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How to attract and retain health workers in rural areas of a fragile state: findings from a labour market survey in Guinea

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Abstract

Most countries face challenges attracting and retaining health staff in remote areas but this is especially acute in fragile and shock-prone contexts, like Guinea, where imbalances in staffing are high and financial and governance arrangements to address rural shortfalls are weak.

The objective of this study was to understand how health staff could be better motivated to work and remain in rural, under-served areas in Guinea. In order to inform the policy dialogue on strengthening human resources for health, we conducted three nationally representative cross-sectional surveys, adapted from tools used in other fragile contexts.

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We found that the locational job preferences of health workers in Guinea are particularly influenced by opportunities for training, working conditions, and housing. Most staff are satisfied with their work and with supervision, however, financial aspects and working conditions are considered least satisfactory, and worrying findings include the high proportion of staff favouring emigration, their high tolerance of informal user payments, as well as their limited exposure to rural areas during training.

Based on our findings, we highlight measures which could improve rural recruitment and retention in Guinea and similar settings. These include offering upgrading and specialization in return for rural service; providing greater exposure to rural areas during training; increasing recruitment from rural areas; experimenting with fixed term contracts in rural areas; and improving working conditions in rural posts. The development of incentive packages should be accompanied by action to tackle wider issues, such as reforms to training and staff management.

Keywords: Health workers; fragile states; Guinea; rural retention; discrete choice experiment

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Introduction

Health professionals are a fundamental component of health service delivery. Their numbers, distribution, and performance directly affect health outcomes. Global studies show statistically significant associations between the density of health workforce and maternal, infant, and under-five mortality rates, and vaccination coverage (1,2).

In 2016 the Human Development Index ranked Guinea 183rd out of 188 countries (3). Guinea has a low life expectancy of 58 years, driven by high mortality ratios. Maternal mortality is still amongst the highest in the region (4). The Guinea health system is facing the challenges of high need, low funding, and maldistribution of resources (including staff), which are clustered in urban areas. Public expenditure on health increased post-Ebola but remains very low, at an estimated US$7.58 per capita (5).

Guinea's health sector is organised into three levels (6). The primary level is composed of 925 health posts and 410 health centres, which are the closest facilities to communities, and are predominantly found in rural areas. The secondary level is composed of 38 regional and prefectural hospitals that are respectively the first- and second-level referral hospitals for health centres. These tend to be located in regional and prefectural urban centres. The tertiary level has three specialised tertiary-level hospitals in Conakry. These hospitals cater largely to urban populations and the more economically advantaged. The parastatal health sector comprises three dispensaries and four hospitals associated with mining and agricultural enterprises. The private health sector consists both of non-profit and for-profit health institutions. It is mostly run by nurses and technical health agents (ATS – an auxiliary medical group trained to diploma level for two years), offering basic health services and

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64 treatment at varying prices. The formal private health sector consists of 41 clinics and 106
65 medical cabinets, as well as providers of traditional medicine.

66 The Government of Guinea has identified inequities in the composition and distribution of
67 the health workforce, as well as the low motivation and sub-optimal performance of health
68 professionals, as a critical challenge to the effective delivery of health services. At the end of
69 2014, there were 11,527 employees in public and private health facilities (6). Of these, 7,706
70 can be classified as health workers, including doctors, nurses, midwives, and ATS. This
71 represents a density of 0.62 health workers per 1,000 population, which indicates a large
72 shortfall relative to the World Health Organisation minimum target of 2.28 per 1,000
73 population (7). Urban areas are home to most of the hospitals, as well as private sector and
74 additional income-generating opportunities (formal and informal). As a result, only 17% of
75 the public sector health staff serve in rural areas, where 70% of the total population lives.
76 Health centre provision is dominated by ATS. There are also concerns about quality of care
77 provided in facilities, which often lack basic infrastructure, especially in rural areas (6).

78 The objective of this study was to understand how health staff could be better motivated to
79 work and remain in rural, under-served areas in Guinea, in order to inform the policy
80 dialogue (on strengthening human resources for health). This is a question which many
81 countries struggle with (8-10), but which has particular urgency in fragile, shock-affected
82 contexts like Guinea, where health needs are high, resources are limited, governance to
83 ensure even and well-managed services across a large territory is constrained, and the
84 divergence between living conditions in metropolitan areas and the rural hinterland are
85 especially pronounced (8,11).

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Materials and methods

Approach and tools

We conducted three nationally representative cross-sectional surveys, adapted from tools used in other fragile contexts (12,13):

1. **Health professionals:** *Health professionals (general physicians, nurses/ midwives, ATS) employed in the* primary-, secondary-, and tertiary-level health facilities in Guinea. This included generating information on the motivation, satisfaction, and preferences of health professionals employed in the health labour market, with different backgrounds and characteristics. It included a Discrete Choice Experiment (DCE) to identify and measure the relative importance of variables influencing the uptake of different jobs, including in rural areas.
2. **Patients:** *Patients who had visited a health facility recently to seek treatment.* The survey gathered data on the demographic and socio-economic conditions of patients, their choices, access, cost, perceptions of the health system and professional performance, and satisfaction.
3. **Health facilities:** *At the facilities that were visited to interview staff and patients*, information was collected on the workplace context of health professionals. The survey mainly focused on service availability, opening hours, infrastructure, equipment, staffing, patient load, supplies, privacy, and other aspects of user-friendliness.

Discrete Choice Experiment (DCE)

A DCE consists in asking health workers to make multiple choices, each time between two (or more) jobs. Each job is valued according to different attributes, which vary in their levels.

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Assuming health workers reveal their true preferences, it enables the researcher to infer the relative importance of each attribute compared to the others.

The choice of job sets was informed by preliminary qualitative work conducted in January 2017, which included focus group discussions with medical doctors, medical students, nurses, midwives, and ATS in eight institutions (46 participants in total). These discussions focused on what attributes matter in relation to job choices, and what considerations were important for the health workers in relation to working in rural areas (Box 1).

Box 1. Selected DCE attributes

- **Location:** Conakry hospital, regional hospital, or prefectural hospital. The latter was the lowest-level facility where doctors needed to be incentivised to be posted. For nurses and midwives, the lowest facility level was rural health centres (4 levels). For technical health agents (ATS), the health posts were the lowest level (5 levels).
- **Equipment:** For the infrastructure and equipment, we included a superior option which included a waiting room, a private room for health workers (with a phone and a work computer), as well as equipment appropriate for different levels of facilities (e.g. echocardiography or ultrasound machine for national and regional hospitals). The intermediate option entailed sufficient smaller instruments and supplies that all facilities should have. These include thermometers, blood pressure meters (sphygmomanometer), stethoscopes, syringes, needles, stiches, bandages, and basic drugs. The lowest option consisted in the systemic lack of infrastructure and even small equipment. This is what is reported as the current field conditions in remote areas.

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- **Housing:** This was included as a dichotomous variable: whether housing is provided by the health facility administration or not.
- **Transport:** We included a dichotomous variable: whether a motorbike is provided by the health facilities as a mode of transportation or not.
- **Time-bound contract:** This is the maximum duration the health workers would stay at the facility before being promoted or transferred to a higher-tier facility. For medical doctors, we selected five years, and for nurses, midwives and ATS we selected seven years.
- **Training:** Medical doctors had choices of specialisation or attending workshops. Nurses and midwives had workshops on specific themes, or a technical specialisation. ATS were offered the opportunity to become a nurse through a specific programme.
- **Wage:** Wage expectations for remote places were very high and had a large variability so it was decided to have two levels, with the second increment being larger than the first one.

Health professionals across four cadres were asked to choose between hypothetical jobs, according to their preferences. Since we had many job attributes, we chose to create 16 choices per health worker to be able to estimate the preferences completely (1st level interactions between attributes). The hypothetical set of jobs pairs was designed using a SAS macro %MktEx, which ensures that variance of the experimental matrix is maximised (14).

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Sampling

The sampling frame included health workers (doctors, nurses, midwives, and ATS) working in public sector health facilities in Guinea. We used a multi-stage stratified sampling approach to sample the prefectures and health facilities, and then to sample health workers and patients from the sampled health facilities. The calculated sample size for the health workers survey was 600 health workers and 480 patients. The requirement for a higher sample for the health workers was driven by the need to adjust for intra-cluster correlation related to the four different types of health workers. (The statistical assumptions used were: population size: 6,000; expected frequency: 50%; confidence level: 95%; margin of error: 5%; design effect: 1.0; number of clusters: 120; cluster size: 5.)

In the first stage, we sampled 15 prefectures (out of 33 total): Conakry, the prefecture containing the administrative centre of each of the seven regions, and another rural prefecture in each region, randomly selected with equal probabilities from among all prefectures in the region.

In the second stage, we sampled 17 hospitals in total: the three national hospitals of Conakry, the seven regional hospitals, and the seven prefectural hospitals in the selected prefectures. We also sampled three community hospitals and health centres in Conakry. These were randomly selected with equal probability from the six such health facilities in the capital. In each of the other 14 selected prefectures, we sampled one urban health centre and one rural health centre, randomly selected with equal probability from among the total number or urban and rural health centres located in the prefecture.

A total of 55 health facilities were sampled, including three national hospitals, seven prefectural hospitals, seven regional hospitals, three communal hospitals, 28 health centres,

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and seven health posts. Among them, 10 were in the forested region, 17 in the maritime region, 17 in middle Guinea, and 11 in upper Guinea. Of these 55 facilities, 34 were in urban areas and 21 in rural areas, reflecting the distribution of health infrastructure.

