calculation).

[e] Of those obligated, 1 (7.1%) respondent was bound to return to a rural area.

we repeated the analysis using: (i) a mixed logit model without "irrational" respondents (participants selecting the "inferior" fixed task alternative), (ii) conditional logit (fixed effects only) models, and (iii) hierarchical Bayesian models.

Results

Out of 310 fourth year students enrolled in Ghana's medical schools, 307 (99.0%) students participated in the survey. Of these, five survey files were corrupted by viruses or lost due to computer malfunction; thus the analysis was conducted with 302 total records. The survey took a mean of 31.6 (standard deviation, SD: ± 12.45) minutes.

The demographic characteristics of the population are shown in Table 1. The mean age of the students was 22.9 years, SD 1.4 years. They tended to come from educated families and were predominantly unmarried and childless. Most had done a rural outreach or service during medical school. There were 40 international students in this class, mostly from Nigeria. Of the Ghanaian students, about one-fourth had lived abroad. Few students were born in a rural area or were bonded to return service (i.e. obligated to practise in a rural area after graduation in exchange for funding while in training).

In the fixed task in which we presented the same jobs to all students, 23 respondents (7.6%) selected the posting which was objectively less attractive than the alternative posting provided (e.g. it offered a lower salary, basic versus superior housing, no utility car versus a utility car). Models estimated with and without these respondents did not differ substantively and so, consistent with current practice, these respondents were retained in the main analysis.[19] We correctly predicted 92.4% of the alternatives selected in the fixed task. This predictive validity is consistent with that reported in other DCE studies.[19]

The utility parameter estimates for job attributes are shown in Table 2. Model 1 is a main effects model and Model 2 includes an interaction term for sex (m/f). The signs on all estimates were as expected and all attribute main effects were significantly different from zero. In the main effects model, improved infrastructure and equipment, supportive management and study leave after two years were major predictors of the preference for a particular rural job. The withdrawal of basic housing had an adverse

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Table 2. **Mixed logit model[a] results for discrete choice experiment on rural posting attributes influencing students' stated job preferences**

Attribute	Parameter	Model 1		Model 2	
		β[b]	95% CI	β[b]	95% CI
Salary[c]	Mean	0.12	0.09 to 0.15	0.12	0.08 to 0.15
	SD	0.09	0.04 to 0.14	0.10	0.05 to 0.15
Allowance for children's education[d]	Mean	0.70	0.54 to 0.86	0.68	0.48 to 0.87
	SD	0.48	0.23 to 0.73	0.49	0.25 to 0.74
Improved infrastructure[e]	Mean	1.42	1.17 to 1.66	1.44	1.14 to 1.74
	SD	1.19	0.94 to 1.44	1.22	0.96 to 1.48
Supportive management[f]	Mean	1.17	0.96 to 1.39	1.05	0.79 to 1.30
	SD	1.08	0.84 to 1.33	1.10	0.85 to 1.35
2 years before study leave[g]	Mean	1.04	0.83 to 1.24	1.18	0.92 to 1.44
	SD	1.01	0.78 to 1.25	1.04	0.79 to 1.29
No housing[h]	Mean	−1.59	−1.88 to −1.31	−1.56	−1.90 to −1.22
	SD	1.18	0.87 to 1.50	1.23	0.91 to 1.56
Superior housing[h]	Mean	0.65	0.44 to 0.86	0.83	0.56 to 1.11
	SD	0.78	0.46 to 1.10	0.83	0.50 to 1.15
Utility car[i]	Mean	0.78	0.61 to 0.94	0.73	0.53 to 0.94
	SD	0.58	0.33 to 0.83	0.62	0.37 to 0.87
Female interaction terms					
Salary	–	–	–	0.01	−0.04 to 0.06
Allowance for children's education	–	–	–	0.09	−0.19 to 0.38
Improved infrastructure	–	–	–	0.02	−0.37 to 0.41
Supportive management	–	–	–	0.40	0.03 to 0.77
2 years before study leave	–	–	–	−0.33	−0.68 to 0.03
Basic housing	–	–	–	−0.18	−0.66 to 0.30
Superior housing	–	–	–	−0.42	−0.84 to −0.01
Utility car	–	–	–	0.17	−0.13 to 0.47
No. of respondents	–	302		301	
No. of observations	–	6644		6622	
Log-likelihood	–	−1541.7595		−1529.8463	
Likelihood ratio χ^2	–	209.28		208.02	

CI, confidence interval; SD, standard deviation.

