Using incentives to attract nurses to remote areas of Tanzania: a contingent valuation study

Michael A. Munga, Gaute Torsvik and Ottar Maestad

Centre for International Health (CIH), University of Bergen, Bergen, Norway, Department of Monitoring and Evaluation, National Institute for Medical Research, Dar es Salaam, Tanzania, Department of Economics, University of Bergen, Bergen, Norway and Chr. Michelsen Institute, Bergen, Norway

*Corresponding author. Health systems and Policy Research/Monitoring and Evaluation Departments, National Institute for Medical Research, P.O BOX 9653, DAR ES SALAAM 999, United Republic of Tanzania. Tel: +255 222121400. E-mail: michaelmunga@yahoo.com

Accepted 21 January 2013

This article analyses (1) how financial incentives (salary top-ups) and non-financial incentives (housing and education) affect nurses' willingness to work in remote areas of Tanzania and (2) how the magnitude of the incentives needed to attract health workers varies with the nurses' geographic origin and their intrinsic motivation. A contingent valuation method was used to elicit the location preferences of 362 nursing students. Without any interventions, 19% of the nurses were willing to work in remote places. With the provision of free housing, this share increased by 15 percentage points. Better education opportunities increased the share by 28 percentage points from the baseline. For a salary top-up to have the same effect as provision of free housing, the top-up needs to be between 80 and 100% of the base salary. Similarly, for salary top-ups to have the same effect as provision of better education opportunities, the top-up should be between 120 and 140%. Our study confirms results from previous research, that those with a strong intrinsic motivation to provide health care are more motivated to work in a remote location. A more surprising finding is that students of older age are more prepared to take a job in remote areas. Several studies have found that individuals who grew up in a remote area are more willing to work in such locations. A novel finding of our analysis is that only nursing students with a ‘very’ remote origin (i.e. those who grew up farther from a district centre than the suggested remote working place) express a higher willingness to take the remote job. Although we do control for nursing school effects, our results could be biased due to omitted variables capturing individual characteristics.

Keywords Health workers; remote areas; financial and non-financial incentive

KEY MESSAGES

- Recruitment of students with remote origin seems to be quite effective in reducing the need for incentives, but only if people are recruited from places that are more remote than the place where we want them to work.
- Very high salary top-ups are needed to match the effect of educational interventions and provision of free housing.

Background

Like many countries, Tanzania experiences substantial difficulties in attracting health professionals to work in remote health facilities. To design effective programmes to improve the geographical distribution of health workers, we need to know how the workers will respond to various policy measures. The aim of this article is twofold; first, to measure and compare the effects of financial and non-financial incentives on nurses' willingness to work in remote areas of Tanzania.
potential effect of financial and non-financial interventions on nurses’ willingness to work in remote areas and, second, to identify how individual characteristics, such as the remoteness of origin and intrinsic motivation are associated with their willingness to work in remote areas.

There are several possible interventions that can be used to induce health workers to take positions in remote areas. The interventions have commonly been categorized as selection, education, coercion and incentives (WHO 2009; Wilson et al. 2009). Selection interventions attempt to identify individual characteristics that may increase the likelihood of students taking a job in remote areas after graduation (Robinowitz 1993; Robinowitz et al. 1999, 2001; Wilson et al. 2009). Criteria, such as geographic origin, ethnicity, gender, initial career intent indicating that a student has plans to work in remote areas after graduation, and service orientation (e.g. remote volunteer activities reported during application to medical schools), are frequently used to implement selection-based interventions (Wilson et al. 2009). Several studies from higher-income countries have found that individuals with a rural background are more willing to accept remote jobs than those having a more urban background (Talley 1990; Rolfe et al. 1995; Fryer et al. 1997; Easterbrook et al. 1999; Robinowitz et al. 1999, 2001; Wilkinson et al. 2000; De Vries and Reid 2003; Dumbabin and Levitt 2003; Wilson et al. 2009). A similar pattern has been found in low-income countries: see e.g. Chomitz et al. (1998) and Serneels et al. (2007).

There are two types of educational interventions that can enhance prospective health workers’ willingness to work in remote areas. First, the teaching of health workers may emphasize the importance of providing medical services in remote areas. Second, clinical rotation and internships during medical training in remote settings may acquaint students to rural working conditions (Wilson et al. 2009). Although the evidence is not conclusive, remote exposure coupled with adequate local guidance and supervision indicates that such educational interventions may increase the number of health workers interested in remote medical service (Erkel et al. 1995; Diefenbeck et al. 2006; McDonnel and Lowe 2008; Smedley 2008).