At the third stage we sampled the health workers and patients by sampling two or three *clusters* (each composed of five health workers), depending on the size of the facilities, in each of the 55 chosen facilities. In total, 120 clusters (600 health workers) were required, and these were allocated to the 55 facilities according to their size and complexity. Similarly, from each cluster we sampled four patients to reach the total sample of 480 patients. The field team members were given sampling forms in sealed envelopes containing the first random number and sampling steps so that they could draw the samples in the field.

Fieldwork

The survey tools were administered using computer-assisted personal interviews (CAPI) in Android tablets. The fieldworkers' manual and the data collection tools were translated into French.

Enumerators received a two-week training on administering the data collection tools. They also carried out a pilot test at the end of the training. Data were collected over two months from December 2017 to January 2018. Data were uploaded every day to a portal, where it was checked for completeness and accuracy each day by a data management expert. Any discrepancies were resolved immediately while the teams were still in the field.

Analysis

Data were transferred to Stata using StatTransfer. Data were then further checked, prior to the analysis, for ranges, outliers and internal inconsistency, and were cleaned.

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We analysed data using R and Stata. Multiple regression and two sample tests for proportions were used to see statistical significance. Statistical tests were considered significant at 95% confidence level with a p-value of less than 0.05.

Descriptive statistics were presented for health workers, patients, and health facility data by different attributes, including geographical regions, locality (urban–rural), health facility types, and health worker types.

During analysis, we grouped the health workers into 'highly motivated' and 'less motivated' categories, as well as 'mainly intrinsically motivated' and 'mainly extrinsically motivated' categories, based on a composite score for their motivation profile, consisting of 21 explicit indicators (for full details, see (15)).

The grouping of health workers according to their levels of satisfaction was done based on a composite score, consisting of measures of a) their confidence and reported efficacy, b) workload, c) work environment, c) financial situation, and e) four generic satisfaction scales concerning their career.

For the health facility survey, we generated a composite index with the health facility data, classifying the health facilities into 'better equipped' and 'poorly equipped' facilities, and we used that variable to examine the association of this classification with the health workers and patient survey data.

We divided the patients' survey participants by their socio-economic status using information about their assets. We also grouped the patients into 'satisfied' and 'unsatisfied' to test further associations.

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We used Guinean Franc (GNF) as the currency for the DCE tool and presented the findings in United States Dollar (USD) (at the exchange rate from August 2018 of 1 USD = 9,014 GNF).

Ethics

The study protocols were approved by the National Ethics Committee for Health Research of the Ministry of Health in Guinea in October 2017. Informed consent was obtained from all respondents prior to data collection and data were anonymised prior to analysis.

Results

In the health worker survey, we sampled 600 health workers. One of the interviews was incomplete, leaving a sample of 599 health workers, including 153 (26%) doctors, 111 nurses (19%), 74 midwives (12%), and 261 (44%) ATS. Out of 153 doctors, 22 (4% of the entire sample) were specialist doctors. 57% were female and 43% male.

Health worker location and career history

Only 16% of health workers worked in rural areas, reflecting the national maldistribution of staffing. 95% were permanent employees.

Among the doctors, 96% were trained in Conakry and only 28% practised in rural areas during their training (Figure 1). Those working in rural areas were significantly more likely to have had exposure to rural areas during training (49% versus 39%). Nurses and midwives trained in two to three sites, and 44% and 35%, respectively, practised in rural areas during their training. For ATS, although their training occurs in the widest range of sites, just under half (47%) practised in rural areas during training.

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Figure 1: Proportion of health workers who practised in rural areas during training, by health workers type

This was also reflected in their work practice – only 9% of the sampled doctors had worked in rural areas for more than 10 years, while this proportion was even lower for midwives (6.5%). 25% of nurses and 28% of ATS had worked in rural areas for ≥10 years. Current work location reflected work experience: 86% of staff who worked in rural areas had previously worked in rural areas, compared to only 38% for those who worked in urban areas. Staff in urban facilities were significantly more experienced and remained in their posts longer (mean: 8.2 years in workplace at the time of the study) than staff in rural areas (only 3.2 years).

Motivation to join the profession and preparedness

"Helping others" was the overwhelming majority of the reported reasons for becoming health workers for all four cadres, with no significant difference between those in rural and urban areas (Figure 2).

Figure 2: Main reason to become a health worker

Typically, health workers felt well prepared for their job (78%–88% across groups). However, 12% of doctors felt not at all prepared. 49% of health workers in rural areas indicated that they had to perform tasks "daily" or "often" for which they felt inadequately prepared, compared to 39% for urban staff (Figure 3).

Figure 3: Proportion of health workers performing tasks without required training

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Workload

Most staff (61–89% across the groups) felt that their colleagues were working as hard as they were, and there were no noteworthy differences in this across rural and urban areas. This was reflected in reported working days and hours, which were relatively uniform, at around 8.5 hours per day and six days per week across the cadres. Rural health staff worked significantly longer hours per week (58 versus 50 for urban health staff) and saw a higher number of patients per day but the difference was not significant (8.4 versus 7.7 for urban health staff). Only a small proportion of staff (6% in rural areas and 3% in urban areas) felt that they had a workload that was more than they could handle (Figure 4).

Figure 4: Perceptions of health workers on workload, by cadres and locality

Satisfaction

The average health worker was quite satisfied with life in general (a score of 2.8, out of 4), and felt neutral satisfaction about their career prospects (2.6) and work–life balance (2.6). Health workers were the most unsatisfied with their financial situation (2.1) and then their working conditions (2.4), although this was mainly felt by doctors and midwives. There was no statistically significant difference between urban and rural workers in any of these areas.

A composite index covering 22 indicators suggests greater dissatisfaction for doctors, compared to other cadres, and a significantly higher level of dissatisfaction for rural staff (11.5 versus 10.3 for urban staff, out of 20). Predictors of reported general satisfaction with life included good working conditions, being intrinsically motivated, and coming from a better socio-economic background. In relation to the composite satisfaction score, working in urban

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289 areas and being female were also significantly and positively associated with satisfaction
290 (Table 1).

291 **Table 1: Multiple regression model for predicting satisfaction composite score and**
292 **overall satisfaction with life**

	Stated satisfaction with life overall			Satisfaction composite score		
	est	SE	p-value	est	SE	p-value
is female	-0.007	0.055	0.897	-1.38	0.39	0.010**
age	0.002	0.023	0.931	0.13	0.09	0.174
age squared	0.000	0.000	0.721	0.00	0.00	0.088*
has a spouse or is engaged	0.022	0.085	0.803	0.18	0.43	0.693
number of children	-0.022	0.013	0.131	0.02	0.06	0.806
family background (socio-economic quintile)	0.065	0.027	0.049**	-0.13	0.20	0.540
currently works in rural facility	-0.062	0.097	0.544	1.02	0.41	0.0410**

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	Stated satisfaction with life overall			Satisfaction composite score		
	est	SE	p-value	est	SE	p-value
currently works in hospital	-0.097	0.057	0.132	-0.09	0.56	0.881
is a nurse	-0.106	0.146	0.493	-0.31	0.26	0.274
is a midwife	0.002	0.140	0.989	-0.55	0.57	0.368
is an ATS	0.022	0.064	0.747	0.00	0.67	0.994
income (US$)	-0.000	0.000	0.197	0.00	0.00	0.947
income squared (US$)	0.000	0.000	0.111	0.00	0.00	0.913
number of years as a health worker	0.000	0.002	0.852	-0.01	0.01	0.652
extrinsic motivation (external)	0.048	0.035	0.215	0.22	0.19	0.298
extrinsic motivation (introjected)	0.003	0.045	0.943	-0.07	0.13	0.622
extrinsic motivation (integrated)	0.064	0.035	0.109	-0.34	0.22	0.170

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	Stated satisfaction with life overall			Satisfaction composite score		
	est	**SE**	**p-value**	**est**	**SE**	**p-value**
intrinsic motivation	0.086	0.025	0.012**	-0.67	0.13	0.001***
supervisor considers worker needs	0.033	0.050	0.532	-0.72	0.36	0.086*
facility equipment is good	0.083	0.024	0.009**	-4.03	0.36	0.000***
N		*572*			*572*	
r2		*0.1016*			*0.521*	

293 ** p<0.1, ** p<0.05, *** p<0.01*

294

295 On specific questions about their career, most of the mean scores indicate high satisfaction
296 or positive feelings. The exceptions were worries about being unemployed or being posted
297 elsewhere, and agreement with the statement that it is difficult for health workers to care
298 much about whether the work that they do was done correctly or not.

299
300 The majority (60%) of health workers felt that the facility met the demands of their patients.
301 However, doctors were the most critical, with only 37% feeling so. Health workers wanted to

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see improvements most in the skills of their colleagues (35%), the equipment (29%), and the infrastructure of their facilities (15%). While there was little variation among the four cadres, there were some significant differences between urban and rural health workers: 15% of rural workers wanted to see the availability of medicine and materials improve, compared to 6% of urban workers. Also, 9% of urban workers wanted to see the cleanliness and hygiene of their facilities improve, compared to 4% of rural health workers (Figure 5).

