How can rural jobs be made more attractive to Tanzanian health workers? Results from a discrete choice experiment.*

by

Julie Riise Kolstad
Department of Economics, University of Bergen
Fosswinckelsgate 14, N-5007 Bergen, Norway
julie.kolstad@econ.uib.no

1. Introduction

Human resources for health (HRH) are perhaps the single most important input to the health sector in low-income countries (Hongoro and McPake, 2004), and shortage of health personnel and poor health worker performance is one of the most pressing problems in these countries (Chen et al., 2004). Recent reports have pointed out that human resources comprise a fundamental constraint to improving health outcomes and reaching the Millennium Development Goals (Joint Learning Initiative, 2004) (World Bank, 2004). It has further been stated that lack of personnel with relevant skills forms a threat to the success of recent global initiatives such as the Global Fund to fight AIDS, Tuberculosis and Malaria, as well as other programmes intended for scaling up health services in order to reach the Millennium Development Goals (Wyss, 2004).

A recent policy research working paper from the World Bank (Gauri, 2001) points out the regional imbalances as one of four key problems in the health cares systems in developing countries. Geographic imbalances in the health workforce have been a persistent feature of nearly all health systems, but the imbalances are often more severe in low-income countries. Thus, the geographical imbalance of health personnel is a well known problem in the health

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sector of developing countries.

The most comprehensive overview of the available evidence on HRH situation in Tanzania (Dominick and Kurowski, 2005) identifies the geographical imbalance to be one of five main HRH problems, and points to the fact that there are severe information gaps on this area. What seems to be clear from census data from 2001/2002 is that the number of health workers per capita in Tanzania declined by 40 % in the period from 1994/95 to 2001/02 (Kurowski, 2004). The medical cadres were reduced from 34,8 per 100 000 population to 25,3 per 100 000 in the same period, mostly because of population growth. Another report (Joint Learning Initiative, 2004) states that the number of physicians per 1000 population is 0,02 in Tanzania. This number is very low even compared to neighbouring countries like Uganda and Malawi. There seems to be large variation between the districts, however; in Dar es Salaam there are 0,14 doctors and specialists per thousand while in Ruvuma there are only 0,004 per thousand. Similar patterns are found for the rest of the cadres (Kurowski, 2004). The line dividing districts with a relatively high number of staff from those with little staff can be drawn between rural and urban districts (Wyss, 2004). A report from 2004 confirms the picture of difficulties with attracting health workers to rural districts. The shortage of Clinical Officers and Assistant Medical Officers relative to the staffing norm for instance, is around 70 % (McKinsey&Company, 2004).

According to Dominick and Kurowski, the migration rates from rural to urban districts are unknown, and a thorough analysis of the causes of geographical imbalances is lacking. Overall, evidence on staff morale, satisfaction and motivation is scarce. More specifically, there is no evidence on what may be the most effective policy in order to make Tanzanian health personnel work in rural districts. Lack of such evidence makes prioritising between different policies aimed at correcting the geographical imbalances very difficult and arbitrary, and the consequences of allocating scarce resources wrongly may be severe (Bewley, 1995) (Fehr and Falk, 2002).

This article seeks to elicit some of the aspects of the choice of work among Tanzanian health workers. The aim is to find out more about the preference structure of Tanzanian health workers and to answer the question: which are the most important determinants for health workers appraising the possibility of working and living in different parts of Tanzania? Furthermore, the government and health authorities of Tanzania need more information about

the possible effects of policy interventions aimed at recruiting more health workers to rural and remote areas. An important goal of this article is thus that it shall shade a light on the effect of different policies on the probability of choosing a job in a rural district.

Most of the information available on health personnel's willingness to work in rural districts in Tanzania comes from qualitative research. These results give valuable insight into complex and important issues, but provide little operational guiding for policy makers. This paper provides much needed quantitative measures. 60 % of all the Tanzanian Clinical Officer[1] finalists participated in an extensive discrete choice experiment (DCE), which can be used to elicit their preference structure. Although DCEs have become a more common method of eliciting preferences in health economics, very few attempts at applying DCEs on health personnel in developing countries has been gone through with before. Chomitz et al. (1998) made use of a variant of a stated preference method on doctors in Indonesia. Mangham (2006) conducted a DCE on nurses in Malawi and there has recently been conducted a DCE also in Ethiopia (Hanson and Jack, 2007). However, as far as we know, a DCE or similar quantitative exercises have never been applied in order to elicit the preference structure of health personnel in Tanzania. Also the preferences of mid-cadres[2] like clinical officers have never been properly investigated. Mid-cadres like the clinical officers represent a very big and important share of the health workforce in Tanzania (9,5 %. In comparison the medical doctors represent 1,1 % (Kurowski, 2004)), and it is the clinical officers who form the backbone of the clinical workforce. This pattern is similar in many other developing countries. Their degree is often not recognized in developed countries, so these cadres are more prone to stay in their home country than other cadres like medical doctors and nurses.

The rest of the paper will be structured as follows: section 2 gives a brief overview of the literature on preferences of health personnel in developing countries. The focus is particularly on empirical literature and on how preferences affect the willingness to work in rural areas. In section 3 the data and method are presented, while section 4 specifies the econometric model and the estimations. Section 5 presents and discusses the results. Finally, section 6 concludes.

