Determining Priority Retention Packages to Attract and Retain Health Workers in Rural and Remote Areas in Uganda

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INTRODUCTION

Human resources constraints present an important challenge to health system planners in Uganda. Attracting and retaining health workers in rural and underserved areas throughout the country has proven difficult. Currently, positions staffed by the Uganda Ministry of Health (MOH) in many of these areas remain 50% vacant (Africa Health Workforce Observatory 2009). This situation is not unique to Uganda. Health system planners in developing and developed countries alike are similarly struggling to staff positions in rural areas. The World Health Organization (WHO) recently developed global policy recommendations to aid health workforce decision-makers seeking to address rural attraction and retention issues. These guidelines suggest policy strategies to increase access to health workers in remote and rural areas through improved retention, covering four main categories of education, regulation, financial incentives, and personal and professional support (WHO 2010). The Uganda MOH is committed to pursuing a package of these strategies to make rural postings more attractive to the country's health workers, in an attempt to fill currently vacant positions. However, it is not at present clear which package of strategies would be most effective in Uganda.

One important step in determining which package of rural attraction and retention strategies will be most effective in Uganda is to estimate which strategies health workers themselves most prefer. To this end, in August 2010, the MOH, in partnership with Capacity*Plus*, USAID's global health workforce project, conducted a discrete choice experiment (DCE) survey among current students in health training programs as well as health workers practicing in rural districts to investigate preferences for potential attraction and retention strategies for postings in the country's rural areas. The results of this survey constitute an important input to the policy-making process related to the identification, costing, and selection of possible retention interventions for implementation.

METHODS

DCE is a quantitative method to determine the relative importance health workers place on different characteristics related to employment options and to predict health workers' decision-making using hypothetical choice data. Capacity*Plus* is operationalizing the DCE methodology through a user-friendly retention survey tool designed to quickly allow human resources managers to determine health workers' motivational preferences. The tool consists of a step-by-step manual with clear instructions for conducting a retention survey using the Rapid DCE methodology. The tool guides the user through all phases of the Rapid DCE in a simple, friendly, and straightforward manner and contains sample formats for each step in the process.

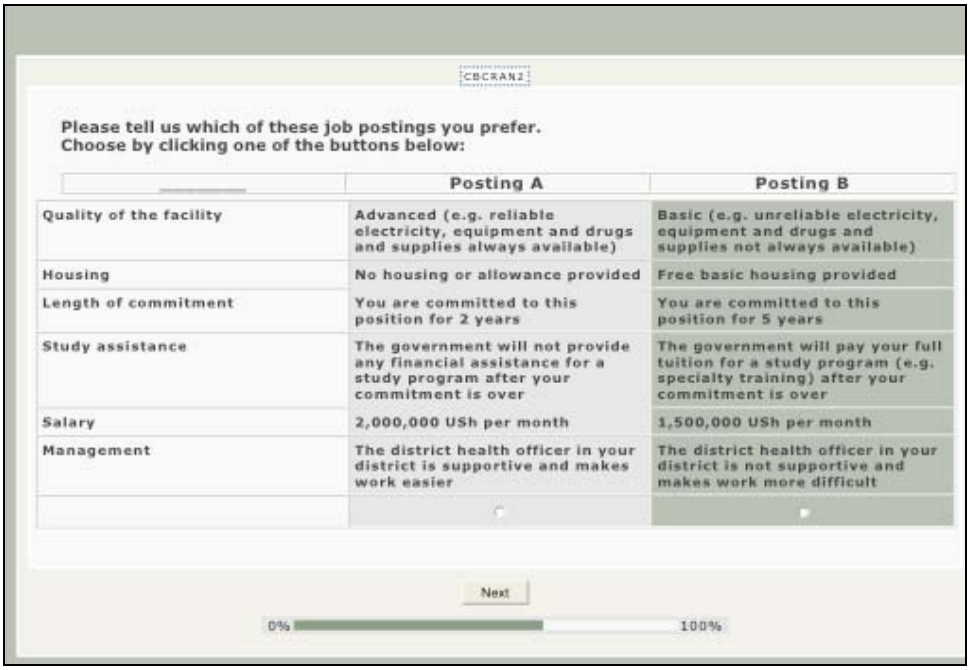
Personnel from the Human Resources Department of the MOH identified the health worker cadres to be targeted by the DCE survey. These included: 1) medical officers, 2) nursing officers, 3) pharmacists, and 4) laboratory technicians. In the first data collection phase, Capacity*Plus* staff conducted two focus group discussions (FGDs) with students representing each of these cadres, for a total of eight FGDs. The nursing FGDs also included students who were current health

workers attending upgrading courses. Discussions centered on identifying which strategies for attraction and retention among the full list outlined by the WHO are most important to health workers in Uganda. This information was then used to construct the DCE survey instrument.