Figure 5: Breakdown of the one most important thing health workers would like to improve in their health facility

Career plans and preferences

A large majority (85%) of health workers preferred to work in urban areas in the longer term (Table 2). However, this average was much higher for doctors (94%), nurses (91%), and midwives (91%), while it was lower of ATS workers (75%). As expected, a greater proportion of those who worked in urban areas preferred to work in urban areas in the longer term (89%) than those who worked in rural areas (63%). Furthermore, a large proportion of health workers plan to migrate abroad (85%). This was consistent across the cadres and between urban and rural workers, with no significant difference between groups. 73% of health workers wished to transfer from their position in the near future, and, again, this was quite consistent across the cadres and localities. Of the 11% health workers that wanted to change professions, most said it was because they were looking for better career options or income prospects.

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Table 2: Health worker preferences (location, position, and profession)

		by designation				by locality	
	Overall	Doctor	Nurse	Midwife	ATS	Urban	Rural
Prefers urban areas	85%	94%	91%	91%	75%	89%	63%
Looking to migrate abroad	84%	82%	88%	86%	82%	83%	88%
Prefers to transfer to new position	73%	76%	75%	77%	70%	72%	80%
Looking to change profession	11%	7%	3%	11%	16%	10%	15%

Those who intended to continue working in the health sector (89%) preferred to stay in the public/government sector (77%), while 10% preferred to switch to the private section and 14% to the non-government organisation/faith-based sector. A higher proportion of midwives preferred to stay in the public section (89%), compared to other workers, while doctors were more likely to want to switch to the private or non-government organisation /faith-based sector. There was little difference between those working in rural and urban areas in terms of preferring to stay in the public section (76% and 80%), while more urban workers preferred

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to switch to the private sector (11%) than rural (4%). Preferences by facility type largely reflect the distribution of staff across facility types.

If health care workers had prior experience of working in rural areas, they had a 14.6% greater likelihood of working there (Table 3). Each additional year of prior experience working in a rural facility was associated with a 1% increase in likelihood of preferring to work in rural areas in the long term. However, it was interesting to note that having some exposure to rural areas during training did not have a strong correlation with the fact that they were working in rural areas but had some correlation with a preference to do so. Another predictor of working in and preferring rural facilities was a health worker's motivation. Those with higher intrinsic motivation were more likely to be working in urban facilities (3% more likely) – perhaps because of the better working conditions found there – but were most likely to prefer rural facilities in the longer term.

Table 3: Multiple regression model for predicting whether health worker currently works in and has long-term preference to work in rural health facility

	Currently working in rural area			Has long-term preference to work in rural area		
	est	**SE**	**p-value**	**est**	**SE**	**p-value**
is female	-0.029	0.028	0.330	-0.016	0.016	0.340
age	-0.026	0.011	0.043**	-0.028	0.016	0.130

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age squared	0.000	0.000	0.147	0.000	0.000	0.215
has a spouse or is engaged	0.050	0.040	0.249	0.018	0.041	0.676
number of children	-0.001	0.009	0.882	0.012	0.008	0.158
socio-economic family background (1–5)	-0.027	0.013	0.083*	-0.021	0.012	0.131
grew up in rural area	-0.001	0.052	0.984	0.046	0.038	0.271
exposed to rural areas during training	-0.045	0.047	0.369	0.039	0.018	0.064*
has experience in rural area	0.146	0.066	0.064*	0.017	0.044	0.706
number of years of experience in rural area	0.024	0.004	0.000***	0.010	0.004	0.034**
extrinsic motivation (external regulation)	0.030	0.017	0.134	-0.029	0.014	0.071*
intrinsic motivation	-0.028	0.012	0.043**	0.011	0.006	0.113
currently works in rural area				-0.101	0.042	0.045**
N		*592*			*592*	
r2		*0.267*			*0.130*	

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*Note: Robust standard errors clustered by region; *p<0.1, **p<0.05, ***p<0.01*

Remuneration

Health workers had a mean monthly net salary of 185 USD and median of 156 USD, ranging from 127 USD for rural ATS to 551 USD for rural doctors. On average, health workers received an additional public payment of 19 USD (median of 2 USD), although this low value was due to 32% of health workers not receiving any other kind of non-salary payment.

Doctors were more likely than other health workers to receive additional non-salary payments, with 68% of urban doctors and 60% rural doctors receiving other payment. In particular, they were more likely to receive transport, housing, and other allowances. Nurses, midwives, and ATS workers received similar treatment in terms of getting allowances and other non-salary payments. Overall, there did not appear to be a consistent trend as regards urban and rural health workers.

Looking at payment amounts for the various non-salary payments, there was very little variation across cadre and locality. The median monthly payment for transport was 30 USD and for housing it was 11 USD, and these values were the same for all eight cadre and locality combinations. Perdiem and performance-based pay had more variation, as would be expected. Altogether, the median total non-salary payment was 45 USD, with the medians similar across cadre and locality.

Health workers received payments regularly, with 95% never experiencing a missing payment. However, one-third have been paid late. The average number of late payments in the last

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373 year was 1.5. The estimate was higher for doctors (1.8) and midwives (2.0), and higher for
374 rural workers (2.2) compared to urban (1.3).
375
376 16% of health workers claimed that it was common practice for patients to pay for their
377 services. This proportion was higher in rural areas (22%) than urban areas (15%), although the
378 difference was not significant. 53% of health workers were comfortable with accepting
379 payment and this was higher for rural workers (62%) than urban workers (51%), though not
380 significantly so. A range of other remuneration strategies were also pursued. Overall, 14% of
381 health workers said it was common practice to receive payments to receive better treatment
382 in public facilities, with an average of 14 USD received by health workers from this source.
383 The proportion was higher in rural facilities (22%) than urban facilities (13%). Receiving gifts
384 was widely prevalent, with 60% of health workers receiving gifts, and this was higher in urban
385 facilities (62%) than rural ones (49%). Of those who said it was common, 88% were
386 comfortable with the practice.
387
388 In terms of pursuing other economic activities, 23% of health workers said it was common
389 practice to privately consult patients outside of work hours, and to receive an average of 10
390 USD per week doing so. Unexpectedly, the proportion was higher among rural workers (36%)
391 than urban workers (20%). 21% of health workers also say it was common practice to pursue
392 non-health-related income-generating activities, like farming, in addition to being a health
393 care professional.

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Supervision and absenteeism

Most health staff had their supervisors present at their workplace, though this was higher in urban areas (99%) than rural areas (90%), and overall satisfaction with supervision was high (75% of the sampled doctors and 88% of the sampled ATS agreed with the statement that their supervisors consider their needs). Most supervisors' initial reaction to their staffs' absenteeism was understanding the reasons for their absence (63–78% of staff across the cadres expect this behaviour), though sanctions and warnings of various kinds were also likely. Only 1–3% of staff across cadres believed that no action would be taken in the event of staff absence.

Staff reported that colleagues were absent for two to three days per month on average, with sickness being the main reason, followed by family-related reasons. Reported absence data suggested about 11% of working days are lost each month, with higher levels for doctors than other staff and higher levels for urban areas (though the difference was not significant).

Motivational profiles

Health staff showed low levels of amotivation, moderate levels of intrinsic motivation, and high identified and integrated regulation (2.5 points out of 4, which is much higher than the scores for external and introjected regulation). This suggests that the average health worker is motivated most by helping others, having responsibilities, having a sense of meaning in their work, and feeling personally responsible. There were no significant differences across groups in relation to this. Intrinsic motivation, somewhat contrary to expectations, was significantly higher for urban than for rural health staff.

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DCE

For the DCE, the responses were well balanced on the whole, though a small but significant proportion of health staff followed dominant attributes: 10% of doctors always opted for specialisation, while 8.5% always followed the largest wage. For nurses and midwives, some locations dominated: 13% of nurses always picked Conakry as a choice for posting, while 7% always picked a regional hospital; the equivalent for midwives was 22% and 4%, respectively.

The DCE analyses indicated that for all health workers, except ATS, location and training were the most significant items (Table 4). For doctors, Conakry and regional hospitals carried about the same value, but the negative cost associated with a prefectural (district) hospital was the largest, estimated at around 568 USD. For nurses and midwives, the lowest-level facility was the rural health centre, for which they would require 435 USD. However, prefectural locations were not significantly different from Conakry or regional hospitals. For nurses and midwives, increasing their human capital was more important: a nursing specialisation and frequent workshops were valued at about 640 and 718 USD per month, which is extremely high. ATS also valued upgrading their skills and status to that of nurses, at an additional 458 USD, which was also the single largest attribute. Specialisation comes second for doctors, at about 439 USD, while training workshops would be worth 121 USD.

Table 4: MRS: monetary value in USD

	Doctors		Nurses/midwives		ATS	
	MRS	**p-value**	**MRS**	**p-value**	**MRS**	**p-value**
Location (ref.=Conakry)						
Regional hospital	14.64	0.725	141.56	0.079	307.30	0.004

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Prefectural hospital	-568.45	0	36.17	0.665	260.37	0.007
Rural health center			-434.88	0.001	204.68	0.042
Rural health post					2.22	0.979
Working condition/equipment (ref.=poor)						
Medium	127.14	0.011	248.28	0	22.74	0.516
Good	165.74	0	296.54	0	57.47	0.107
Training (ref.=none)						
Workshop	120.59	0.002	640.78	0		
Specialisation	439.21	0	718.33	0		
Nursing school					458.07	0
Time-bound (ref.=none)						
5 years	21.52	0.581				
7 years			62.13	0.174	5.33	0.871
Housing						
Yes	102.84	0.001	126.36	0.003	47.15	0.264
Motor-bike						
Yes	68.89	0.032	215.11	0	136.90	0

In third overall position were the material conditions at the health facility, valued by medical doctors at 127 USD for medium-level and 166 USD for good conditions. Nurses and midwives valued working conditions more, at 248 USD and 297 USD per month on average respectively. Material conditions were not significant for ATS. Good conditions were more appreciated than medium-level conditions by all cadres, but the difference was not statistically significant.