[1] A clinical officer (CO) is something between a nurse and a medical doctor. They have more or less the same amount of education as the nurses but the training of COs is more clinically oriented. Clinical officers often function as medical doctors in rural areas.
[2] Mid-cadres: cadres between nurses and medical doctors, called clinical officers and assistant medical officers.

2. Incentives identified in empirical literature

Pecuniary incentives like higher salaries or hardship allowances for health workers stationed in rural districts can help making rural jobs more attractive. A number of financial incentive schemes have been suggested and it has often been found that financial incentives have a positive effect on the willingness to work in rural areas, see for instance (Chomitz et al., 1998), (Serneels et al., 2005), (Kristiansen and Forde, 1992). The size of this effect varies between, schemes, countries and cadres.

Important non-pecuniary motivation factors are also identified in several empirical works. Vujicic et al. (2004) show, for instance, that non-pecuniary incentives like provision of housing and the prospect of an opportunity to upgrade qualifications were important reasons for wanting to migrate (Vujicic et al., 2004). Moreover, financial incentives have in some cases limited effect compared to non-financial incentives when it comes to self-esteem and job satisfaction (Kingma, 2003). Opportunities for educational upgrading, career development and colleagues at the working place are other motivation factors that have been found to be important when health workers decide where to work (Serneels et al., 2005) (Chomitz et al., 1998). It has further been suggested that lack of equipment and supplies and of appropriate facilities can act as a deterrent for health professionals to accept positions in rural and underserved areas. This was a primary reason cited by medical students for not practicing in rural Pakistan (Zaidi, 1996). The study of Serneels et al. (2005) among others, investigates the assumption of social preferences being important decision factors. They found that the student's motivation to help the poor, which where their proxy for intrinsic motivation, were one of two main determinants of willingness to work in a rural area in Ethiopia.

Based on earlier research there is also reason to believe that background variables and other personal characteristics can be important explanatory variables. Sex, family income, talent, education level and the regional base of the family are all such variables that are likely to affect each individual's willingness (and hence the motivation) to work in rural districts. The influence of individual characteristics on the willingness to work in rural districts is relatively well documented: Chomitz et al. (1998) show that the premium needed to make Indonesian health workers move to rural districts was substantially lower for students coming from rural districts than for students originally from Jakarta. A study from Japan found that rural doctors were more likely to remain in practice in rural areas if they had a rural background. Also, men were relatively much more likely to remain in rural practice than women (Matsumoto et al.,

2005). This finding is supported by a study in which it is observed that women are less prone to accept rural posts and that they are underrepresented in rural areas (Doescher et al., 2000). One suggested reason for women to be less likely to move to rural districts is because of the few job opportunities for their spouses and insufficient education opportunities for their children (Dussault and Franceschini, 2006). Thus, the presence of family members in rural and remote areas increases the probability that an individual will consider these areas for the establishment of his/her practice (Dussault and Franceschini, 2006). In general, growing up in a rural community has been associated with higher probability to practice in rural areas (British Columbia Medical Association, 1998). Family matters in various ways; nurses in Malawi were more likely to work in rural districts if a decent house was offered (Mangham, 2006) and household consumption has been found to be one of the two most important determinants for the willingness to work in rural districts in Ethiopia (Serneels et al., 2005). Finally, age sometimes matters too; younger individuals typically have fewer family responsibilities and are more prepared to move or migrate (Chomitz et al., 1998) (Serneels et al., 2005).

3. Data and the Discrete Choice Experiment

3.1 Data

In general we want to study the preferences of Tanzanian health personnel for different job attributes, but we are particularly interested in what seems to be important determinants for choosing a job in a rural district. On this field there is little natural variation in revealed preferences; wages are more or less the same all over Tanzania, at least for those working in public health facilities, and there is a problem of vacant positions in rural districts. It was therefore necessary to collect data exclusively for this study. Thus, an extensive survey was distributed among more than 300 final year students training to be clinical officers. The clinical officers are chosen because of their ability to do much of the practical work of a physician, and the fact that they often function as physicians in rural districts. A discrete choice experiment formed the main part of the survey, but demographics and other background characteristics of the health workers were also collected in order to control for personal characteristics like sex, age, rural background etc.

The data was collected during the autumn of 2007. Participation in the research was voluntary and the participants were not compensated in any way. 320 CO finalists (around 60% of all CO finalists in Tanzania) from 10 randomly selected schools participated in the DCE. All

finalists on the selected schools were invited to participate. The data was mostly collected during school time, and on the premises of the school. This can probably to a large extent explain the response rate of around 96% which is unusually high for a DCE. Questionnaires which were not completed or filled out by respondents from other countries than Tanzania were excluded from the sample, so the sample used in the analysis consists of 296 respondents.