[a] Mixed logit model estimated using Stata's mixlogit command and 500 Halton draws.

[b] The coefficient (β) represents the mean relative utility of each attribute conditional on other attributes in a choice set, while the standard deviation of the random coefficients reflects the degree of heterogeneity among respondents in the utility of a given attribute.

[c] Continuous variable; the coefficient represents the magnitude of increase in utility for every 10% increase in salary.

[d] Compared with no allowance for children's education.

[e] Compared with basic infrastructure, equipment and supplies.

[f] Compared with unsupportive workplace and management.

[g] Compared with study leave after at least 5 years.

[h] Compared with basic housing.

[i] Compared with no utility car.

effect on preferences and generated a large negative coefficient (β: −1.59).

The main effect coefficients in model 2 were similar to those in model 1. The gender interaction terms were positive for supportive management (β: 0.40; 95% CI: 0.03 to 0.77) and negative for superior housing (β: −0.42; 95% CI: −0.84 to −0.01). Such values suggest that women valued supportive management more

than men but that men valued superior housing more than women. The standard deviations in both models suggest substantial heterogeneity in respondent preferences for all attributes.

Table 3 shows the result of selected policy simulations. Improved infrastructure, supportive management and a 100% salary bonus had the largest effect on preference for rural postings.

The effect of a 100% salary increase on predicted uptake of the new rural posting was approximately equivalent to that of improved infrastructure and management quality. The job posting with multiple incentives was most persuasive; almost 90% of respondents were predicted to prefer a rural job posting with improved infrastructure, superior housing and two years before study leave, to a typical current rural posting.

Lastly, the results of sensitivity analysis using conditional logit and hierarchical Bayesian models were not substantively different from the results presented here. The mixed logit model exhibited better fit than the conditional logit model (data available from the authors).

Discussion

In this study we found that Ghana's fourth year medical students valued rural job attributes that enabled them to perform well clinically (improved infrastructure and equipment) and to grow professionally (supportive management) approximately as much as a doubling of their starting salary. This is consistent with what has emerged from focus group discussions with third and fifth year students, who expressed doubts about being able to apply their clinical skills to help patients in poorly equipped rural hospitals where basic inputs such as electricity and supply of medicines were unreliable. The importance of equipment also emerged from a recent DCE that included 216 Ethiopian physicians.[19]

With regards to management, many students in the focus group voiced concern about being "forgotten" in rural posts when it came to promotions and career development opportunities, such as fellowships or specialty training opportunities. The DCE analysis suggests that supportive management – one of only two attributes for which gender made a difference – was especially important to women. In a qualitative study by Snow et al.,[24] concerns about management and lack of support for career progression were among the most frequently mentioned by physicians in rural districts in Ghana. In several case studies in middle- and low-income countries, supportive supervision has been noted to improve motivation among health workers and quality of care, although impacts on retention were not assessed.[25–27]

The high negative utility of the no housing option suggests that free basic

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housing is considered a pre-requisite for rural practice by students, most likely because of poor availability of quality housing in rural towns in Ghana and students' awareness that this is a standard offering by rural hospitals. The provision of free superior housing (three bedrooms, internet access), which is currently being considered by the Ministry of Health, had a significant positive – although smaller – influence on preferences than workplace attributes. This finding is consistent with the results of an earlier qualitative study in Ghana in which accommodation was scored as the most important determinant for accepting posting to rural areas by practising physicians and nurses.[28] It is also consistent with the recent work in Ethiopia and Ghana.[19,24]

Additional salary was also important, although salary increases need to be large to elicit substantial shifts in preference. A 50% salary increase, for example, was almost as highly valued as free superior housing or a utility car. There is debate in the literature on the importance of wage differentials as an incentive for attracting people to rural jobs. Whereas some studies suggest that small salary increments can have a large influence,[29] others suggest that substantial salary increases are necessary for filling rural postings.[19] Taken together these studies, both done in Ethiopia, suggest that medical students may value salary less than practising physicians. Preferences for salary are also likely to be highly context dependent, both with regard to cost of living in different countries but also the long-term career plans and salary expectations of the graduates. In this study, the relatively high value placed on housing and workplace attributes, as compared with increases in salary, may reflect the view expressed in focus groups, that students may be willing to sacrifice some income to gain medical experience and serve rural communities for a period of two or three years before returning to more lucrative practice in cities. This is consistent with the importance that the respondents placed on a shortened contract before being granted study leave in the DCE. Male students were particularly motivated by shorter contracts.