Coercive interventions, often in the form of compulsory service or bonding, have been tried in a number of countries. To our knowledge there exists no rigorous test of the long-term effectiveness of requiring health workers to take remote jobs for a shorter time. Freywot et al. (2010) provides a useful overview of different compulsory service programmes and some anecdotal evidence of their achievements and failures. Compulsory service programmes are seldom highly regarded among health workers. In a developing context, such programmes tend to be unpopular as they are associated with a number of management problems, such as corruption and favouritism (Serneels et al. 2007). Studies from South Africa report that coercing inexperienced health workers to perform community service in remote areas where there is a lack of adequate technical guidance and support may force them to practice outside their scope of competence and subsequently undermine their confidence and leave them open to litigation. Because of these inadequacies and fear of being litigated, many junior doctors in South Africa often do not consider remote medical practice as a career option (Nemutandani et al. 2006; Marais et al. 2007; Wilson et al. 2009).

Financial and non-financial incentives have also been applied in several countries to attract health workers to remote areas [often combined with a compulsory service programme: see Freywot et al. (2010)]. In many low-income countries, health worker salaries are low, arguably making remuneration a potentially powerful strategy for attracting and retaining health workers in remote areas. Although the use of financial incentives has been a common approach in countries, such as Philippines, Thailand, Zambia and Kenya, to mention a few, evidence indicates that implementing them as stand-alone interventions often has limited impacts and that they therefore should be combined with non-financial interventions (Mathauer and Imhoff 2006).

Studies from Indonesia and Ethiopia show that it is possible to motivate health workers to take remote job postings by using both financial and non-financial incentives (Chomitz et al. 1998; Serneels et al. 2007). Mangham and Hanson (2008) use a discrete choice experiment (DCE) to assess the job attributes that make it more likely that Malawian health workers will accept jobs in the country’s remote areas. They find that better pay and enhanced education are powerful incentives for rural recruitment. The importance of using further education as an incentive for attracting health workers to remote locations is also stressed by Lehmann et al. (2008) and Wilson et al. (2009). Blauw et al. (2010) who use the same method to assess policy interventions to attract nurses to rural areas in three different countries, such as South-Africa, Kenya and Thailand. They also find that offering higher pay in the rural area will work well (especially in Kenya and South-Africa) and that non-financial incentives, such as improved housing and further education, will make it easier to get nurses to take jobs in the remote areas. Kruk et al. (2010) uses DCE on a sample of medical students and find that better pay, combined with supportive management and improved infrastructure, is the most effective package of incentives to attract medical workers to take remote jobs.

Our study adds to this literature by identifying and analysing the effectiveness of financial and non-financial interventions for attracting nurses to remote areas of Tanzania. Our study supplements Kolstad (2010), who analyses how clinical officers can be incentivized to work in remote areas of Tanzania. The fact that we study nurses in our article is important. Nurses constitute a substantial proportion of the health workers in Tanzania and they are even more unequally distributed around the country than are clinical officers (Munga and Maestad 2009). It is well documented that the geographical distribution of nurses is highly unequal and many possible causes have been discussed, but little is known about the effectiveness of different policy interventions (Dominic and Kurowski 2004; Martineau 2004; Munga and Maestad 2009; Munga et al. 2009). It is therefore of vital interest to collect and analyse evidence on this question.

The rest of the article is organized as follows: the first section presents the context. An analytical framework is presented in the next section, followed by the empirical methodology. Then results are presented before discussing the main findings and their policy implications in the ‘Discussion’ section.
is a survey-based method for the valuation of non-market goods and services (e.g. environmental goods and services). The method is also useful for assessing individuals’ preferences over hypothetical job alternatives.

It is only recently that contingent valuation methods have been employed to examine health workers’ practice location choices in a low-income setting (Chomitz et al. 1998; Serneels et al. 2007, 2010). We follow this literature when we let student nurses make hypothetical choices between a (carefully described) urban and remote health position. Students were exposed to a battery of alternatives and, based on their choices, we estimate their reservation wage for taking the remote job. We subsequently made the remote alternative more attractive by offering (1) free housing and (2) improved education opportunities and measured how these compensations lowered the reservation wage.