3.2 The discrete choice experiment

The respondents were asked to make 16 choices between two alternative jobs. These jobs were constructed as bundles of seven different attributes. Existing empirical evidence as well as economic and psychological theory has been valuable in developing the attributes and their levels. A large number of important potential attributes were identified, but in order to restrict the complexity of the job alternatives it was necessary to also restrict the number of attributes. The literature is not conclusive on where the limit goes for the number of attributes that should be included, but somewhere between 3 and 7 has been normal in health economics. In this study 7 attributes are included. This way the job alternatives were not too complex while at the same time giving a relatively complete description of a job and as much information as possible. In making the final decisions about which attributes to include and which levels to give them, a series of in-depth interviews conducted with CO finalists in Kibaha an Sengerema in March 2007 proved to be of vital importance. The interviews, which were conducted in either English or Swahili depending on the student's preferences, were semi structured and concentrated around positive and negative aspects of living and working in rural areas. We also asked about what the students thought could attract them and their friends to rural areas.

Results from the in depth interviews in combination with economic theory and reviews of existing empirical literature lead to the inclusion of the following 7 attributes[3]: Working location, Salary and allowances, Possibilities of further education, Workload, Offer of decent housing, Availability of equipment and drugs at the institution and Infrastructure.

[3] The attributes and their levels are more thoroughly described in Figure 1.

Figure 1: The attributes and their levels*

Attributes	Salary & and allowances	Education opportunities / possibility for upgrading qualifications:	Location	Availability of equipment & drugs	Workload	Housing	Infrastructure
Level 1	650 000 TSH per month	Education offered after 2 years of service	Dar es Salaam	Sufficient	Normal: Nearly enough time to complete duties, one hour extra work pr day	Decent house is provided	The place has mobile coverage, electricity & water
Level 2	500 000 TSH per month	Education offered after 4 years of service	Regional headquarters	Insufficient	Heavy; barely enough time to complete duties. Three hours of extra work per day	No house is provided	The place has unreliable mobile coverage, no electricity or water
Level 3	350 000 TSH per month	Education offered after 6 years of service	District headquarters				
Level 4	200 000 TSH per month	No education offered	A 3 hours bus ride (or more) from the district hq				

* In the regressions the “salary & allowances” attribute is referred to as wage, just out of practicality.

A D-efficient computerised design allowing for interaction effects was applied in order to make the hypothetical jobs and combine them into choice pairs. The design is programmed to give an efficient combination of orthogonality, level balance and minimum overlap. This resulted in a design with 32 choices between pairs of jobs. The 32 choice sets were randomly divided into two blocks, in order not to exhaust the respondents. Each respondent thus made 16 binary choices. Also, there were made two versions of each block where the order of choices was varied in order to correct results from effects of learning, exhaustion or tiredness that could be present[4]. The DCE was tested in a pilot with 30 students at Kilosa Clinical Officer Training Centre, and as a result, the formulation of some of the attribute levels was changed. Also, some of the questions were reformulated. An example of a choice set and a copy of the instructions given to the respondents are provided in Appendix A.4.

4. Specification of the econometric model and estimations

The underlying assumption of this paper is that health workers have a complete ranking of jobs with varying attribute levels. This ranking is given by their preferences for the attributes and their respective levels. As rational economic individuals, the health workers maximise their utility given their preferences for different job attributes; they will always choose the alternative that matches best with their preferences. The preferences are influenced by background characteristics of the individual like sex, religion etc.

Our point of departure in the analysis of the data is a logit model consistent with McFadden`s choice model (McFadden, 1974). The basis of the logit model is the concept of utility maximisation. The decision maker, *n*, which is assumed to be a rational economic individual, faces a choice among *J* (in our case 2, which gives us a standard logit model) alternatives, and he/she will choose alternative *i* over alternative *j* if and only if $U_{ni} \geq U_{nj}$.

The utility that decision maker *n* receives from alternative *j* is given by:

$$U_{nj} = V_{nj} + \varepsilon_{nj}, \forall j$$

However, the utility is not directly observable. The researcher can observe V_{nj}, sometimes referred to as the representative utility, while ε_{nj} is unobservable and treated as random by the

[4] Including a person specific fixed effect did not alter the results.

researcher. It is assumed that ε_{nj} is distributed IID extreme value.

The logit choice probabilities (the probability of choosing alternative i over alternative j) following McFadden (1974) are given by:

$$P_{ni} = \Pr(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \; \forall j \neq i)$$
$$= \Pr(\varepsilon_{nj} < \varepsilon_{ni} + V_{ni} - V_{nj} \; \forall j \neq i)$$

The representative utility, V_{nj} is specified to be linear in parameters:

$$V_{nj} = \beta' x_{nj}$$

x_{nj} is a vector of observed variables relating to alternative j. Since ε_{ni} is not given, the choice probability is the integral of $P_{ni}|\varepsilon_{ni}$ over all values of ε_{ni} weighted by its density. The logit probability of choosing alternative i rather than alternative j thus becomes:

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

The random utility model outlined here is concerned about the utility of one alternative compared to another alternative. It is thus in practice the preferences for one alternative above another that are estimated.

The parameters or coefficients can only give information about the direction and the significance of the effect from changing the levels of an attribute, all else given. For policy makers (and normally also economists) however, the most interesting analysis is the analysis that offers opportunities for valuation and comparison of different policies. The regression results are therefore used to calculate willingness to pay and policy impact measures.