In the second phase of data collection, to look at preferences for attraction to working in rural areas, DCE data were collected from a representative sample of final year students in medical, nursing, pharmacy, and laboratory programs at Uganda's three primary universities: Makerere University, Mbarara University of Science and Technology, and Gulu University. To assess the issue of retention in rural job posts similar data were also collected from a sample of health workers currently practicing in rural areas in Uganda's Western and Northern regions. Pharmacists were not interviewed because too few are currently practicing in rural areas in Uganda to provide sufficient information to aid decision-making.

Respondents were surveyed using the DCE methodology to determine which of the following aspects of job postings they consider most important when deciding where they may work: quality of the health facility, including equipment and supplies; housing situation; length of time committed to remain in the posting; potential opportunities for dual practice in the public and private sectors; government tuition support for future schooling; salary; and support from managers. An example DCE card used in the survey is presented in Figure 1. In addition to the DCE, respondents also provided information on demographics (e.g., age, sex, and ethnicity) and educational and professional experiences.

Figure 1: Example DCE Survey Card Presented to Medical Officers in Uganda, August 2010



All DCE interviews were conducted on computers. Student data were collected in university computer labs with groups of 20 respondents on average at a time. Students from the

respective cadres of interest were interviewed separately. All respondents answered questions independently. A team of 11 field researchers recruited from within the MOH, Ministry of Planning, and the Uganda Muslim Medical Bureau collected data from health workers at their respective facilities. The team attended a one-day training workshop in August 2010 to learn the basics of the DCE method and data collection protocols. The full team then split into four smaller teams for data collection activities. Eligible health care providers were identified individually at the health facilities in which they work, and data were collected on a laptop computer. DCE data collection occurred over a two-week period from the end of August to early September 2010. All interviews took approximately 30 minutes to complete.

FINDINGS

Study Sample

DCE data were collected from 246 medical students, 191 nursing students, 50 pharmacy students, 57 laboratory students, 39 medical officers, 74 nursing officers, and 45 laboratory technicians.

Respondent Demographics

Data related to the demographics of student respondents are provided in Table 1. One-third of interviewed medical students were female, while 72% of interviewed nursing students were female. Females constituted a minority among interviewed pharmacy (32%) and laboratory students (16%). Among all four cadres of respondents, a majority had previously lived in a rural area for at least one year. Student respondents had limited work experience. Nursing students, however, had by far the most work experience, with an average of 5.3 years. Further, nearly 50% of nursing students had previously worked in a rural area. Respondents from the other cadres had very little previous experience working in rural areas. However, many had completed short-term (often two-week) work assignments in rural areas as part of their training program. Between 50%-70% of respondents within each cadre stated that it was likely that they would work in a rural area after finishing their program. However, nearly all respondents claimed that they would consider rural postings after graduation.

Table 1: Descriptive Statistics for University Student Respondents

	Medical (N = 246)		Nursing[1] (N = 191)		Pharmacy (N = 50)		Laboratory (N = 57)	
	n	(%)	n	(%)	n	(%)	n	(%)
Demographics								
Female	84	(34.2)	137	(71.7)	16	(32.0)	9	(15.8)
Age								
18 – 24	177	(72.0)	55	(28.8)	38	(76.0)	48	(84.2)
25 – 34	66	(26.8)	91	(47.6)	11	(22.0)	7	(12.3)
35 – 44	3	(1.2)	35	(18.3)	1	(2.0)	2	(3.5)
45 – 54	0	(0.0)	8	(4.2)	0	(0.0)	0	(0.0)
55+	0	(0.0)	1	(0.5)	0	(0.0)	0	(0.0)
Currently married	10	(4.1)	85	(44.5)	1	(2.0)	2	(3.5)