The method presumes that prospective nurses make deliberative choices of where they want to work in urban or remote parts of Tanzania. Policy interventions will only have the potential to move health workers to the remote area if the burden of working there (if it is considered as a burden) can be compensated by financial and non-financial advantages (McEwan 1999). Formally, the utility a nurse $i$ gets from taking a job depends on the location of the job ($L$), the wage level ($W$) and on other non-financial attributes ($X$) of the job: $u_i = u_i(W, X, L)$.

In our case, the location variable $L$ takes the value $R$ (remote) or $U$ (urban). Similarly, the other variables take on the values $(W_R, X_R)$ in the remote job and $(W_U, X_U)$ in the urban job. Nurse $i$ is indifferent between the urban and the remote job if $u_i(W_R, X_R; R) = u_i(W_U, X_U; U)$. This equation implicitly defines individual reservation wages, i.e. the wage nurse $i$ requires to take a job in the remote area. Let this wage be given by $W^*_R$. A salary at or above this level is needed to attract nurse $i$ to the remote job. The reservation wage may differ across nurses and may be higher or lower than the going salary in the urban job ($W^*_U$). The reservation wage also depends on the non-financial attributes that are associated with the two jobs; $W^*_R = W^*_R(X_R, X_U)$. From the set of reservation wage levels across all $n$ nurses $(W^*_1, ..., W^*_n)$, we calculate the share that is willing to take up a remote job for a given salary. Then we add non-financial advantages to the remote job and assess how these attributes affect the reservation wages.

An alternative approach to identifying individual reservation wages is to use DCE and to estimate individual reservation wages by statistical methods. This approach ensures a statistically efficient design (which is important when samples are small) and is particularly useful when there is a need to trade off several attributes simultaneously, or when there is reason to believe that respondents will answer strategically. However, the current practice when analysing data stemming from DCEs implicitly imposes structural assumptions on preferences. In our case, as we have relatively few job attributes that vary between jobs, we have a specification with many discrete wage levels. This enables us to identify the reservation wage without imposing structural assumptions on preferences. Our method is also more flexible in handling reservation wages that may fall outside the presented range of alternatives: see Serneels et al. (2007, 2010) for a further discussion of the applicability of
using this method to estimate reservation wages for working as a health worker in remote locations.

Data and empirical methodology
Between April and June 2009, we conducted a survey among third and fourth year nursing students in Tanzania mainland. At the time of data collection, there were 29 pre-service nursing schools offering training at the diploma level. Twenty-two schools were owned by faith-based organizations (FBOs) and seven by the government. From the 29 nursing schools, we drew a simple random sample of nine schools (seven of the schools were run by FBOs and two by the government). The sample of schools is listed in Table 2. The schools are located all over the country.

In total, 540 students were enrolled in the study, of which 178 students (32%) could not participate, as they were not present on the days of the interview. Thus, our analysis is based on a sample of 362 nursing students.

To be relevant for policy making, contingent valuation and discrete choice methods require informed design of attributes based on a sample of 362 nursing students. Using this method to estimate reservation wages for working as a health worker in remote locations.

Data and empirical methodology
Between April and June 2009, we conducted a survey among third and fourth year nursing students in Tanzania mainland. At the time of data collection, there were 29 pre-service nursing schools offering training at the diploma level. Twenty-two schools were owned by faith-based organizations (FBOs) and seven by the government. From the 29 nursing schools, we drew a simple random sample of nine schools (seven of the schools were run by FBOs and two by the government). The sample of schools is listed in Table 2. The schools are located all over the country.

In total, 540 students were enrolled in the study, of which 178 students (32%) could not participate, as they were not present on the days of the interview. Thus, our analysis is based on a sample of 362 nursing students.

To be relevant for policy making, contingent valuation and discrete choice methods require informed design of attributes and attribute levels (Lagarde and Blaauw 2009; Blaauw et al. 2010; Vujicic et al. 2010). Our goal was to test the effectiveness of both financial and non-financial incentives to motivate nurses to take jobs in remote areas. Several earlier studies have shown that the prospects of educational upgrading and better housing are non-pecuniary incentives that can be used to attract healthcare workers to take jobs in the rural area, see e.g. Serneels et al. (2007), Vujicic et al. (2010) and Kolstad (2010). Prospects for further education and the availability of proper housing were also ranked highest among non-financial job attributes in a pilot study where 13 nurses were asked to assess different non-financial incentives for taking jobs in remote areas. After having surveyed the data from the pilot study, the first author conducted interviews with seven policy makers from Ministry of Health and Social Welfare and the Prime Minister’s Office-Regional Administration and Local Governments. Policy makers were presented with a number of financial and non-financial attributes as previously reported in the literature (see e.g. Serneels et al. 2007; Kolstad 2010). These interviews made clear that further education and better housing are considered to be relevant policy instruments for attracting nurses to take jobs in remote areas.