4.3 Willingness to pay

In order to calculate the willingness to pay for the job attributes it is more convenient to think of the wage variable as continuous. Assuming that the wage's contribution to utility is quadratic, the regression model will look like this:

$$U = \beta_1 \text{wage} + \beta_2 \text{wage}^2 + \beta_3 \text{edu6y} + \beta_4 \text{edu4y} + \beta_5 \text{edu2y} + \beta_6 \text{distrhq}$$
$$+ \beta_7 \text{regiohq} + \beta_8 \text{DSM} + \beta_9 \text{house} + \beta_{10} \text{workload} + \beta_{11} \text{equipment} + \beta_{12} \text{inf rastr} + C$$

All variables refer to the attributes mentioned in section 3.2 and described in Appendix A.3. A dummy is constructed for each level of the attributes, except for the wage variable which is treated as continuous due to technicalities. Since the wage variable is continuous and quadratic, the willingness to sacrifice wage in order to get a higher level of another job attribute is a function of the wage, given by the following equation:

$$\text{WTP (educationa fter 6 years)} = -\frac{\partial U / \partial \text{edu 6y}}{\partial U / \partial (\text{wage var iables})} = -\frac{\beta_3}{\beta_1 + 2\beta_2 \text{wage}}$$

This WTP measure is calculated for all wage levels, but in the paper only the one for the lowest wage level is reported as this wage level is best reflecting the current circumstances. We calculate the p-value and standard errors using the delta method.

4.4 Policy impact

We can think of the change in probability of taking the baseline job due to a change of the level in one of the job attributes as the impact of a policy that changes the level of this job attribute. When calculating this impact, we let the wage variable be continuous and quadratic, like for the willingness to pay calculation. The regression model thus looks like the one outlined for the willingness to pay. The change in probability of taking the baseline job due to a change in one of the job attributes, let's say if we raise the salary to 350 000 TSH per month, is then as long as all other attributes are kept equal, given by:

$$P_{\text{wage=350}} - P_{\text{wage=200}} = \left(\frac{e^{\beta_1 * 350 + \beta_2 * 350\hat{}2}}{e^{\beta_1 * 200 + \beta_2 * 200\hat{}2} + e^{\beta_1 * 350 + \beta_2 * 350\hat{}2}}\right) - \left(\frac{e^{\beta_1 * 200 + \beta_2 * 200\hat{}2}}{e^{\beta_1 * 200 + \beta_2 * 200\hat{}2} + e^{\beta_1 * 350 + \beta_2 * 350\hat{}2}}\right)$$

Again, we calculate the standard errors and 95 % confidence intervals using the Delta method.

5. Results & discussion

For policy purposes, the most interesting feature of the econometric analysis must be the

marginal analysis. What happens with the probability of taking a job in a rural district when there is a change in a job attribute? Which policies will be most efficient in increasing the probability of Tanzanian health personnel taking a job in rural districts? Two different methods that help answering these questions have been applied. First, the willingness to pay (WTP), or rather to sacrifice some of the salary and allowances in order to get a higher level of one of the other attributes, is estimated and presented in section 5.1. Secondly, the change in the probability of taking a job in a remote area resulting from increasing the levels of the other job attributes is investigated and presented in section 5.2. We may expect from earlier empirical research that various subgroups react differently to different policies, the same exercise is thus done for different subgroups and presented in sections 5.2.1., 5.2.2 and 5.2.3.

5.1 Willingness to pay

The results from the WTP calculation are shown in Table 1. The measures show how much of the salary a fresh CO is willing to sacrifice, given that he/she has a salary of 200 000 TSH per month[5].

On average, the CO finalists are willing to give up 306 166 TSH per month in order to get the possibility of more education after two years of service instead of the basis level with no education at all. The measure gives us a clear indication about the importance of getting more education as soon as possible. A closer examination supports this impression; on average the CO finalists are willing to pay 96 796 TSH in order to get education after six years of service rather than no education possibilities. When the time of service before education is reduced to four years we see that they are willing to sacrifice another 96 316 TSH of their salary every month. It is when the time of service is reduced with two more years however, that we see the strongest effect; the CO finalists are then willing to sacrifice an extra 113 054 TSH per month. In-depth interviews done with Co finalists in March 2007 do to a large extent confirm that the CO students are eager to gain more knowledge and to proceed building their careers.

When it comes to location, there is an average willingness to sacrifice 57 151 TSH per month in order to work in the district headquarter rather than in a remote area (alternatively; in order to work in a rural remote place rather than the district headquarter, 57 151 TSH would have to

[5] This is the most realistic WTP measure as the beginner's wage for public clinical officers is just above 200 000 at the moment. The WTP can be calculated for other wage levels too. The general pattern is that people are willing to pay more when they have higher salaries (and the reverse; they have to be compensated more for negative policies when they have higher salaries).

be added to the salary every month). This is relatively intuitive, as the district headquarters, although it may be small, can offer a number of services and a very different working environment from that in the remote areas. Compared to the willingness to pay for education possibilities, this measure is quite small. The willingness to pay for a job in the regional headquarters is insignificant and very small. It is likely that there are two forces pushing the decision in opposite directions here; in district headquarters as well as remote areas COs do more or less everything, they gain a lot of experience and they work as relatively autonomous clinicians. However, in the regional headquarters the health facilities are on average better equipped than in remote areas. The data is not conclusive on which of these forces that is the strongest. On the other hand of the scale, the students have to be compensated with 82 171 TSH per month in order to take a job in Dar es Salaam rather than in a remote area[6].