In fourth position was housing, at about 103 USD for doctors, 126 for nurses and midwives, and 47 USD for ATS. The value placed on motorbikes was more varied: doctors value them less than housing, at only 69 USD, while nurses/midwives and ATS value them more than housing, at 215 USD and 137 USD, respectively, per month. The difference between the housing and transportation mean was, however, not statistically significant for any group

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In disaggregated analysis, there was little significance in the various groups of doctors tested. Gender and rural origins do not shape preferences significantly. There were only two attributes which were subject to change: motorbikes and specialisation were preferred by younger doctors (under 44 years) and disliked by older ones. Specialisation was also not sought as much by doctors who were married and have a house, but was aimed at by doctors from a self-reported lower economic status.

There was a lot more diversity in preferences among the nurses and midwives group. In terms of location, those that were married, from rural origins, poorer, older, and male preferred a regional hospital or a prefectural hospital, rather than a location in Conakry. Nurses/midwives from a rural area, of self-assessed poor socio-economic status, and male, even positively valued a posting in a rural health centre. The high value of equipment and specialisation came from the younger cohort and the middle class. A limited-term posting mainly interested the young cohort.

For ATS, there was less heterogeneity in the preferences of different groups. As for other health workers, younger people valued studying more. Socio-economically wealthy people had a strong preference for staying in Conakry. ATS from rural origins valued a good wage, while females valued it less.

Based on the DCE results and knowledge/assumption about the current levels of the attributes, it is possible to predict the “natural” allocation of health workers in the different location. We call this a bundle analysis. We first designed a baseline scenario, which consisted of a typical job at each facility level. Applying these assumptions, the natural equilibrium

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would leave the lower-level facilities understaffed, with only 9% of doctors, 11% of nurses/midwives, and 15% of ATS choosing to work there. This is even lower than the actual allocation.

We proposed a medium-level equipment and workshops for rural jobs scenario and estimate that the share of doctors in prefectural hospitals would increase to 15% (Figure 6). A second improvement would be to give to those who go to rural areas, instead of the workshops, a higher probability of specialisation. The simulation for this gave a very large increase in uptake: 26% (equal to increasing wages by 444 USD). The third upgrade would be a 'brick and mortar' refurbishing of the prefectural-level facilities, as well as building a house for the doctors. This would increase uptake by an additional 6% (~one-third uptake) and would also improve patients' welfare through improved facilities and longer operating hours for emergencies. Finally, the fourth option would be to roughly double the wages of doctors, on top of the housing, good materials, and specialisation possibilities, which was expected to lead to 44% of doctors practising at the prefectural level.

Figure 6: Uptake rate of prefectural posts for doctors

For nurses and midwives, the 'natural' allocation to rural health centres (under the same assumptions as for doctors) would be only 11%, and more than two-thirds would be in Conakry or in a regional hospital. This is not in line with the optimal allocation of health workers. We estimate that providing either workshops or offering specialisation to upgrade their skills, associated with improved equipment, would increase the uptake rate of rural jobs almost threefold (**Error! Reference source not found.**). This alone would provide a good balance of the nurses and midwives across different facility types.

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Figure 7: Uptake rate of rural health centre jobs for nurses and midwives

The ATS distribution among all levels is not as imbalanced as the market of doctors, nurses, and midwives: at baseline, 21% would work at the rural health centre level, and 15% in health posts. As for other health workers, the skills upgrade (to nurse) would be an important motivator, bringing uptake rates to 27% in health posts (**Error! Reference source not found.** 8). While equipment or housing would not have a large effect, a wage increase of US$222 would increase uptake by an extra 7%.

Figure 8: Uptake rate of jobs in rural health posts for ATS

Users' perspectives

Our patient sample was more balanced than for health workers, with 47% of patients living in rural areas. The high socio-economic need of the population was illustrated by the fact that 67% of all patients could read or write and had not completed primary education (80% of patients in rural areas have not completed education). 74% in rural areas described themselves as poor or very poor; in urban areas this was still 53%.

A quarter of the patients lived within 1 km of the health facility and the median distance from the facility was 3 km. Looking at socio-economic status, distance tended to have a correlation with the patients' wealth, as those in the lowest socio-economic quintile travelled an average of 25 km, the middle quintile 12 km, and the highest quintile 8 km. The larger travelling distances were often related to the patients from rural areas travelling to urban tertiary hospitals. On average, patients from rural areas travelled 21 km, while urban patients travel 8 km. Most rural patients walked to their health facility (58%), while urban

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517 patients were most likely to use public transport (61%). The mean duration of travel was 41
518 minutes, ranging from one minute to three hours.

519 The waiting time was less than an hour for 77% of the patients and within one to three
520 hours for 21% patients. Very few patients (7 out of 485) had to wait for longer than three
521 hours before the consultation. Those with the lowest socio-economic status tended to wait
522 less and this could be due to wealthier patients living in urban areas where facilities are
523 busier. Patients from rural areas were seen within the hour 81% of the time, compared to
524 73% from urban areas.

525 Consultation times varied across rural and urban areas – 15 minutes on average in the
526 former and 21 in the later. Patients reported high scores on most domains of quality, with
527 little difference between rural and urban areas. Patient satisfaction was high for all domains
528 – overall satisfaction was 93% in rural areas and 89% in urban – and most would
529 recommend the facility to friends and family. Patients awere most satisfied with the
530 language spoken, gender, and attitude of the health professional, and with laboratory
531 investigations and physical examinations. They were least satisfied with the cost of
532 treatment, the explanation of the illness, and taking the history of the illness.

533 71% of patients made some forms of payments at the health facilities, with a median
534 payment of US$8 for those who could recollect amounts. Comparing patients coming from
535 rural versus urban areas, 76% of patients living in urban areas had to pay fees, compared to
536 66% of those living in rural areas. However, the median total fee was lower for urban
537 dwellers at US$7, compared to US$8 for patients from rural areas. There did not appear to
538 be any significant trend across socio-economic status.

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Only 27% received a receipt for their payment (31% in urban areas; 21% in rural). 2% reported paying a member of staff for better service and 2% reported providing gifts to staff. Most paid using household income (72% in rural areas, 28% in urban) and close to zero households were protected by cost sharing mechanisms such as insurance (0.7% in rural areas, 0.5% in urban). The second strategy was to rely on savings (17% of rural patients, 26% urban). However, some had to adopt more risky strategies, such as sale of assets (5% of rural, 1% urban) and loans from family or friends (10% of rural, 9% urban). According to the patients, in the future they would apply the same strategies, though with a higher emphasis on drawing on savings, taking loans, and selling assets.

Health facilities

The findings on facility functioning highlighted the unequal distribution of resources, with facilities in rural areas more likely to be poor or average in their functioning (none were found in the better functioning third of the sample). Equally, regional patterns were clear, with less well functioning facilities predominant in upper Guinea. These findings reflect that the higher-level facilities were more likely to be better performing.

Discussion

This study adopted a complex methodology, combining nationally representative health worker survey, DCE, patient exit interviews and facility surveys, triangulated to better understand the drivers of health staff motivation, retention, satisfaction and performance in Guinea.

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Consistent with earlier data from Guinea (6), our findings highlight the high needs of the population and the maldistribution of health staff. The findings highlight some encouraging areas – for example, the relatively high levels of satisfaction of staff and users in many domains – as well as more worrying features, such as the high proportion of staff favouring emigration, and their high tolerance of user payments for services and quality. Areas of concern which are flagged up include the lack of confidence exhibited by a substantial minority of staff in relation to core tasks which they regularly have to carry out, which reinforces existing published evidence on quality of essential health care in Guinea (16), as well as their limited exposure to rural areas during training. Most staff are generally satisfied with their work and with supervision. However, financial aspects and working conditions are considered by them to be least satisfactory. Moreover, from the patient side, we learn that privacy is not well respected in health facilities. Consistent with existing evidence, the high prevalence of out-of-pocket payments by patients is highlighted. Given the low levels of receipting, it is not clear how far these are formal or informal. Some households are driven to risky strategies to pay for healthcare, such as asset sales.

It is relevant to compare the survey findings with qualitative results from our focus group discussions (15). These highlighted the need to present rural service as a temporary state – many doctors, for example, are unwilling to be posted to rural areas (which for them means any place more than 10 km from a city, and includes prefectural capitals, due to their small population and limited facilities), as they are seen as places from which it is very hard to leave. Their concerns include professional isolation, poor living and working conditions, and also the difficulty of getting promoted when working in rural areas. The costs of living and housing are higher in these areas, the rural allowance is inadequate to cover this gap, and

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583 work opportunities for them and their families are limited. Workloads are regarded as
584 higher in rural areas (as supported by our survey) and training opportunities fewer. Health
585 staff have no health insurance and transportation is challenging. All of these aspects – which
586 are shared in studies addressing this question in other low income and fragile contexts
587 (8,13,17-20) - need to be addressed in order to retain doctors at the prefectural level.