In our study, the students were first presented with a set of fixed location characteristics for the urban and the remote job, as shown in Table 3. Then they had to choose between an urban or remote job in three different scenarios. In all choice scenarios, the salary for an urban job was fixed at the official starting salary for a nursing officer. For the remote job, the starting salary was then increased step by step to create nine discrete alternatives. In scenario 1, there was no housing or improved opportunities for further education associated with the remote job. In the second scenario, the remote job offered free housing and, in the third scenario, improved opportunities for further education were offered, as shown in Table 4. The students made individual choices (communication was prohibited) in a classroom setting.

We did not specify in detail what kind of further education would be provided. The natural interpretation of further education among our respondents (diploma nurses) at the time of the study would be either an advanced diploma (2 years) or a degree in nursing (3 years).

Free housing and improved education opportunities are positive attributes that should not lower the value of a remote job. Hence, if a respondent required a higher wage premium to take the remote job with these job attributes, this would be a clear indication that he or she did not comprehend the logic of the inquiry. However, we did not get inconsistent answers from any of the respondents.

Data analysis is conducted at two levels. First, we provide descriptive statistics on the share of nurses willing to work in

Table 2 Sampled nursing schools and their geographical location

<table>
<thead>
<tr>
<th>Nursing schools</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ilembula nursing school</td>
<td>Iringa region</td>
</tr>
<tr>
<td>Haydom nursing school</td>
<td>Manyara region</td>
</tr>
<tr>
<td>Kolandoto nursing school</td>
<td>Shinyanga region</td>
</tr>
<tr>
<td>Sengerema nursing school</td>
<td>Mwanza region</td>
</tr>
<tr>
<td>Kilimanjaro Christian Medical Centre (KCMC) nursing school</td>
<td>Kilimanjaro region</td>
</tr>
<tr>
<td>Bugando nursing school</td>
<td>Mwanza region</td>
</tr>
<tr>
<td>Huruma nursing school</td>
<td>Kilimanjaro region</td>
</tr>
<tr>
<td>Muhimbili nursing school</td>
<td>Dar es Salaam region</td>
</tr>
<tr>
<td>Muheza nursing school</td>
<td>Tanga region</td>
</tr>
</tbody>
</table>

Table 3 Features differentiating a remote job from an urban job

<table>
<thead>
<tr>
<th>Urban job</th>
<th>Remote job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>Regional capital (other than Dar es Salaam)</td>
</tr>
<tr>
<td>Availability of schools</td>
<td>Relatively well-equipped schools (both private and public)</td>
</tr>
<tr>
<td>Transport and communication facilities</td>
<td>Reliable</td>
</tr>
<tr>
<td>Utilities (e.g. clean tap water and electricity)</td>
<td>Available</td>
</tr>
<tr>
<td>Recreational facilities</td>
<td>Available and sufficient</td>
</tr>
<tr>
<td>Duration of posting</td>
<td>At least 3 years</td>
</tr>
</tbody>
</table>
remote health facilities, depending on the level of salary top-ups and non-financial incentives. Second, we use interval regression analysis to assess the association between reservation wages (under scenario 1) and individual characteristics of the nurse students. Interval regression is an appropriate estimator here since the discrete choice approach used to elicit the reservation wage only establishes an upper and lower boundary of the reservation wage; the reservation wage will be in the interval \((a,b)\), where \(a\) is the highest wage level where the urban job was preferred and \(b\) is the lowest wage level where the remote job was preferred. The reservation wage may also be a censored variable as the actual reservation wage may be lower than the lowest wage presented in the discrete choice alternatives. The interval regression estimation takes these aspects into account. In all regressions, the dependent variable (reservation wage) was log-transformed to generate coefficients that could be interpreted as percentage change attributable to the independent variables.

One of the individual characteristics we associate with reservation wages is the nurse students’ intrinsic motivation to help the poor. Our measure of intrinsic motivation follows the approach used by Serneels et al. (2010). We asked the students to state the importance of various reasons (cost of living, good work environment, closeness to important services, etc.) for choosing a particular work location. Students who ranked ‘a desire to provide health care to the poor and needy’ to be of ‘great importance’ are characterized as intrinsically motivated in our analysis. For a critical discussion of alternative ways to measure health workers’ intrinsic motivation, see Serra et al. (2011).