Table 1: Willingness to pay (WTP) given a wage of 200 000 TSH per month*

Variable	Willingness to pay**	Lower level of 95 % conf. interval	Upper level of 95% conf. interval
Education after 6 y	96 796	41 237	152 356
Education after 4 y	193 112	130 718	255 505
Education after 2 y	306 166	207 475	404 857
District headquarters	57 151	15 988	98 314
Regional headquarters	5 755	-28 356	39 866
Dar es Salaam	-82 171	-129 533	-34 809
Housing provided	57 288	25 926	88 651
Reduced workload	-16 430	-42 630	9 770
Sufficient equipment	110 972	71 886	150 058
Infrastructure	190 348	129 515	251 181
Number of observations	9342		
LR Chi2 (13)	1627,86		
Prob > Chi2	0,0000		
Pseudo R^2	0,2514		

* Estimated with the wage attribute as a continuous and quadratic variable.

** Tanzanian shillings per month

Most of the research from other countries has documented that the more central a job is, the higher is it preferred by various types of health workers. However, one study has actually found similar patterns; nurses participating in a DCE in Malawi preferred on average to work in small towns rather than the big cities (Mangham, 2006). Another study also found some of this pattern among the female medical and nurse students in Indonesia; they preferred to do their internship in other cities rather than in Jakarta, the capital (Chomitz et al., 1998). None

[6] This is a true economic result, not merely a consequence of the way the statistical software treat values of 0.

of the mentioned studies did, however, suggest explanations to these findings. Again, the in-depth interviews with students before and after the DCE was conducted, may give some insight in why this result emerges. Several students express an apprehension that if they take a job in Dar es Salaam, they will not be allowed to do the "fun" and interesting things. As there is less shortage of manning in Dar es Salaam, and the work force there is more educated than other places in the country, the fresh COs are afraid that they will loose their autonomy and that they will be given little challenging tasks and too little responsibility. Dar es Salaam is also considered to be far more expensive than other urban or semi urban areas. Costs of living are likely to be a particular concern to young people that are on the verge of settling. However, it is worth noting that Table 1 shows that the respondents value both good infrastructure and education opportunities much higher than they dislike Dar es Salaam. Thus, our observation that they have to be compensated to take a job there does not necessarily contradict the general empirical pattern of inflow of people and health workers to Dar es Salaam. In general, the students are not very concerned with the location of their job compared to other features like education possibilities, equipment situation at the health institution and infrastructure.

On average the respondents were willing to reduce their monthly salary with 190 348 TSH if they could have a job in an area with decent infrastructure[7]. Equipment did not appear to be as important as the general infrastructure, but they were willing to pay 110 972 TSH per month in order to work in an institution with sufficient equipment and drugs compared to one without those amenities. Finally, housing has often come up as an alternative way of compensating and attracting health workers, but it seems that it is not very highly valued among the CO finalists. To be sure, they are willing to pay a certain amount (57 288 TSH) of their salary in order to get a house, but compared to education and the prerequisites to do their job as they are taught to, an offer of a house seems to mean little.

Although the preference for workload is not significant, it is also worthwhile noting that it is negative as this reflects what quite often came up in the in-depth interviews, namely that a high workload at this stage of their career is valuable because it gives more experience. Thus, not all fresh COs are scared off by jobs with heavy workload, on the contrary, some tend to seek it in order to gain more experience.

[7] Defined as "mobile coverage, electricity and water".

To sum up; the willingness-to-pay analysis tells us that possibility for more education is by far the most valued feature of a job when measured as how much salary one is willing to give up in order to get a higher level of another attribute. Other factors that are more directly concerning the ability to do a good (updated) job, like infrastructure and sufficient equipment are also very important. Offer of a decent house and the location on the other hand seem not to be so important for the next generation of COs. However, a policy that aimed at offering houses for instance would probably have positive effects, although at a relatively small scale.

5.2 Policy impact

By differentiating the probability function with respect to changes in job attributes we can try to forecast the *effectiveness of different policies*. The point of departure is a job in a remote area[8] where the salary is 200 000 TSH, no education is offered, no house is offered, the workload is relatively high, there is little and outdated equipment and the infrastructure is bad. This may appear as a worst-case scenario, but the fact is that it is rather close to the reality in many rural remote areas in Tanzania at the moment. The general effectiveness of the policies is presented in Table 2.

Table 2: Changes in probabilities, the whole sample*

Change from base line	Change in probability	Standard error	P>|z|
Wage 350	.261	.0274	0.000
Wage 500	.468	.0271	0.000
Wage 650	.618	.0211	0.000
Education after 6 y	.179	.0453	0.000
Education after 4 y	.346	.0336	0.000
Education after 2 y	.517	.0253	0.000
Housing provided	.107	.0245	0.000
Reduced workload	-.031	.0242	0.204
Sufficient equipment	.205	.0208	0.000
Infrastructure	.342	.0169	0.000
Number of observations	9342		
LR Chi2 (13)	1627,86		
Prob > Chi2	0,0000		
Pseudo R^2	0,2514		

* Estimated with the wage attribute as a continuous and quadratic variable.