Allowances for children's education and a utility car were relatively less influential than other attributes in determining the preference for rural postings. The students we studied were young and most of them had not started a family, so

Table 3. Policy simulations modelling preferences for rural postings with different job attributes

New job attribute	Preferred rural posting			
	New		Current[a]	
	%	SD	%	SD
30% salary increase	58.76	0.20	41.24	0.20
50% salary increase	63.96	0.31	36.04	0.31
100% salary increase	73.75	0.49	26.25	0.49
Allowance for children's education	66.09	0.37	33.91	0.37
Improved infrastructure	75.38	0.62	24.62	0.62
Supportive management	72.17	0.59	27.83	0.59
Study leave after 2 years	70.22	1.53	29.78	1.53
No housing	22.00	1.39	78.00	1.39
Superior housing	63.99	1.08	36.01	1.08
Utility car	67.30	1.23	32.70	1.23
Multiple incentives[b]	89.50	1.06	10.50	1.06

SD, standard deviation.

[a] Current rural posting: base salary; no allowance for children's education; basic infrastructure, equipment and supplies; unsupportive management; study leave after 5 years; basic housing; and no utility car.

[b] Improved infrastructure, superior housing, study leave after 2 years.

perhaps their future children's education was not among their main concerns. With regard to transportation, some students may have intended to purchase their own car, since many of them belonged to a high socioeconomic group.

This study had several limitations. First, the respondents may not have fully understood or followed the instructions for the DCE. They may, for instance, have expressed a stronger preference for those attributes that they felt were most likely to be implemented or for those with which they had more experience (e.g. infrastructural factors over child education allowance). Second, social desirability may have biased students' responses, as suggested by the relatively high value placed on non-salary attributes versus salary increases. Third, several methodological aspects of DCE analysis in general, and of mixed logit models specifically, are unresolved. These include the criteria for selecting random versus fixed attributes, the preferred distribution for parameters and the proportion of variability attributable to scale rather than preference heterogeneity.[19,22] Future research will be needed to clarify these issues in analysing choice data. Fourth, any inferences made on the basis of these results apply only to medical students, not to physicians in practice. From the work of Serneels[29] and Hanson,[19] it appears that these two groups may differ in their preferences for rural practice. Fifth, because the study presented only rural options, the results

cannot be used to model the uptake of rural versus urban postings. Lastly, as with all stated preference studies, it would be important to validate the results by comparing them to revealed preference data, ideally from policy experiments.

Our findings suggest that workplace attributes and housing are uppermost in the minds of young physicians when contemplating rural practice. The importance of non-salary attributes to graduating physicians in Ghana is consistent with the anecdotally high rates of uptake of postings in rural hospitals managed by the Christian Health Association of Ghana (Kwesi Asabir, Ghana Ministry of Health, personal communication, 4 September 2009). Hospitals operated by this entity have larger budgets than public hospitals and are generally better equipped; the housing they provide also tends to be of better quality. For example, national facility surveys in Ghana have shown that 81% of health facilities operated by religious groups have an on-site water source and 64% have a regular supply of electricity (or a backup generator), versus 64% and 32% of public facilities, respectively.[30] Other studies have revealed the importance of workplace attributes and housing in rural recruitment and retention.[31]

The most informative direction for future research in this area would be a policy experiment measuring the uptake of rural postings that provide one or more of the valued incentives. Our simulations show that three non-financial incentives

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offered jointly – better housing, improved infrastructure and shorter contract duration before study leave – may be very attractive to graduating students. Improving medical equipment and supplies is also likely to independently enhance quality of care and health outcomes in rural areas. Instituting these incentives in the short-term may be more feasible in Ghana than salary increases, which require changes to public service agreements. Whatever package is selected, it would need to be assessed not solely in terms of recruitment but also of physician satisfaction and retention in rural areas.[24] Furthermore, it is unlikely that rural incentives alone will be sufficient to redress the current imbalance in the number of rural and urban physicians. Strategies such as more training in rural hospitals and return-of-service agreements should all be studied as well.[31]