### Results

**The impact of financial and non-financial incentives on nurses’ willingness to accept remote jobs**

Without any intervention, 19% of the nurses said they would be willing to work in remote health facilities (Table 5; Figure 1). With provision of free housing, the share of nurses willing to chose a remote job increases from 19 to 34%. Improved education opportunities increases the share from 19 to 47%.

Hence, the specified improvement in education opportunities is a far more effective policy measure than the provision of free housing.

Without non-financial incentives (housing or education), a doubling of the salary in the remote job increases the share that will take this job from 19 to 40%. This shows that a substantial wage premium has to be added for remote jobs for the salary to have the similar effects as provision of free housing and provision of better opportunities for further education. Our calculations from the underlying data show that for a salary top-up to have the same effect as provision of free housing, a top-up of between 80 and 100% is required. Similarly, a top-up between 120 and 140% is needed to get the same effect as from improved education opportunities (see also Figure 1).

**Association between nurses’ personal characteristics and reservation wage**

Table 6 summarizes key characteristics of the respondents. About 50% of the nursing students grew up in urban areas (regional capitals); 11.9% in Dar es Salaam and 37.9% in other regional capitals. This share is higher than the percentage of urban residents in Tanzania’s general population. Some of the students are recruited from remote locations; 11.1% come from remote locations <100 km from a rural district capital, whereas 6.1% come from ‘very remote locations’ (>100 km from a rural district capital).

In addition to the origin of the students, we are particularly interested in whether student nurses differ in their intrinsic motivation to serve the poor and to what extent such differences may affect the reservation wage.

In the regression analysis, we controlled for age, gender, marital status and whether a respondent had children or other dependants. We also controlled for nursing schools’ observable and non-observable characteristics through a nursing school fixed effect. The econometric approach is summarized in the following equation:

\[
\log(W_k^j) = \beta_0 + \beta_1 R^j + \beta_2 M^j + \beta_3 Z^j + \beta_4 S^j + s',
\]

where \(W_k\) is the reservation wage (specified as an interval variable), \(R\) represents remoteness of origin, \(M\) is intrinsic motivation, \(Z\) is a vector of individual characteristics and \(S\) represents school dummies. The model was estimated by interval regression. Among the 360 observations, there were 175 uncensored, 69 left-censored and 116 interval observations. Table 7 summarizes the results from regression analyses. Model 1 includes only the main variables of concern: student

### Table 4 Description of the three choice scenarios

<table>
<thead>
<tr>
<th>Choice scenario 1</th>
<th>Urban job</th>
<th>Remote job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>No housing provided</td>
<td>No housing provided</td>
</tr>
<tr>
<td>Further education</td>
<td>After 6 years</td>
<td>After 6 years</td>
</tr>
<tr>
<td>Choice scenario 2</td>
<td>Housing</td>
<td>No housing provided</td>
</tr>
<tr>
<td>Further education</td>
<td>After 6 years</td>
<td>After 6 years</td>
</tr>
<tr>
<td>Choice scenario 3</td>
<td>Housing</td>
<td>No housing provided</td>
</tr>
<tr>
<td>Further education</td>
<td>After 6 years</td>
<td>After 3 years</td>
</tr>
</tbody>
</table>

### Table 5 Proportion of nurses willing to work in remote areas depending on salary premium and non-financial incentives in rural jobs

<table>
<thead>
<tr>
<th>Salary premium (%)</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No non-financial incentive</td>
<td>No free housing</td>
<td>Better education opportunities</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>19%</td>
<td>34%</td>
<td>47%</td>
</tr>
<tr>
<td>100</td>
<td>40%</td>
<td>56%</td>
<td>66%</td>
</tr>
<tr>
<td>200</td>
<td>59%</td>
<td>78%</td>
<td>88%</td>
</tr>
<tr>
<td>300</td>
<td>96%</td>
<td>97%</td>
<td>98%</td>
</tr>
</tbody>
</table>
origin and intrinsic motivation. We find that nursing students originating from ‘very’ remote areas (>100 kms from rural district capital) and those with high-intrinsic motivation have a much lower reservation wage than others. These results are robust to the inclusion of a number of controls (Models 3 and 4). However, to originate from an area that is less remote—but still classified as such—is not associated with a lower reservation wage (this result is consistent across all models and we therefore chose to drop this variable from the specification). In all model specifications, those who grew up in very remote areas have more than 50% lower reservation wage than others for accepting a remote job. In our preferred specification (Model 4), the difference is \(-58\% \ (P < 0.001)\).