Although increased salaries is often the first thing that springs to mind when thinking about ways to increase the recruitment to rural areas, this measure alone may not be the most

[8] Defined as ”a three hour bus ride or more from the district headquarter”

efficient way to recruit more health workers to rural districts. Increasing the monthly beginner salary up to 650 000 TSH will not surprisingly have the strongest effect on the probability of taking a job in a remote area as it increases the probability with 62 percentage points. However, such a policy would be extremely expensive, and certainly so from day one. Increasing the wages slightly less, to 500 000 TSH per months does also seem to be an effective measure, it increases the probability of taking the remote job with 47 percentage points. Finally, increasing wages to 350 000 TSH per month will increase the probability of taking a remote job with 26 percentage points. These results show that regulation of the salary and allowances is a powerful instrument, but also that as the salaries are increased this instrument will become less effective (raising the wages to 350 000 increased the probability with 26 pp, raising it with another 150 000 to 500 000 increased the probability with 21 pp, while increasing it with another 150 000 to 650 000 increases the probability with only 18 pp). If wage increases is the chosen policy it may thus after raising the wages to a certain level be better to include other policies than to increase the wages further.

To offer possibilities for further education after two years of service may be another policy instrument for the authorities. It proves to be the second most effective policy as it increases the probability of taking the remote job with 52 percentage points if the education offer is given after two years of service. Giving education opportunities after 4 and 6 years of service increase the probability of taking a rural job with 35 and 18 percentage points respectively. A policy where further education or upgrading of qualifications is given after a certain period of service in a rural area could thus also form a well aimed instrument for correcting geographical imbalances of the health workforce. This kind of policy can also be convenient as it represents a way to postpone the costs a bit. Better access to education may in addition give positive externalities unless the health workers then become too attractive to other countries and hence other working locations. The policy of promising more education after a certain time of service has just one catch and that's the question of whether or not the health workers will trust the authorities when they make such a promise. Several of the respondents told in in-depth interviews that although the offer would sound tempting, they were not sure if they could afford to trust such a promise. The authorities will thus have to prove some kind of commitment in advance for such a policy to be credible.

Investing in infrastructure is something that often comes up as a way to make rural remote areas more attractive (and in some ways less remote) not only for health workers but also for

entrepreneurs, public servants and other service providers. Our analysis shows that if the authorities provide a decent basic infrastructure, the probability of taking a remote job would increase with 34 percentage points. The rest of the policy instruments follow according to their effect on the probability; supplying the health institutions with sufficient amount of equipment and drugs (21 percentage points) and offering decent houses to the health workers (11 percentage points).

In general the marginal effects are quite substantial and the standard errors are relatively small, so one can expect to see positive effects from any of the suggested policies. There is one exception though; namely the policy of decreasing workload. There may be many reasons why this policy does not turn out to give a significant effect. The result is not merely a statistical one, so there must be an economic reason for this. As we have touched upon earlier, the students did not seem to agree on whether it was good or bad that the workload is reduced. Some wanted experience and welcomed a high workload, while others wanted to have time to do things apart from their official job and were skeptical to high workload. Another thing that makes it difficult to obtain a clear effect from reducing the workload is that there is not a clear understanding, neither among the students, nor among the authorities, on what is actually the present level of workload in remote areas.

5.3.1 Impact depending on gender

Table 3 displays the impact of policies (changes in probabilities) for different subgroups. Separate regressions have been run, and probabilities calculated for each subgroup. The second and third columns of Table 3 show results for male and female respondents respectively. It turned out that women tend to be significantly less responsive than men to pecuniary incentives, increasing the salaries to 650 000 had lower effect on females than on males. Increasing salaries to over a certain level would thus be less effective in attracting female COs than male COs to rural remote places. Females are also more concerned with infrastructure and the resource situation on a potential working place than their male counterparts; a good infrastructure, an offer of a house and sufficient equipment contributes more positively to their utility (and hence their probability of taking the job) than to that of the male students. Another interesting pattern is also worth noting; women seem to be more patient than men when it comes to how much they value the opportunity of getting education after 6 years compared to after 2 years. Male respondents have a much steeper response curve to education than the females; they value education opportunities after 6 years less than the

female respondents and after 2 years significantly higher than the female respondents.