588 Certain policy responses emerge as promising: in particular, offering upgrading and
589 specialisation in return for rural service; providing greater exposure to rural areas during
590 training; increasing recruitment from rural areas; experimenting with fixed-term contracts in
591 rural areas, especially for younger staff; improving working conditions in rural posts; and
592 attracting staff with high intrinsic or external introjected motivation.

593 In terms of recruiting and retaining health staff in rural areas: for doctors, it is clear from the
594 DCE that conditional specialisation options, particularly for younger doctors, could be a
595 powerful motivator to attract and retain doctors at prefectural hospital level, followed by
596 investment in facility equipment and provision of housing and transport. This is consistent
597 with findings in other contexts about the importance of specialisation for doctors (21). This
598 may require regulatory adaptation to civil service rules in Guinea.

599 To motivate nurses and midwives to serve at the health centre level would require,
600 according to our findings, training options linked to rural services, alongside investment in
601 moderate levels of equipment, transport, and housing. These actions are more likely to be
602 effective for staff from poorer backgrounds and rural areas.

603 For ATS, offering upgrading training after a period of service in rural areas, especially for
604 younger staff, could be an effective motivator, alongside the offer of transport and housing.

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605 Staff from poorer backgrounds, and potentially women, may be more attracted by this
606 package.

607 The study has some limitations. We did not attempt to survey community health workers.
608 Although the community health workers do perform important functions in Guinea, the
609 study focused on the formal health workforce. We did not attempt to survey staff working
610 purely in the private sector, as this was not our focus, although our tools do shed important
611 light on health staff dual practice and attitudes towards working in the private versus public
612 sector. We also used a tool for gathering patient evidence (exit interviews) which is
613 exclusive to users, rather than the wider (including non-user) population. The justification
614 for this was our focus on the experiences of those engaging with public sector facilities and
615 staff. More reliable measures of quality of care, such as use of vignettes or mystery
616 shoppers, might have been warranted if quality of care had been a stronger focus of our
617 work, however, we have used patient reports as this was only one component of the labour
618 market study, and so the resource intensity of more robust techniques was not warranted.
619 The focus here was on generating largely quantitative analysis on staff preferences and
620 policy-modifiable factors influencing their choices on location in particular. For these
621 purposes, our tools were adequate, though in future additional qualitative interviews at
622 local and national level could help shape our understanding of what margins there are for
623 human resource package reforms.

624 This study has not examined cost-effectiveness, which should be further considered as the
625 Ministry of Health develops its national human resources strategy. It is likely that a focus on
626 supporting mid-level cadres in rural areas will be a priority, given the limited funding and
627 existing extreme maldistribution. International evidence suggests that well-supported mid-

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level cadres (such as ATS) can provide appropriate healthcare in rural areas (10). Addressing the health workforce imbalance, in Guinea as in other stressed settings, also requires a good understanding of what is feasible within the local political economic context (22), which will require further elaboration in the context of plans in Guinea to allocate funds from mining industries to local authorities.

The study has also not considered the issue of how posts and funds are allocated from the MoH side, as our objective was to understand health workers' perceptions, motivation, and preferences. The wider evidence base highlights the importance of ensuring funding is made available for rural health posts and is managed in a decentralised way, so that health staff who do not take up positions in these areas cannot continue on the public payroll in urban areas (10). Local performance management is likely to be more effective and supportive in other ways too, and is consistent with the wider regional and international emphasis on decentralisation, accountability, and resource allocation according to results (23). This will require changes to public funding, as well as capacity building and improved incentives for local-level managers in the public sector. In relation to patients' payments, there should be action at each level to ensure that user fees are reduced through better risk pooling and that fees are predictable, transparent, and fully receipted, with zero tolerance of informal payments.

Conclusions

The objective of this study was to provide analysis to inform more effective human resource policy making and improve the distribution of staff to rural areas, in particular. This policy challenge is common to many countries, but especially acute in low income and fragile states, where the levers to manage the public health care market effectively are typically

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651 weak. The research also aims to add to the hitherto limited research on human resources
652 for health in francophone Africa.
653
654 Our findings highlight some encouraging findings around staff satisfaction, including with
655 supervision and non-financial aspects of their work. However, they also raise concerns
656 around staff preparedness for their roles, future career intentions and informal charging.
657 Options for better rural attraction and retention include offering upgrading and
658 specialisation in return for rural service (especially for doctors); providing greater exposure
659 to rural areas during training; increasing recruitment from rural areas; experimenting with
660 fixed-term contracts in rural areas, especially for younger staff; improving working
661 conditions in rural posts; and attracting staff with high intrinsic or external introjected
662 motivation. However, the development of incentive packages should be accompanied by
663 action to tackle the wider issues too, through reforms to training and decentralisation of
664 human resources funding and management, considering all stages of the human resource
665 journey and with sensitivity to the different staff profiles and preferences expressed in this
666 study.

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672 **Declaration of interest statement**

673 The authors report no conflict of interest.

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674 **References**

675 (1) Anand S, Barnighausen T. Health workers and vaccination coverage in developing
676 countries: an econometric analysis. The Lancet 2007;369(9569):1277-1285.

677 (2) Anand S, Barnighausen T. Human resources and health outcomes: cross-country
678 econometric study. The Lancet 2004;364(9445):1603-1609.

679 (3) UN Development Program. Human Development Report 2016. 2016.

680 (4) World Health Organisation. Guinea: WHO statistical profile. 2015.

681 (5) World Bank. World Bank Data: Guinea. 2018.

682 (6) Ministry of Health. National Health Development Plan, Republic of Guinea. 2015.

683 (7) WHO. The World Health Report 2006: Working together for health. 2006.

684 (8) Wurie H, Samai M, Witter S. Retention of health workers in rural and urban Sierra Leone:
685 findings from life histories. Human Resources for Health 2016;14(3).

686 (9) University of Zambia School of Medicine and Dalhousie University's WHO/PAHO
687 Collaborating Centre on Health Workforce Planning and Research. A Synthesis and
688 Systematic Review of Policies on Training and Deployment of Human Resources for Health in
689 Rural Africa. 2014.

690 (10) World Health Organisation. Increasing access to health workers in remote and rural
691 areas, through improved retention. 2010.

692 (11) Witter S, Bertone M, Chirwa Y, Namakula J, So S, Wurie H. Evolution of policies on
693 human resources for health: opportunities and constraints in four post-conflict and post-
694 crisis settings. Conflict and Health 2017;10(31).

695 (12) Hou X, Witter S, Zaman R, Engelhardt K, Hafidz F, Fernanda J, et al. What do health
696 workers in Timor-Leste want, know and do? Findings from a national health labour market
697 survey. Human Resources for Health 2016;14(69).

698 (13) Smitz M, Witter S, Lemiere C, Eozenou P, Lievens T, Zaman R, et al. Understanding
699 health workers' job preferences to improve rural retention in Timor-Leste: findings from a
700 discrete choice experiment. PLoS One 2016.

701 (14) Kuhfeld W. Marketing Research Methods in SAS: Experimental Design, Choice, Conjoint,
702 and Graphical Techniques. 9.2 ed. 2010.

703 (15) Witter S, Herbst C, Zaman R, et al. Guinea Health Labour Market Study: Final Report.
704 2018.

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705 (16) Hatem M, Halabi-Nassif H, Maroun M. Evaluation de la qualite des services de sante
706 maternelle et neonatale en Guinea-Conakry et au Togo. Sante Publique 2018;Hors serie:101-
707 111.

708 (17) Witter S, Mashange W, Namakula J, Wurie HR, Ssengooba F, and Alonso-Garbayo A.
709 Incentives for health workers to stay in post and in rural areas: findings from four conflict-
710 and crisis-affected countries. 2017.

711 (18) Bundeth S, Neath N, Nonglak P, Sothea S. Understanding rural health service in
712 Cambodia: results of a Discrete Choice Experiment. In: Jalilian H, Sen V, editors. Improving
713 Health Sector Performance Singapore: ISEAS; 2011.

714 (19) Lehman U, Dieleman M, Martineau T. Staffing remote rural areas in middle- and low-
715 income countries: a literature review of attraction and retention. BMC Health Services
716 Research 2008;8(19).

717 (20) Dieleman M, Pham C, Le Vu A, Martineau T. Identifying factors for job motivation of
718 rural health workers in north Viet Nam. BMC Health Services Research 2003;1(10).

719 (21) Mandeville K, Lagarde M, Hanson K. The use of discrete choice experiments to inform
720 health workforce policy: a systematic review. BMC Health Services Research 2014;14(367).

721 (22) Bertone M, Witter S. An exploration of the political economy dynamics shaping health
722 worker incentives in three districts in Sierra Leone. Social Science and Medicine
723 2015;141:56-63.

724 (23) Van de Pas R, Kolie D, Delamou A, Van Damme W. Health workforce development and
725 retention in Guinea: A policy analysis post-Ebola. *Human Resources for Health*. 2019;17(63).