Recall from Table 3 that the remote job alternative was described as being located 50–100 km from a rural district headquarter (which is equivalent to the district capital). A natural interpretation of our findings is thus that recruitment from remote areas reduces the need for incentives only when candidates are recruited from areas that are more remote than the area where we want them to work.3

The results in Table 6 indicate further that nurses with high intrinsic motivation have around 25% \((P < 0.001)\) lower reservation wage than others. Again, this association is robust across all model specifications, including when we control for possible schools-specific effects.

The results also show that those who reported to have one or more dependants have 18.5% \((P = 0.037)\) higher reservation wage than others for accepting remote job. However, having children has only a small and insignificant association with willingness to accept a remote job postings. Older students are more willing than young ones to work in remote areas; 1 year increase in age reduced the reservation wage by 3.9% \((P = 0.004)\).

Our estimated coefficients may be biased if omitted variables are correlated with our main explanatory variables—remote origin and intrinsic motivation. It is reassuring that the estimated coefficients are very robust to the inclusion of control variables, including controls that capture unobservable school characteristics. There could, however, be unobserved individual

---

**Figure 1** The proportion of nurses willing to work in remote areas depending on salary premium and non-financial interventions.

**Table 6** Respondents’ background characteristics \((n = 362)\)

<table>
<thead>
<tr>
<th>Gender</th>
<th>85.6%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>25.1 years</td>
</tr>
<tr>
<td>Marital status</td>
<td>89.2%</td>
</tr>
<tr>
<td>Number of children</td>
<td>12.2 %</td>
</tr>
<tr>
<td>Number of dependants</td>
<td>22.7 %</td>
</tr>
<tr>
<td>Place where one grew up</td>
<td></td>
</tr>
<tr>
<td>Dar es Salaam</td>
<td>11.9 %</td>
</tr>
<tr>
<td>Other regional capital</td>
<td>37.9 %</td>
</tr>
<tr>
<td>Rural district capital</td>
<td>28.6 %</td>
</tr>
<tr>
<td>Remote (&lt;100 km from rural district capital)</td>
<td>11.1 %</td>
</tr>
<tr>
<td>Very remote (&gt;100 km from rural district capital)</td>
<td>6.1 %</td>
</tr>
<tr>
<td>Abroad</td>
<td>4.4%</td>
</tr>
</tbody>
</table>
Discussion

This article adds to a growing body of literature that assesses the relative merits of using financial and non-financial incentives to motivate health workers to take jobs in remote areas. It is the first study to address this question in the context of Tanzanian nurses. In addition to the incentive issues, this article also tries to pin down how strongly individual characteristics are associated with the willingness to take up remote job postings.

Impact of financial and non-financial incentives on willingness to accept remote jobs

We have shown that nurses’ location preferences are responsive to both financial and non-financial interventions. We find that a 100% wage premium in remote areas increases the share of nurses willing to take jobs in these areas by 21 percentage points (Table 4). The impact of monetary incentives is comparable with those reported in a study from Ethiopia (Hanson and Jack 2008). They study ‘medical doctors’ and find that doubling the salary increases the probability of doctors accepting remote jobs from 4 to 27%. Serneels et al. (2007) have shown that 57 and 83% salary premiums are needed to attract, respectively, 80% of graduating nurses and 80% of doctors to remote areas of Ethiopia. According to our study, to achieve a similar result for Tanzanian nurses, the salary needs to be raised by \( \frac{260}{24} \) (see Figure 1). Compared with Ethiopia, our results indicate that a larger share of prospective Tanzanian nurses want to work in the remote areas at the outset (for similar wages) but it seems to be more difficult to motivate those who prefer an urban location at the outset to reconsider and take a remote job.

Dussault and Franceschini (2006) argue that, in places where recruitment of health workers is difficult, such as remote places of many developing countries, targeted subsidies might be an efficient tool for attracting health workers. Our results indicate that a larger share of prospective Tanzanian nurses want to work in the remote areas at the outset (for similar wages) but it seems to be more difficult to motivate those who prefer an urban location at the outset to reconsider and take a remote job.