Table 3: Changes in probabilities, subgroups*

Variable	Male	Female	Rural remote background	Not rural remote background	Very much willing to help	Not so much willing to help
Wage 350 000 TSH	**.277*** **	**.248*** **	**.173*** **	**.306*** **	**.174*** **	**.283*** **
	(.0342)	(.0469)	(.0462) §	(0346) §	(.0589)	(.0313)
Wage 500 000 TSH	**.498*** **	**.437*** **	**.364*** **	**.520*** **	**.341*** **	**.501*** **
	(.0333)	(.0475)	(.0485) §	(.0333) §	(.0626) §	(.0304) §
Wage 650 000 TSH	**.656*** **	**.570*** **	**.551*** **	**.652*** **	**.493*** **	**.651*** **
	(.0251) §	(.0378) §	(.0386) §	(.0255) §	(.0550) §	(.0226) §
Education after 6 years of service	**.152*** **	**.229*** **	**.206*** **	**.167*** **	**.120**	**.191*** **
	(.0578)	(.0744)	(.0735)	(.0586)	(.0991)	(.0517)
Education after 4 years of service	**.363***	**.315***	**.290***	**.389***	**.195*** **	**.394*** **
	(.0422)	(.0574)	(.0567)	(.0423)	(.0754) §	(.0377) §
Education after 2 years of service	**.559*** **	**.449*** **	**.473*** **	**.543*** **	**.510*** **	**.526*** **
	(.0303) §	(.0455) §	(.0444) §	(.0311) §	(.0531)	(.0288)
Decent housing offered	**.085*** **	**.165*** **	**.099** **	**.122*** **	**.094***	**.108***
	(.0312) §	(.0403) §	(.0402)	(.0313)	(.0518)	(0281)
Normal workload	**-.028**	**-.030**	**-.030**	**-.021**	**.020**	**-.047***
	(.0305)	(.0412)	(.0393)	(.0312)	(.0515)	(.0275)
Sufficient equipment	**.169*** **	**.273*** **	**.136*** **	**.248*** **	**.310*** **	**.173*** **
	(.0263) §	(.0345) §	(.0351) §	(.0263) §	(.0422) §	(.0242) §
Decent infrastructure	**.314*** **	**.407*** **	**.269*** **	**.385*** **	**.318***	**.352*** **
	(.0218) §	(.0273) §	(.0291) §	(.0211) §	(.0366)	(.0193)
Number of observations	5986	3324	3062	6176	1974	7336
LR chi2 (13)	1061.54	614.54	398.86	1250.44	298.79	1355.32
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	.2558	.2667	.1879	.2921	.2184	.2665

* Changes in probability are reported first, in bold. The stars indicate the statistical significance (p-value) of the results (* Significant at 10% level, ** Significant at 5 % level, *** Significant at 1% level) while the standard error is reported in the brackets. A regression is run for each subgroup. The differences between the preferences of subgroups that were statistically significant are indicated by an §. Note that the total number of observations may vary with the groups examined. For example; when analysing the differences between men and women's preferences, observations where the respondent has failed to answer the question of sex are left out of the sample, while when analysing the preferences of students with a rural remote background versus other students, those who have failed to answer this question are left out of the sample. The same applies when analysing students with or without a strong motivation of helping people. The variation in results is ignorable, but this way we have used all available information.

5.3.2 Impact depending on rural remote background

Also here, there are significant differences between the preferences of students with parents living in rural (remote) areas and the rest of the students, as we can see in the fourth and fifth columns in Table 3. Students with parents living in rural remote areas are less responsive to pecuniary incentives at all levels, and significantly so. They are also significantly less responsive to an offer of education after two years of service, although the difference between the two groups here is not so big. Furthermore, there are significant differences in the effects

from improving the equipment and drug situation at the health facilities, and the infrastructure in the area. Those with a rural background are less responsive to these attributes than the rest of the respondents. This reflects the general (but not always significant) pattern; more or less all job attributes are less valued by students with parents living in remote areas than by the other students. All policies related to changing the level of job attributes will thus have less effect on these COs than other COs. Probably this group is already more prone to take jobs in rural remote places than the other finalists, which may to some extent explain why these students are less responsive to incentives than the rest.

5.3.3 Impact depending on willingness to help people

Intrinsic motivation or to be exact, a proxy for intrinsic motivation namely the willingness to help the poor, has been found to be one of the most successful variables in explaining the willingness to work in rural areas (Serneels et al., 2005). This finding is relatively little tested in similar empirical studies from developing countries. Our survey allowed us to check whether persons that were found to be very willing to help other people react differently to incentives than other students. A dummy variable that measures willingness to help other people was constructed on the basis of *total* agreement to all of the following three statements: 1) ”I feel good when I can help other people, even if it means I have to work very hard”, 2) “The general satisfaction coming from helping other people is the same no matter what I get paid” and 3) “As long as I receive the minimum public salary for COs, I am willing to work where it is most needed in order to help as many as possible”. The results from the regressions of these two subgroups (those very willing and those not so willing to help other people) are presented in the sixth and seventh columns of Table 3. Firstly we see that those who are motivated by being able to help other people are quite much less responsive to pecuniary incentives than the other finalists, in particular when the salaries are increased to over 350 000 TSH per month. This reflects the general pattern; finalists that are very willing to help are generally also less responsive to incentives. However, there is one attribute that this group is very concerned with compared to others, namely the equipment and drugs available at the heath facility. They are substantially and significantly more responsive to a policy of providing sufficient equipment and drugs than their counterparts. This result makes sense as provision of equipment and drugs are important prerequisites for helping people. Finally, while the other subgroups analysed have kept more or less the same ranking of incentives/policies as the general average, the subgroup of people very willing to help others, have a slightly different ranking from the rest. The most important differences are that they

are more responsive to getting opportunities for more education after 2 years than to getting a monthly wage of 650 000 TSH, and that they value sufficient equipment and drugs higher than other groups. Equipping health facilities properly and ensuring a sufficient amount of drugs may thus attract more fresh COs who are very motivated to help other people.

6. Concluding comments

When talking about the geographical imbalance of the health workforce, it is very common to refer to rural and rural remote areas as a bundle of negative associations. Our results underline that it is important to bear in mind that it is not necessarily the geographical location per se that hinders clinical officers from taking jobs in rural areas, but rather bad infrastructure and the fear of falling behind in professional development. In practice this is important because it means that policies to correct the imbalance do not only have to be compensating, they can also aim at changing the prerequisites in rural areas.