	Medical (N = 246)		Nursing[1] (N = 191)		Pharmacy (N = 50)		Laboratory (N = 57)	
	n	(%)	n	(%)	n	(%)	n	(%)
Has children	17	(6.9)	103	(53.9)	4	(8.0)	3	(5.3)
Lived in rural area at least one year	133	(54.1)	168	(88.0)	31	(62.0)	52	(91.2)
University program and work experience								
Form of tuition payment								
Sponsored by government of Uganda	176	(71.5)	24	(12.6)	27	(54.0)	21	(36.8)
Sponsored by other group	8	(3.3)	9	(4.7)	5	(10.0)	13	(22.8)
Pay fee out-of-pocket	61	(24.8)	153	(80.1)	18	(36.0)	23	(40.4)
Years of work experience, *mean (SD)*	0.2	(1.1)	5.3	(6.7)	0.1	(0.3)	0.7	(2.9)
Worked in a rural area	9	(3.7)	92	(48.2)	0	(0.0)	5	(8.8)
Worked in rural area as part of school program	241	(98.0)	163	(85.3)	35	(70.0)	32	(56.1)
Working in rural area after graduation								
Very unlikely	34	(13.8)	10	(5.2)	6	(12.0)	3	(5.3)
Unlikely	81	(32.9)	38	(19.9)	23	(46.0)	10	(17.5)
Likely	103	(41.9)	107	(56.0)	19	(38.0)	34	(59.7)
Very likely	22	(8.9)	32	(16.8)	2	(4.0)	9	(15.8)
Preferences for job posting								
Would consider working in a rural area								
Yes	230	(93.5)	186	(97.4)	48	(96.0)	56	(98.3)
No	15	(6.1)	3	(1.6)	2	(4.0)	1	(1.8)

Note: Values may not add to total N due to missing responses (refusal to answer)
[1]68 (35.6%) nursing respondents entered their program directly from secondary school and 121 (63.4) were "up-graders" returning to school after a period of time working. 102 (53.4%) nursing respondents were in a nursing program, 45 (23.6%) were in a midwifery program, and 40 (20.9%) were in a comprehensive (nursing and midwifery) program.

Demographic information for health workers is provided in Table 2. As with the student population, females comprised a minority of medical officers (13%) and laboratory technicians (11%), while a majority of nursing officers was female (87%). For all cadres, nearly all respondents had resided in a rural area for at least a year. This is not surprising, as the sample of health workers was recruited from rural health facilities. On average, health worker respondents had about 10 years of work experience and five years of experience in their current posting.

Table 2: Descriptive Statistics for Health Worker Respondents

	Medical officers (N = 39)		Nursing officers[1] (N = 74)		Laboratory techs (N = 45)	
	n	(%)	n	(%)	n	(%)
Demographics						
Female	5	(12.8)	64	(86.5)	5	(11.1)
Age						
18 – 24	1	(2.6)	0	(0.0)	1	(2.2)
25 – 34	14	(35.9)	26	(35.1)	28	(62.2)
35 – 44	10	(25.6)	28	(37.8)	12	(26.7)
45 – 54	11	(28.2)	17	(23.0)	3	(6.7)
55+	3	(7.7)	3	(4.1)	1	(2.2)
Currently married	28	(71.8)	47	(63.5)	34	(75.6)
Has children	32	(82.1)	63	(85.1)	38	(84.4)

	Medical officers (N = 39)		Nursing officers[1] (N = 74)		Laboratory techs (N = 45)	
	n	(%)	n	(%)	n	(%)
Lived in rural area at least one year during childhood	31	(79.5)	65	(87.8)	40	(88.9)
Work experience						
Level of health facility						
Health Center IV	13	(33.3)	37	(50.0)	25	(55.6)
District hospital	10	(25.6)	25	(33.8)	12	(26.7)
Regional referral hospital	13	(33.3)	9	(12.2)	7	(15.6)
Years of work experience, *mean (SD)*	10.6	(7.7)	10.2	(8.6)	7.0	(6.8)
Years of work at current health facility, *mean (SD)*	4.8	(3.8)	5.2	(5.2)	4.9	(6.0)

Note: Values may not add to total N due to missing responses (refusal to answer)
[1]43 (58.1%) nursing officer respondents were posted as nurses and 31 (41.9%) were posted as midwives