Table 7 The association between selected independent variables and the log of reservation wage

<table>
<thead>
<tr>
<th>Dependent variable = log (reservation wage)</th>
<th>Model 1 coefficient (P-value)</th>
<th>Model 2 coefficient (P-value)</th>
<th>Model 3 coefficient (P-value)</th>
<th>Model 4 coefficient (P-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very remote</td>
<td>-0.503** (0.001)</td>
<td>-0.509** (0.001)</td>
<td>-0.513** (0.001)</td>
<td>-0.580** (0.000)</td>
</tr>
<tr>
<td>Remote</td>
<td>0.052 (0.630)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>-0.266** (0.000)</td>
<td>-0.265** (0.000)</td>
<td>-0.255** (0.000)</td>
<td>-0.249** (0.000)</td>
</tr>
<tr>
<td>Female</td>
<td>-0.009 (0.925)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age in years</td>
<td>-0.032* (0.019)</td>
<td>-0.039* (0.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>0.029 (0.847)</td>
<td></td>
<td>0.087 (0.560)</td>
<td></td>
</tr>
<tr>
<td>Having dependants</td>
<td>0.194* (0.027)</td>
<td></td>
<td>0.185* (0.037)</td>
<td></td>
</tr>
<tr>
<td>Having children</td>
<td>0.027 (0.851)</td>
<td></td>
<td>0.021 (0.880)</td>
<td></td>
</tr>
<tr>
<td>Nursing school fixed effect</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>13.390 (0.000)</td>
<td>13.395 (0.000)</td>
<td>14.164 (0.000)</td>
<td>14.380 (0.000)</td>
</tr>
<tr>
<td>( n )</td>
<td>360a</td>
<td>360</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>Maximum likelihood ( R^2 )</td>
<td>0.067</td>
<td>0.066</td>
<td>0.091</td>
<td>0.126</td>
</tr>
</tbody>
</table>

*Significant at 5% level; **significant at 1% level.

aData on reservation wage for two nursing students were missing in our data set and thus the two were excluded from our analysis.
is even larger; the proportion who want to move to a remote area increases from 19 to 47% when further education is provided after 3 years and not after 6 years, as in the urban job. In comparison, in Ethiopia, the provision of educational incentives was shown to have a more modest impact on medical doctors (Hanson and Jack 2008).4

A review of the literature that uses DCE to assess potential interventions to attract workers to remote areas shows that non-pecuniary incentives are strongly associated with higher willingness to take up rural job posts (Lagarde and Blaauw 2009). Similarly, and in conformity with our findings, Blaauw et al. (2010) found that better education opportunities would be the most effective intervention to induce health professionals to accept a rural job. Magham and Hanson (2008) found that opportunities to upgrade qualifications, provision of government housing and a net increase in salary had the greatest impact on nurses’ employment choices. Vujicic et al. (2004) find that free housing is a powerful incentive for motivating older women with a rural background to take a rural job posting.

Who wants to work in remote areas?

Several studies find evidence that it is easier to recruit health workers with a rural origin to take jobs in remote locations (Chomitz et al. 1998; Wilkinson et al. 2000; Humphreys et al. 2002; Serneels et al. 2007; Wilson et al. 2009). In Australia, for example, it has been shown that after 5 years (from 1971 to 1976) of implementing admission policies favouring rural origin applicants, 66% of those with rural origin had become rural doctors, in comparison with 16% of doctors with an urban background (Dunbabin and Levitt 2003). Similar findings have been reported by Rolfe et al. (1995) in a study of graduate doctors from the University of Newcastle medical school between 1982 and 1988. In their study, doctors who lived in rural areas before enrolling in medical school were 2.5 times more likely to practice in rural locations than those with an urban background. Recently, similar findings were presented in South Australia (Wilkinson et al. 2000). An important result in our study is that rural origin is not necessarily sufficient to reduce the reservation wage for accepting remote work places. We find that nurses need to be recruited from ‘more’ remote places than the ones where we want them to work for such selection strategies to have any effect. This distinction has not been made in previous literature.

Another important finding in this study is that intrinsic motivation considerably reduces the wage premium required to take a remote job. Nurse students with a high intrinsic motivation have on average ~25% lower reservation wage for taking a remote job than those who do not express this attitude. The magnitude of this effect is comparable with the effect of intrinsic motivation reported in Serneels et al. (2010). Their data come from a contingent valuation study among nurse students in Ethiopia and Rwanda and their definition of intrinsic motivation is slightly different from ours (they classify students who rank ‘the opportunity to help the poor’ as the most important job characteristic with high intrinsic motivation). On a more general basis, several authors have stressed the importance of intrinsic motivation and professional commitment for public service deliveries; see e.g. Deci (1975), Wilson (1989) and Dixit (2002). Some studies have shown that women in particular—and to some extent those from NGO schools by have a higher intrinsic motivation than others (Serneels et al. 2007). We did not find these patterns in our data.