The analysis has focused on the preference structure for a particular cadre in a particular phase of their lives. In this phase it is very important to get as much experience as possible and to become well educated (get higher grade than CO). Generalisations to other cadres and also to COs that have come longer in their careers may be dangerous and difficult as their preferences are likely to be quite different from the ones that have been analysed here.

A problem with stated preference data, like data coming out of surveys, is that respondents will not have to demonstrate their actual willingness to take different jobs, e.g. to work in rural districts. Unfortunately there is not much to do about this when there are no data on revealed preferences. When stating their preferences respondents will also have incentives to try to manipulate the results of the analysis. However, this problem was sought avoided by using a DCE.

Lastly, just a warning: this analysis deals with the effect of different policy measures, not the costs of implementing them. For any government with a budget constrain it will be advisable to do a thorough analysis of the net gain (or loss) from implementing different measures before concluding on what will be the most efficient thing to do.

References

Bewley, T. (1995). A depressed labor market as explained by participants. *American Economic Review, Papers and Proceedings* 85, 250-254.

British Columbia Medical Association (1998). Attracting and Retaining Physicians in Rural British Columbia. Vancouver: Report from The BCMA Rural Issues Commitee.

Chen, L., Evans, T., Anand, S., Boufford, J. I., Brown, H., Chowdhury, M., Cueto, M., Dare, L., Dussault, G., Elzinga, G., Fee, E., Habte, D., Hanvoravongchai, P., Jacobs, M., Kurowski, C., Michael, S., Pablos-Mendez, A., Sewankambo, N., Solimano, G., Stilwell, B., Waal, A. d. and Wibulpolprasert, S. (2004). Human resources for health: overcoming the crisis. In *Lancet*, Vol. 364. 1984-90.

Chomitz, K. M., Setiadi, G., Azwar, A., Ismail, N. and Widiyarti (1998). What Do Doctors Want? Developing Incentives for Doctors to Serve in Indonesia's Rural and Remote Areas.: The World Bank.

Doescher, M., Ellsbury, K. and Hart, L. (2000). The distribution of rural female generalist physicians in the United States. *Journal of Rural Health* 16, 111-118.

Dominick, A. and Kurowski, C. (2005). Human Resources for Health - an Appraisal of the Status Quo in Tanzania Mainland.

Dussault, G. and Franceschini, M. C. (2006). Not enough there, too many here: understanding geographical imbalances in the distribution of the health workforce. *Human Resources for Health* 4.

Fehr, E. and Falk, A. (2002). Psychological foundations for incentives. *European Economic Review* 46, 687-724.

Gauri, V. (2001). Are Incentives Everything? Payment Mechanisms for Health Care Providers in Developing Countries. The World Bank.

Hanson, K. and Jack, W. (2007). Health worker preferences for job attributes in Ethiopia: Results from a discrete choice experiment.

Hongoro, C. and McPake, B. (2004). How to bridge the gap in human resources for health. *Lancet* 364, 1451-1456.

Joint Learning Initiative (2004). Human Resources for Health: Overcoming the Crisis. Harvard University Press.

Kingma, M. (2003). Economic incentive in community nursing: attraction, rejection or indifference? *Human Resources for Health* 1.

Kristiansen, I. S. and Forde, O. H. (1992). Medical specialist's choice of location: the role of geographical attachment in Norway. *Soc Sci Med* 34, 57-62.

Kurowski, C., K. Wyss, S. Abdulla, N. Yémadji, A. Mills (2004). Human resources for health: Requirements and availability in the context of scaling-up priority interventions in low-income countries. Case studies from Tanzania and Chad.: London School of Hygiene and Tropical Medicine.

Mangham, L. (2006). Adressing the Human Resource Crisis in Malawi's Health Sector: Employment preferences of public sector registered nurses in Malawi. *ESAU Working Paper Series*.

Matsumoto, M., Okayama, M., Inoue, K. and Kajii, E. (2005). Factors associated with rural doctors' intention to continue a rural career: A survey of 3072 doctors in Japan *Australian Journal of Rural Health* 13, 219-225.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In *Frontiers in Econometrics*(Ed, Zarembka, P.). New York: Academic Press, 105-142.

McKinsey&Company (2004). Acting Now to Overcome Tanzania's Greatest Health Challenge; Addressing the Gap in Human Resources for Health.

Serneels, P., Lindelow, M., Garcia-Montalvo, J. and Barr, A. (2005). For Public Service or Money: Understanding Geographical Imbalances in the Health Workforce. The World Bank.

Vujicic, M., Zurn, P., Diallo, K., Adams, O. and Poz, M. D. (2004). The role of wages in the migration of health care professionals from developing countries. . *Human resources for Health* 2.

World Bank (2004). The millennium development goals for health: rising to the challenges. Washington DC.

Wyss, K. (2004). An approach to classifying human resources constraints to attaining health related Millennium Development Goals. *Human Resources for Health* 2.

Zaidi, A. (1996). Why medical students will not practice in rural areas: evidence from a survey. *Social Science and Medicine* 22, 527-533.