Preferences for Attraction and Retention Strategies

Raw output from statistical models of DCE data are presented in the appendix. The data were compiled and analyzed using Sawtooth and STATA software. These outputs were used to determine the most preferred strategy packages for each cadre of interest and are presented in Tables 3–6. Student and health worker data are pooled within each cadre for these analyses. This pooling is appropriate, as stratified analyses of student and health worker data showed there was little difference between the two groups within each cadre. A measure of preference impact is provided for each strategy package. This preference impact measure reflects the percentage of the cadre population that would prefer the presented job posting to other job postings after the indicated strategy package is implemented. Each package of strategies is presented twice (Options A and B), with the only difference being the level of salary. Each of the two salary levels presented for each cadre was determined during FGDs in the first phase of data collection. The higher salary figure represents the FGD consensus response to the question, "How much salary do you think the Ministry of Health should provide for a job posting for your cadre? Please keep in mind resource limitations and respond with a reasonable figure." Then, the lower salary figure is a compromise between this higher figure and the current base salary for each cadre.

For medical officers the most preferred package of strategies included a 100% increase in salary (from a current base salary of 750,000 USh), improvements to health facility quality, a contractual commitment to the posting for two years, and full tuition support for continued education at the end of this contractual commitment (Table 3). An estimated 82% of medical officers would prefer a posting with this package of strategies to other available job postings in Uganda.

For nursing officers the most preferred package of strategies included a 122% increase in salary (from a current base salary of 450,000 USh), improvements to health facility quality, and improved support from health facility managers (Table 4). An estimated 90% of nursing officers would prefer a posting with this package of strategies to other available job postings in Uganda.

For pharmacists the most preferred package of strategies included a 150% increase in salary (from a current base salary of 800,000 USh), improvements to health facility quality, regulations allowing dual practice (i.e., the ability to own and operate a private pharmacy in addition to working at a public facility), and improved support from health facility managers (Table 5). An estimated 71% of pharmacists would prefer a posting with this package of strategies to other available job postings in Uganda.

For laboratory technicians the most preferred package of strategies included a 150% increase in salary (from a current base salary of 400,000 USh), improvements to laboratory equipment and supplies, a contractual commitment to the posting for two years, and full tuition support for continued education at the end of this contractual commitment (Table 6). An estimated 95% of laboratory technicians would prefer a posting with this package of strategies to other available job postings in Uganda.

Table 3: Most Preferred Strategy Packages and Predicted Preference Impact to Attract and Retain Medical Officers to Postings in Uganda

Results are based on interviews with medical students (N = 246) and practicing medical officers (N = 39)

Medical officers	
Package 1	
Salary Option A* 1) Increase salary to **1,500,000 USh** per month 2) Improve the quality of the health facility 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 82% of medical officers prefer this posting to other job postings	**Salary Option B*** 1) Increase salary to **1,000,000 USh** per month 2) Improve the quality of the health facility 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 64% of medical officers prefer this posting to other job postings
Package 2	
Salary Option A 1) Increase salary to **1,500,000 USh** per month 2) Train district health officers to be more supportive and effective 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 76% of medical officers prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **1,000,000 USh** per month 2) Train district health officers to be more supportive and effective 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 54% of medical officers prefer this posting to other job postings
Package 3	
Salary Option A 1) Increase salary to **1,500,000 USh** per month 2) Set commitment to position at two years 3) Provide full tuition support for school program at the end of commitment **Preference impact:** 65% of medical officers prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **1,000,000 USh** per month 2) Set commitment to position at two years 3) Provide full tuition support for school program at the end of commitment **Preference impact:** 42% of medical officers prefer this posting to other job postings

Medical officers	
Package 4	
Salary Option A 1) Increase salary to **1,500,000 USh** per month 2) Provide full tuition support for school program at the end of commitment **Preference impact:** 46% of medical officers prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **1,000,000 USh** per month 2) Provide full tuition support for school program at the end of commitment **Preference impact:** 25% of medical officers prefer this posting to other job postings

*Note: Current base salary: 750,000 USh per month. Salary Option A: 100% increase. Salary Option B: 33% increase

Table 4: Most Preferred Strategy Packages and Predicted Preference Impact to Attract and Retain Nursing Officers to Postings in Uganda

Results are based on interviews with nursing students (N = 191) and practicing nursing officers (N = 74)