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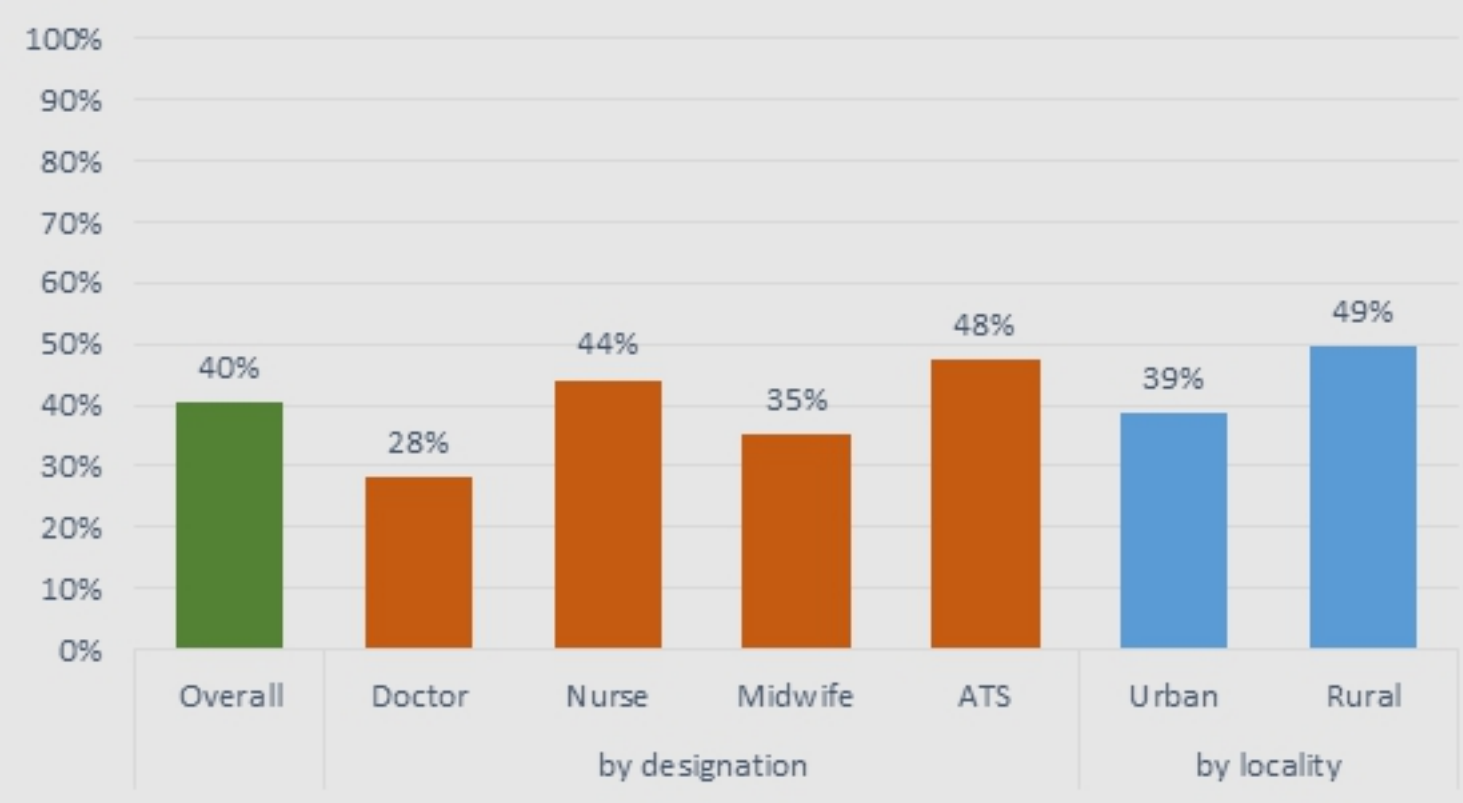

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Overall
Doctor
Nurse
Midwife
ATS
Urban
Rural
by designation
by locality

Figure 1

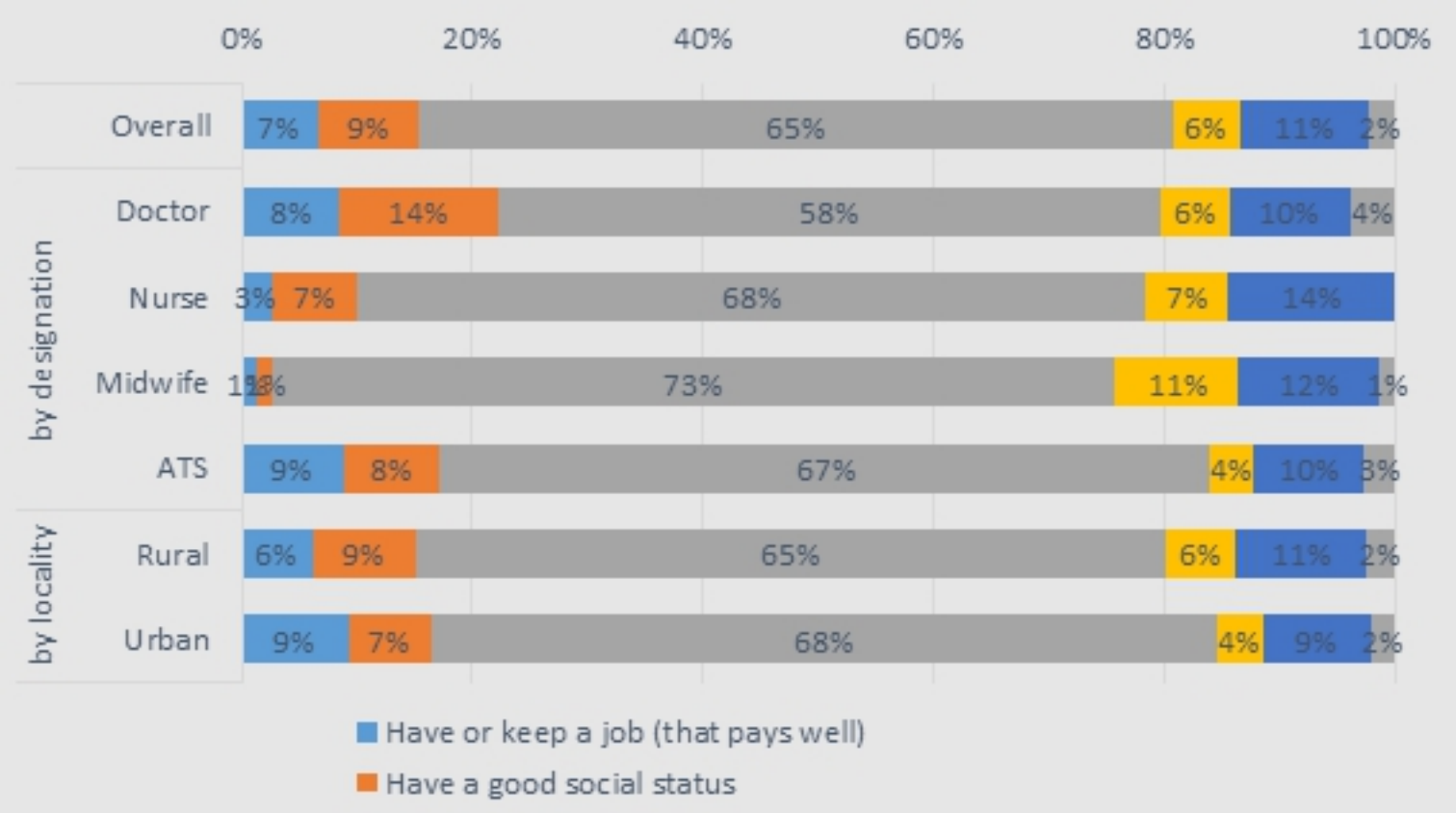

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by designation
Doctor
8%
14%
58%
6%
10%
4%
Nurse
3%
7%
68%
7%
14%
Midwife
1%
1%
73%
11%
12%
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ATS
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3%
by locality
Rural
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Have or keep a job (that pays well)
Have a good social status