An interesting experiment is under way in Zambia, where the government, with support from development partners, has instituted several measures to recruit and retain physicians in rural areas. Interventions included the refurbishment of government housing, school fees, car loans, improved hospital equipment and assistance with placement for post-graduate training at the end of a 3-year contract.[32] Although recruitment targets have not been reached, the Ministry of Health has posted 54 physicians to rural areas, most of which had never had physicians before.[33] Zambia's health worker shortage is even more dire than Ghana's overall, and this makes comparison difficult.[34] The enormous shortage of health workers in rural Ghana and in other countries makes it imperative to carry out this type of implementation research. Well planned experiments can help identify effective and efficient human resource strategies for meeting the health needs of underserved rural populations in Africa. ∎

ملخص

خصائص العمل تؤثر على أفضليات الممارسة في الأرياف بين طلبة الطب في غانا: تجربة منعزلة للاختيارات

الهدف تحديد كيف تؤثر خصائص العمل على طلبة الطب المدرجين في العام الدراسي الرابع في أفضلياتهم الافتراضية للوظائف في أرياف غانا.

الطريقة وفقا للمناقشات التي أجريت مع مجموعات بؤرية من طلبة الطب، والأطباء الممارسين، وأطباء من وزارة الصحة، أعد الباحثون تجربة منعزلة للأفضليات بحيث تقييم كيفية تحديد الطلبة لأفضلية بعض الوظائف في الأرياف ومدى تأثر ذلك بالخصائص المختلفة للوظيفة، والتي كانت كما يلي: الراتب الأعلى، والمسكن المتميز المجاني، والبدلات الخاصة بتعليم الأطفال، والمعدات الجيدة، والإدارة الداعمة، والعقود القصيرة قبل السماح بالإجازة الدراسية، وتوفير السيارة. وأجرى الباحثونتجربة منعزلة للاختيارات مع استبيان منهجي قصير بين جميع طلبة الطب في العام الرابع من الدراسة في غانا واستخدم الباحثون طرزاً مختلطة من لوغاريتم الأرجحية لحساب المردود التقديري المستخلص من خصائص كل وظيفة.

الموجودات توافرت المعطيات الكاملة لتحليل التجربة المنعزلة للاختيارات لـ 302 طالباً من إجمالي 310 طالباً (97%). واختلفت جميع المتثابتات التقديرية للخصائص اختلافاً يعتد به إحصائياً عن الصفر وكانت لها العلامات الإيجابية والسلبية المتوقعة. وبالنسبة للتأثيرات الأساسية للطراز المختلط من لوغاريتم الأرجحية، ارتبطت المعدات الجيدة، والإدارة الداعمة بدرجة كبيرة مع تفضيلات الوظيفة ($\beta=1.42$، فاصلة الثقة 95%: 1.17 إلى 1.66, و 1.17 = β، فاصلة الثقة 95 %: 0.96 إلى 1.39، على التوالي)، وذلك رغم أن العقود القصيرة وحوافز الرواتب قد ارتبطتا أيضا بتفضيلات الوظيفة. وكان لعدم استمرارية توفير المسكن الأساسي تأثيراً سلبياً كبيراً ($\beta= 1.59$، فاصلة الثقة 95%: 1.88 إلى 1.31). أما في النماذج التي اشتملت على التفاعل بين الجنسين، فانصبت أفضليات النساء على الإدارة الأكثر دعماً، بينما كانت الأفضلية للسكن المتميز بالنسبة للرجال.

الاستنتاج ترافقت الظروف الأفضل للعمل بصورة كبيرة مع اختيارات الوظائف الافتراضية في الأرياف بين طلبة الطب الغينيين المدرجين في العام الرابع. وهناك ومن الضروري إجراء دراسات لاكتشاف إذا كانت خصائص الوظيفة بالنسبة للخريجين من الأطباء هي التي تحدد الإشغال الفعلي للوظائف في الأرياف.

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Résumé

Préférences concernant la pratique rurale exprimées par les étudiants en médecine ghanéens : expérience à choix discrets

Objectif Déterminer comment les préférences d'étudiants en quatrième année de médecine pour des postes de travail hypothétiques en milieu rural au Ghana ont été influencées par les caractéristiques spécifiques de ces postes.