Finally, we find that older nurse students are more inclined to take a job in a remote area. Adding 1 year to the age of a student reduces the reservation wage for taking a remote job—~4% (P = 0.010). Serneels et al. (2010) also estimate how age impacts on the wage required for taking a remote job. Contrary to our results, they do not find a significant association between age and the reservation wage.

Cost-effectiveness

As our study did not systematically collect data on the costs of the alternative interventions, we are unable to accurately assess their cost-effectiveness. In a follow-up interview, the managing director of one of the remotely located nursing schools estimated the costs of a rural house to be 3–8 million Tsh (depending on the standard) and that offering 1 year of further education would cost around 2.4 mill Tshs. If salaries are paid during education, another 3 mill Tshs must be added. For a 2- to 3-year education programme, total costs could then amount to 11–16 mill Tshs. Hence, if free housing keeps the nurse in the remote location for the same number of—or more—years than the promise of further education, free housing might be the most cost-effective policy option.

A salary top-up of around 100% (i.e. around 3 mill annually) would clearly not be a cost-effective option, especially as such a top-up most likely would have to be extended to all health workers currently working in remote areas.

Study limitations

A problem with using stated preferences or hypothetical choices, instead of real choices, is that respondents may not reveal their true preferences when their choices do not have real consequences. For this reason, it would be preferable to use actual choices rather than hypothetical choices to assess the impact of policy interventions. But in many instances—and this is true in our case—there has not been enough variation in the relevant policy variables to assess their impact on actual choices (Freeman 1993; Louviere et al. 2000; Hensher et al. 2005).

The attributes we have used to differentiate remote and urban jobs might not exhaust all the important differences between these locations. Respondents may have had different jobs in mind than the ones that actually are available in the Tanzanian context. This could bias our results.

The study focuses on the first job only. Preferences can change over the life cycle, implying that our results do not necessarily reveal much about job choice later in life.

Conclusion

Incentives for taking up rural jobs stand to be an important aspect of the health systems of many countries if they are to effectively increase the share of health workers in remote areas and ultimately alleviate the distributional inequalities. Specific educational interventions are more effective in attracting nurses to remote areas than provision of free housing. Very high salary
top-ups are needed to match the effect of educational interventions and provision of free housing. Recruitment of students with remote origin seems to be quite effective in reducing the need for incentives, but only if people are recruited from places that are more remote than the place where we want them to work.

Acknowledgements
The research reported in this article was carried out with financial assistance from the Research Council of Norway and the Quota Scholarship Programme under the Government of Norway. The authors would like to thank the nursing schools’ authorities that gave us the permission to collect data from nursing students. We are also grateful to the third and fourth year students (academic year 2008/2009) for responding to our questionnaires. We are also grateful to the National Institute for Medical Research (NIMR) for issuing us a research clearance to conduct the study in Tanzania. The findings, interpretations and conclusions expressed herein are those of the authors and do not necessarily reflect the views of any individual(s) or institution(s) mentioned in the article, nor do they reflect the positions of institutions with which the authors are affiliated. M.A.M. conceived the study, participated in its design and had the initial responsibilities of data collection, analysis and preparation of the first draft of the manuscript. O.M. and G.T. conceived the study and fully participated in the design and analysis and critically commented on all drafts of the manuscripts to its final format. All authors have read and agreed on the manuscript to be submitted as it is.

Conflict of interest
None declared.

Endnote
1 The main reasons for their absence were either sickness or that they participated in clinical/practical rotations in the hospital wards.
2 By the time of data collection, the official starting salary for a nursing officer in Tanzania was about US$ 200.
3 Strictly speaking, the coefficients cannot be interpreted as percentage changes unless we are talking about marginal changes in the underlying variables. In this case, the real percentage change will be somewhat bigger than the estimated coefficients.
4 Of course, we cannot know if the difference in the impact of educational incentives is due to differences between Ethiopia and Tanzania or due to the fact that we compare different cadres of health workers.

References
Hanson K, Jack W. 2008. Health Worker Preferences for Job Attributes in Ethiopia: Results from a Discrete Choice Experiment. London School of Hygiene and Tropical Medicine/Georgetown University (Unpublished report).


Robinowitz HK. 1993. Recruitment, retention, and follow-up of graduates of a program to increase the number of family physicians in rural and underserved areas. The New England Journal of Medicine 328: 934–9.