Figure 2

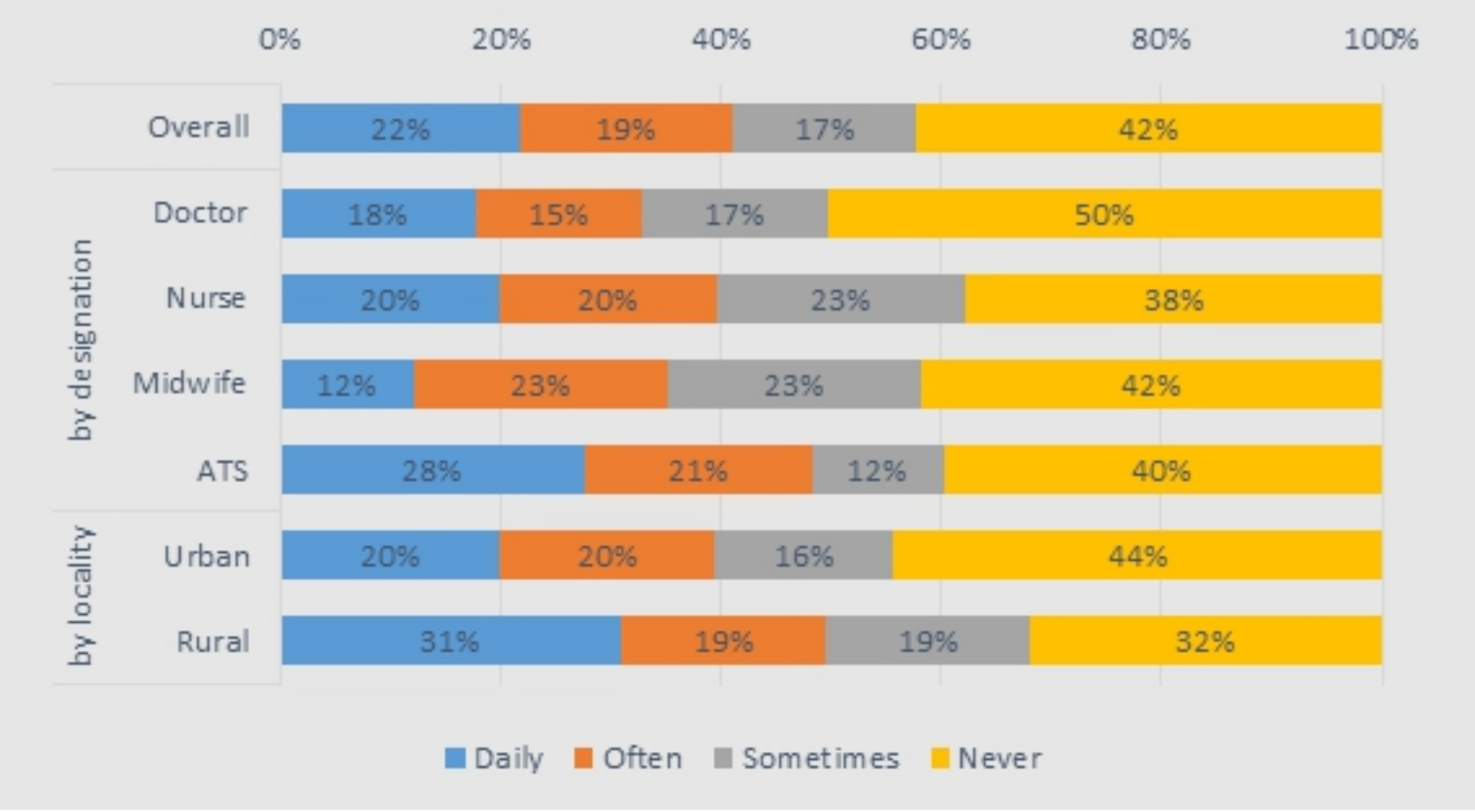

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by designation
Doctor
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Nurse
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20%
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38%
Midwife
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23%
23%
42%
ATS
28%
21%
12%
40%
by locality
Urban
20%
20%
16%
44%
Rural
31%
19%
19%
32%
Daily
Often
Sometimes
Never

Figure 3

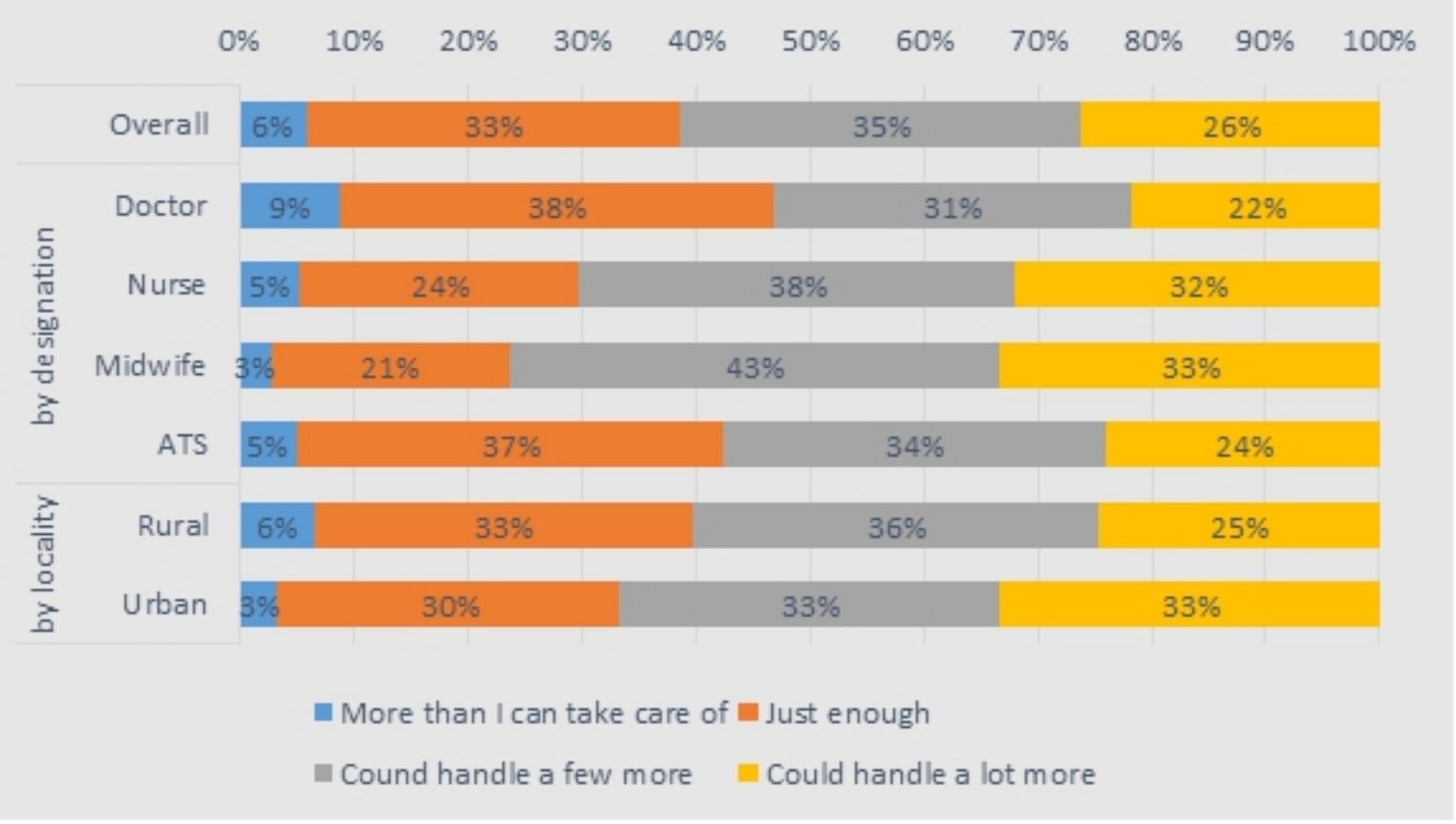

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26%
by designation
Doctor
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38%
31%
22%
Nurse
5%
24%
38%
32%
Midwife
3%
21%
43%
33%
ATS
5%
37%
34%
24%
by locality
Rural
6%
33%
36%
25%
Urban
3%
30%
33%
33%
More than I can take care of
Just enough
Cound handle a few more
Could handle a lot more

Figure 4

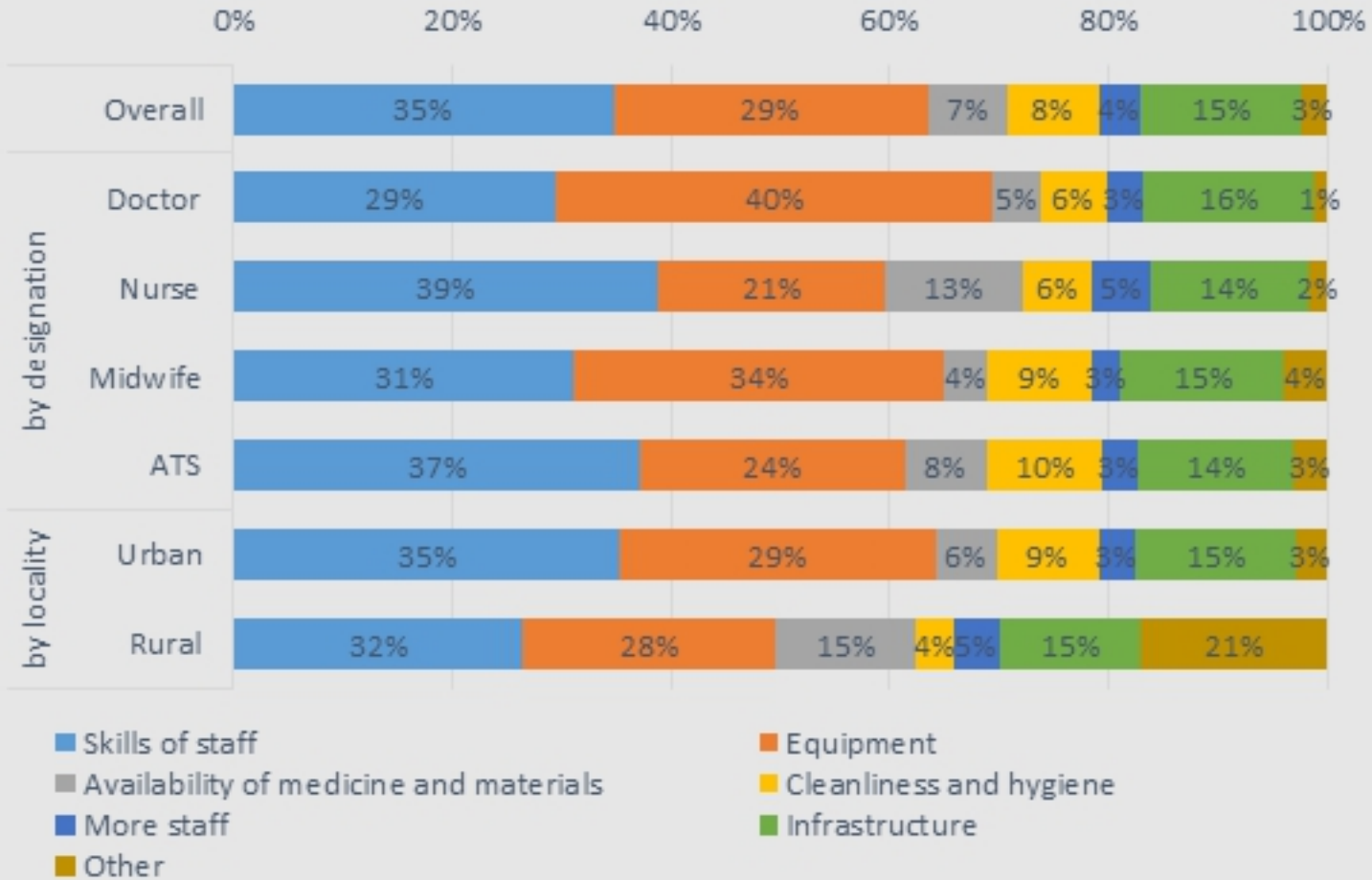

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ATS
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3%
14%
3%
by locality
Urban
35%
29%
6%
9%
3%
15%
3%
Rural
32%
28%
15%
4%
5%
15%
21%
Skills of staff
Equipment
Availability of medicine and materials
Cleanliness and hygiene
More staff
Infrastructure
Other