Nursing officers	
Package 1	
Salary Option A 1) Increase salary to **1,000,000 USh** per month 2) Improve the quality of the health facility 3) Improve support from the facility manager **Preference impact:** 90% of nursing officers prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **600,000 USh** per month 2) Improve the quality of the health facility 3) Improve support from the facility manager **Preference impact:** 48% of nursing officers prefer this posting to other job postings
Package 2	
Salary Option A 1) Increase salary to **1,000,000 USh** per month 2) Improve support from the facility manager **Preference impact:** 74% of nursing officers prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **600,000 USh** per month 2) Improve support from the facility manager **Preference impact:** 23% of nursing officers prefer this posting to other job postings
Package 3	
Salary Option A 1) Increase salary to **1,000,000 USh** per month 2) Improve quality of the health facility **Preference impact:** 65% of nursing officers prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **600,000 USh** per month 2) Improve quality of the health facility **Preference impact:** 16% of nursing officers prefer this posting to other job postings

*Note: Current base salary: 450,000 USh per month. Salary Option A: 122% increase. Salary Option B: 33% increase

Table 5: Most Preferred Strategy Packages and Predicted Preference Impact to Attract and Retain Pharmacists to Postings in Uganda

Results are based on interviews with pharmacy students (N = 50)

Pharmacists	
Package 1	
Salary Option A* 1) Increase salary to **2,000,000 USh** per month 2) Improve the quality of the health facility	**Salary Option B*** 1) Increase salary to **1,500,000 USh** per month 2) Improve the quality of the health facility

Pharmacists	
3) Allow pharmacists to own and operate one private pharmacy 4) Improve support from the facility manager **Preference impact:** 71% of pharmacists prefer this posting to other job postings	3) Allow pharmacists to own and operate one private pharmacy 4) Improve support from the facility manager **Preference impact:** 49% of pharmacists prefer this posting to other job postings
Package 2	
Salary Option A 1) Increase salary to **2,000,000 USh** per month 2) Improve the quality of the health facility 3) Allow pharmacists to own and operate one private pharmacy **Preference impact:** 51% of pharmacists prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **1,500,000 USh** per month 2) Improve the quality of the health facility 3) Allow pharmacists to own and operate one private pharmacy **Preference impact:** 29% of pharmacists prefer this posting to other job postings
Package 3	
Salary Option A 1) Increase salary to **2,000,000 USh** per month 2) Allow pharmacists to own and operate one private pharmacy 3) Improve support from the facility manager **Preference impact:** 50% of pharmacists prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **1,500,000 USh** per month 2) Allow pharmacists to own and operate one private pharmacy 3) Improve support from the facility manager **Preference impact:** 28% of pharmacists prefer this posting to other job postings

*Note: Current base salary: 800,000 USh per month. Salary Option A: 150% increase. Salary Option B: 88% increase

Table 6: Most Preferred Strategy Packages and Predicted Preference Impact to Attract and Retain Laboratory Technicians to Postings in Uganda

Results are based on interviews with laboratory students (N = 57) and practicing laboratory technicians (N = 45)

Laboratory Technicians	
Package 1	
Salary Option A* 1) Increase salary to **1,000,000 USh** per month 2) Improve the availability of laboratory equipment and supplies 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 95% of lab technicians prefer this posting to other job postings	**Salary Option B*** 1) Increase salary to **600,000 USh** per month 2) Improve the availability of laboratory equipment and supplies 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 85% of lab technicians prefer this posting to other job postings
Package 2	
Salary Option A 1) Increase salary to **1,000,000 USh** per month 2) Improve support from the facility manager 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 88% of lab technicians prefer this	**Salary Option B** 1) Increase salary to **600,000 USh** per month 2) Improve support from the facility manager 3) Set commitment to position at two years 4) Provide full tuition support for school program at the end of commitment **Preference impact:** 69% of lab technicians prefer this

Laboratory Technicians	
posting to other job postings	posting to other job postings
Package 3	
Salary Option A 1) Increase salary to **1,000,000 USh** per month 2) Improve the availability of laboratory equipment and supplies 3) Improve support from the facility manager **Preference impact:** 92% of lab technicians prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **600,000 USh** per month 2) Improve the availability of laboratory equipment and supplies 3) Improve support from the facility manager **Preference impact:** 78% of lab technicians prefer this posting to other job postings
Package 4	
Salary Option A 1) Increase salary to **1,000,000 USh** per month 2) Improve the availability of laboratory equipment and supplies **Preference impact:** 81% of lab technicians prefer this posting to other job postings	**Salary Option B** 1) Increase salary to **600,000 USh** per month 2) Improve the availability of laboratory equipment and supplies **Preference impact:** 57% of lab technicians prefer this posting to other job postings