Méthodes A partir de discussions avec des groupes thématiques d'étudiants en médecine, des médecins en exercice et des employés du Ministère de la santé, nous avons mis sur pied une expérience à choix discrets (DCE), qui a permis d'évaluer comment les préférences exprimées par les étudiants pour certains postes en milieu rural étaient influencées par les diverses caractéristiques de ces postes : salaire plus élevé, logement confortable gratuit et indemnité pour l'éducation des enfants, équipement perfectionné, encadrement coopératif, contrats plus courts avant la fin des études et véhicule de fonction. Nous avons appliqué cette DCE à l'ensemble des étudiants ghanéens en quatrième année de médecine à l'aide d'un bref questionnaire structuré, puis employé des modèles logit à effets mixtes pour estimer l'utilité de chaque caractéristique des postes.

Résultats Nous disposions de données complètes se prêtant à une analyse de la DCE pour 302 étudiants sur 310 (97 %). Toutes les estimations des paramètres liés aux caractéristiques différaient significativement de zéro et présentaient les signes attendus. La modélisation logit des effets mixtes principaux faisait apparaître une forte association entre la présence d'un équipement perfectionné ou d'un encadrement coopératif et la préférence pour le poste ($\beta = 1,42$; intervalle de confiance à 95 %, IC : 1,17à 1,66, et $\beta = 1,17$; IC à 95 % : 0,96 à 1,39, respectivement), même si la possibilité de contrats plus courts et l'existence de primes salariales étaient aussi associées à cette préférence. Ne pas mettre à disposition un logement de base avait une forte influence négative ($\beta = -1,59$; IC à 95 % : -1,88 à -1,31). Les modèles intégrant les termes d'interaction entre les sexes indiquaient que les préférences des femmes étaient plus influencées par la présence d'un encadrement coopératif et celles des hommes par la mise à disposition d'un logement confortable.

Conclusion Il existait une forte association entre de meilleures conditions de travail et le choix déclaré par les étudiants ghanéens en quatrième année de médecine d'un poste rural hypothétique. Des études sont nécessaires pour déterminer si les caractéristiques des postes conditionnent l'acceptation réelle des postes en milieu rural par des médecins ayant obtenu leur diplôme.

Resumen

Preferencias por destinos rurales entre los estudiantes de medicina en Ghana: experimento de elección discreta

Objetivo Determinar qué condiciones específicas de empleo influyen en la preferencia declarada de alumnos de cuarto año de medicina por puestos de trabajo hipotéticos en zonas rurales en Ghana.

Métodos Basándonos en conversaciones mantenidas con grupos de discusión de estudiantes de medicina y médicos en ejercicio en el Ministerio de Salud, creamos un modelo de elección discreta (MED) para evaluar el efecto de diversas condiciones de empleo en la preferencia declarada de los estudiantes por determinados destinos rurales; a saber: sueldos más altos, alojamiento gratuito de mayor calidad, subsidios de educación para los niños, mejores equipos, gestión de apoyo, contratos más cortos antes de la licencia de estudios, y entrega de un coche. Ensayamos sobre el terreno el MED y un breve cuestionario estructurado entre todos los estudiantes de cuarto año de medicina en Ghana, y usamos modelos logit mixtos para estimar la utilidad de cada característica del trabajo.

Resultados Se consiguió usar en el análisis MED los datos completos de 302 de un total de 310 estudiantes (97%). Todas las estimaciones de los parámetros de las condiciones estudiadas fueron significativamente distintas de cero y tuvieron el signo previsto. En el modelo logit mixto de efectos principales, un mejor equipo y la gestión de apoyo fueron los factores más estrechamente relacionados con la preferencia por el trabajo ($\beta = 1,42$, intervalo de confianza del 95%: 1,17–1,66, y $\beta = 1,17$, IC95%: 0,96–1,39, respectivamente), si bien se observó también una asociación con los contratos más cortos y las bonificaciones salariales. La interrupción de la prestación de alojamiento básico tuvo una enorme influencia negativa ($\beta = 1,59$, IC95%: 1,88–1,31). En los modelos que incluían la interacción del factor género, las preferencias de las mujeres respondían en mayor medida a la gestión de apoyo y las de los hombres, a una vivienda mejor.

Conclusión Se observó una sólida relación entre unas condiciones de empleo mejores y la elección declarada de puestos de trabajo rurales hipotéticos entre estudiantes de cuarto año de medicina de Ghana. Es necesario realizar nuevos estudios para averiguar si las condiciones de empleo determinan la ocupación real de puestos de trabajo rurales por los médicos que acaban la carrera.

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