*Note: Current base salary: 400,000 USh per month. Salary Option A: 150% increase. Salary Option B: 50% increase

CONCLUSIONS

The findings presented here suggest that health workers in Uganda would be willing to take postings in rural areas if those postings are made more attractive. DCE data on student and currently practicing health worker preferences indicate specific strategy packages that, if implemented, may make rural postings more attractive. All cadres prefer substantial salary increases. This finding is consistent with reports from other settings and underscores the primary importance of maintaining competitive salary levels for health worker retention. Further, data from all cadres suggest that improvements to health facility quality, including better infrastructure and more dependable equipment and supplies, are important to health workers. Improvements to health facility quality may constitute a particularly cost-effective policy strategy in Uganda. Costs related to facility upgrades will be incurred once, but the benefits accrued in terms of increased health worker attraction may be multiplicative, as many health workers from various cadres interact with each facility and reap the benefits. In addition, facility upgrades such as improved access to equipment and drugs will enable health workers to provide a higher quality of care.

These findings suggest a pair of strategies that may have substantial benefit with very little associated cost. Specifically, medical officers and laboratory technicians indicated that the implementation of a contractual agreement system that clearly indicated a two-year commitment to a rural posting would make that posting more attractive. While constructing such a system would have administrative costs, these costs may be minimal in comparison to the potential benefits in terms of health worker attraction. Similarly, pharmacists indicated that regulations that would allow dual practice in the public and private sectors would make rural postings more attractive. While these regulations also have some administrative costs, they may be minimal when compared to their potential benefits.

Information provided during FGDs in the first phase of data collection for this project provides insight into specific policy strategies that the MOH may pursue to make job postings more attractive to health workers. FGD respondents indicated that, when considering the quality of the health facility they may work in, the availability of reliable equipment and well-stocked pharmaceuticals is most important. This suggests that policies aimed at strengthening these inputs in rural health facilities may be particularly effective at attracting health workers to these areas. In addition, FGD respondents made it clear that they are most interested in tuition support for full-time training degrees that would advance their career prospects, rather than support for short training courses. Finally, FGD respondents indicated that, when considering support from the manager of the facility they may work in, the clear declaration and consistent enforcement of cadre responsibilities is most important. That is to say, nurse respondents were adamant that the facility manager should ensure that they are only responsible for nursing-related activities, and not responsible for other activities such as custodial duties. This suggests that policies aimed at strengthening management support systems to enforce job descriptions may be effective at attracting health workers.

Next Step: Costing the Package Options

These data clarify student and health worker preferences for strategies for attraction and retention in the Ugandan health sector. However, they do not provide information on how much it will cost the MOH to pursue these strategies. For this information, a formal costing exercise will be required. These DCE results do suggest which strategy packages should be focused on for costing efforts. Once package costs are determined, planners should return to these DCE results and engage in a more comprehensive assessment of strategy costs and potential benefits to determine the most cost-effective attraction and retention policies for health workers in Uganda.

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APPENDIX

The following tables present output from mixed logit models of discrete choice data. For these analyses, each cadre of interest was investigated independently. Each table presents two important estimates. First, the "mean" value indicates the average utility respondents derived from specific DCE attributes. The magnitude of the "mean" values can be compared within any single table to better understand the relative values respondents within a group placed on different job posting attributes. For example, in Table 7 the "mean" value for "tuition support for future schooling" was 1.53, while the "mean" value for "housing provided" was 0.70. We can interpret these values by saying respondents valued tuition support more than twice as much as housing provided (1.53/0.70 = 2.19). However, "mean" values cannot be compared across tables. We cannot compare the "mean" value for "quality of the facility: advanced" among the medical cadre in Table 7 to the "mean" value for "quality of the facility: advanced" among the nursing cadre in Table 8. This comparison has no meaning.

The second important estimate presented in the tables is the SD value. SD here stands for standard deviation, and the values in the tables indicate the level of heterogeneity in utilities for specific attributes. Large values for SD suggest that there was significant heterogeneity in preferences for an attribute. That is to say, large values of SD suggest that while some respondents may have placed high value on a particular attribute, other respondents may have placed lower value on that attribute. Low values of SD suggest that most respondents placed similar value on an attribute.

Table 7: Results from a Mixed Logit Model of DCE Data Collected from In-Service Medical Officers and Medical Students in Uganda, 2010

	Mean	(SE)	SD	(SE)
Attribute				
Salary (continuous in 1M USh/mo.)	1.93	(0.13)***	1.34	(0.15)***
Quality of facility: advanced	0.91	(0.09)***	0.98	(0.11)***
Housing:				
Allowance provided	0.68	(0.09)***	0.12	(0.17)
Housing provided	0.69	(0.09)***	0.01	(0.13)
Tuition support for future schooling	1.32	(0.10)***	1.10	(0.11)***
Length of commitment 2 yrs (ref: 5 yrs.)	0.79	(0.08)***	0.78	(0.11)***
District health officer is supportive	0.51	(0.07)***	0.42	(0.12)***
Model diagnostics				
Number of respondents	285			
Number of observations	6,270			
Log likelihood	-1,456.6			
Likelihood ratio χ^2	239.1			

*p < 0.10, **p < 0.05, ***p < 0.01

Table 8: Results from a Mixed Logit Model of DCE Data Collected from In-Service Nursing Officers and Nursing Students in Uganda, 2010

	Mean	(SE)	SD	(SE)
Attribute				
Salary (continuous in 1M USh/mo.)	5.56	(0.42)***	4.14	(0.54)***
Quality of facility: advanced	1.05	(0.09)***	1.09	(0.11)***
Housing:				
Allowance provided	0.70	(0.08)***	0.31	(0.16)**
Housing provided	0.64	(0.08)***	0.11	(0.17)
Staffing level at facility (ref: 50% understaffed)				
25% understaffed	0.17	(0.08)**	0.03	(0.15)
Fully staffed	0.32	(0.09)***	0.28	(0.16)*
Length of commitment 2 yrs (ref: 5 yrs.)	0.02	(0.06)	0.21	(0.14)
Facility manager is supportive	1.04	(0.08)***	0.89	(0.09)***
Model diagnostics				
Number of respondents	265			
Number of observations	5,830			
Log likelihood	-1,473.9			
Likelihood ratio χ^2	231.0			

*p < 0.10, **p < 0.05, ***p < 0.01

Table 9: Results from a Mixed Logit Model of DCE Data Collected from Pharmacy Students in Uganda, 2010

	Mean	(SE)	SD	(SE)
Attribute				
Salary (continuous in 1M USh/mo.)	1.88	(0.33)***	1.09	(0.46)**
Quality of facility: advanced	0.89	(0.21)***	0.80	(0.29)***
Housing:				
Allowance provided	0.90	(0.25)***	0.08	(0.33)
Housing provided	0.93	(0.24)***	0.04	(0.25)
Allowed to own and operate 1 private pharmacy	1.95	(0.32)***	1.56	(0.36)***
Length of commitment 2 yrs (ref: 5 yrs.)	0.80	(0.27)***	1.14	(0.29)***
Facility manager is supportive	0.84	(0.23)***	0.91	(0.32)***
Model diagnostics				
Number of respondents	50			
Number of observations	1,100			
Log likelihood	-242.9			
Likelihood ratio χ^2	50.4			

*p < 0.10, **p < 0.05, ***p < 0.0

Table 10: Results from a Mixed Logit Model of DCE Data Collected from In-Service Laboratory Technicians and Laboratory Students in Uganda, 2010

	Mean	(SE)	SD	(SE)
Attribute				
Salary (continuous in 1M USh/mo.)	2.89	(0.47)***	3.21	(0.62)***
Equipment to do job	1.85	(0.23)***	1.68	(0.24)***
Housing:				
Allowance provided	0.72	(0.17)***	0.07	(0.22)
Housing provided	0.83	(0.17)***	0.41	(0.23)*
Tuition support for future schooling	1.35	(0.18)***	1.17	(0.24)***
Length of commitment 2 yrs (ref: 5 yrs.)	-0.05	(0.14)	1.24	(0.36)***
Facility manager is supportive	0.97	(0.16)***	0.64	(0.19)***
Model diagnostics				
Number of respondents	102			
Number of observations	2,244			
Log likelihood	-503.0			
Likelihood ratio χ^2	132.0			

*p < 0.10, **p < 0.05, ***p < 0.01

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