Figure 5

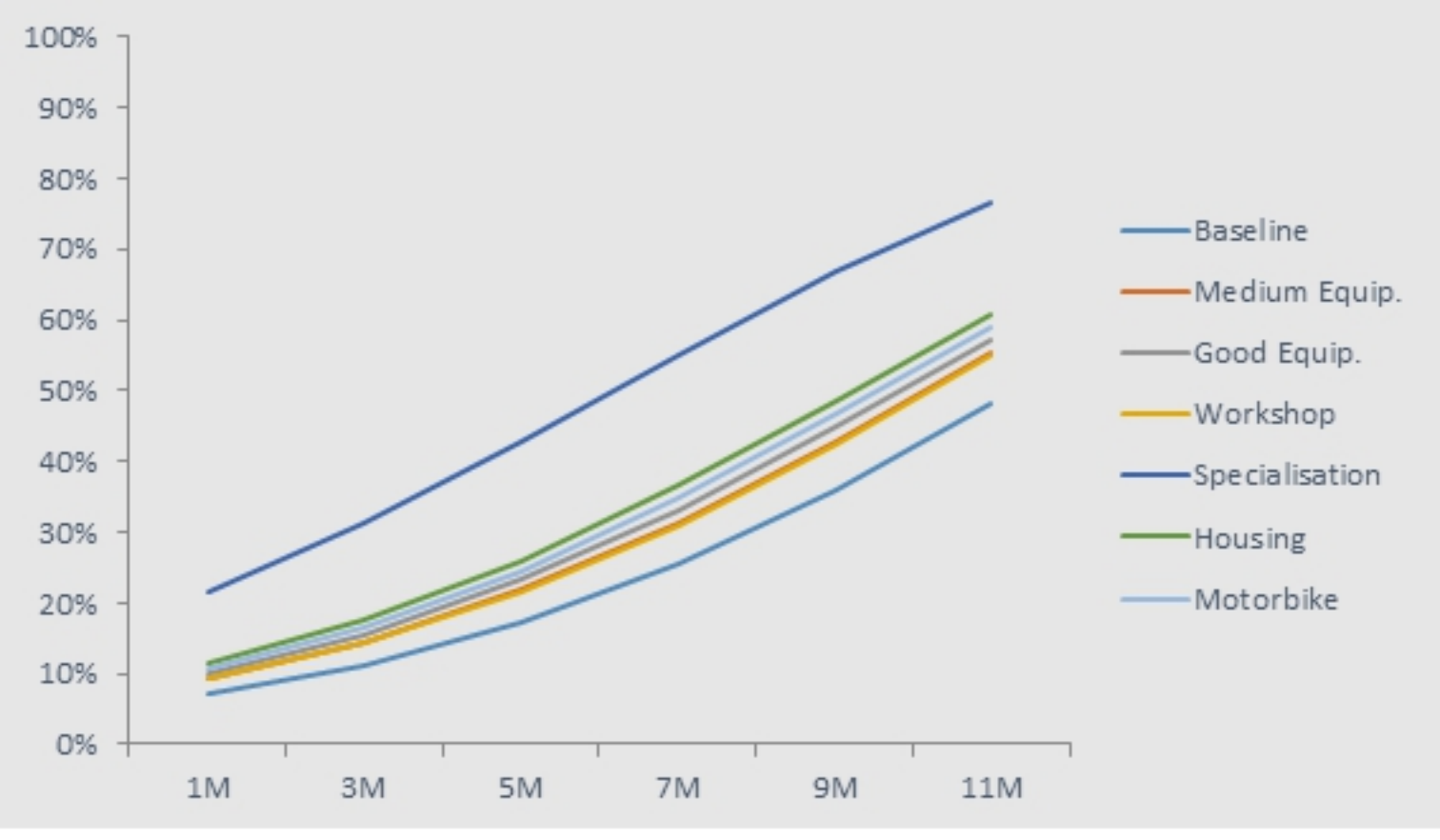

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1M
3M
5M
7M
9M
11M
Baseline
Medium Equip.
Good Equip.
Workshop
Specialisation
Housing
Motorbike

Figure 6

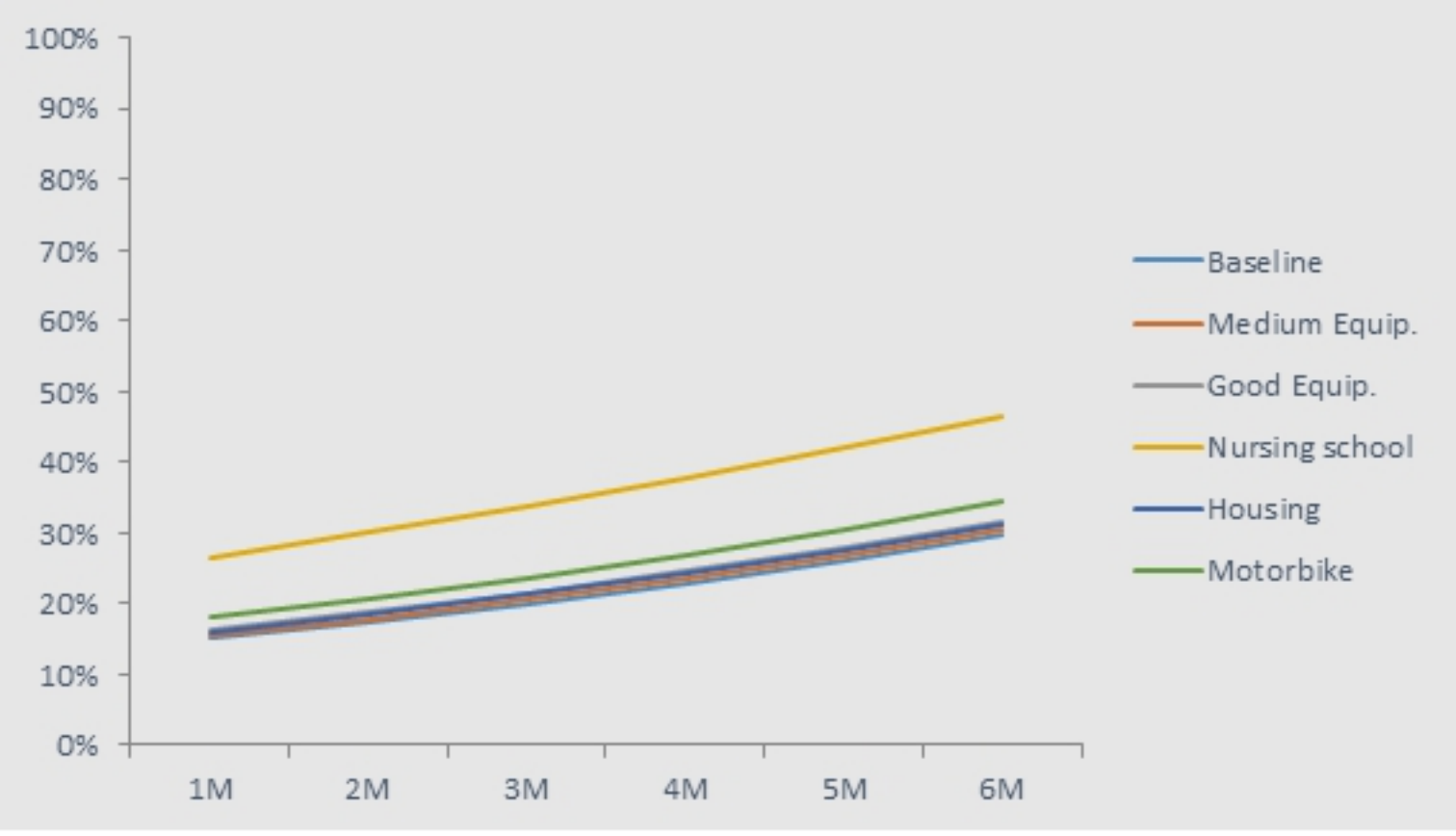

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Baseline
Medium Equip.
Good Equip.
Nursing school
Housing
Motorbike

Figure 8

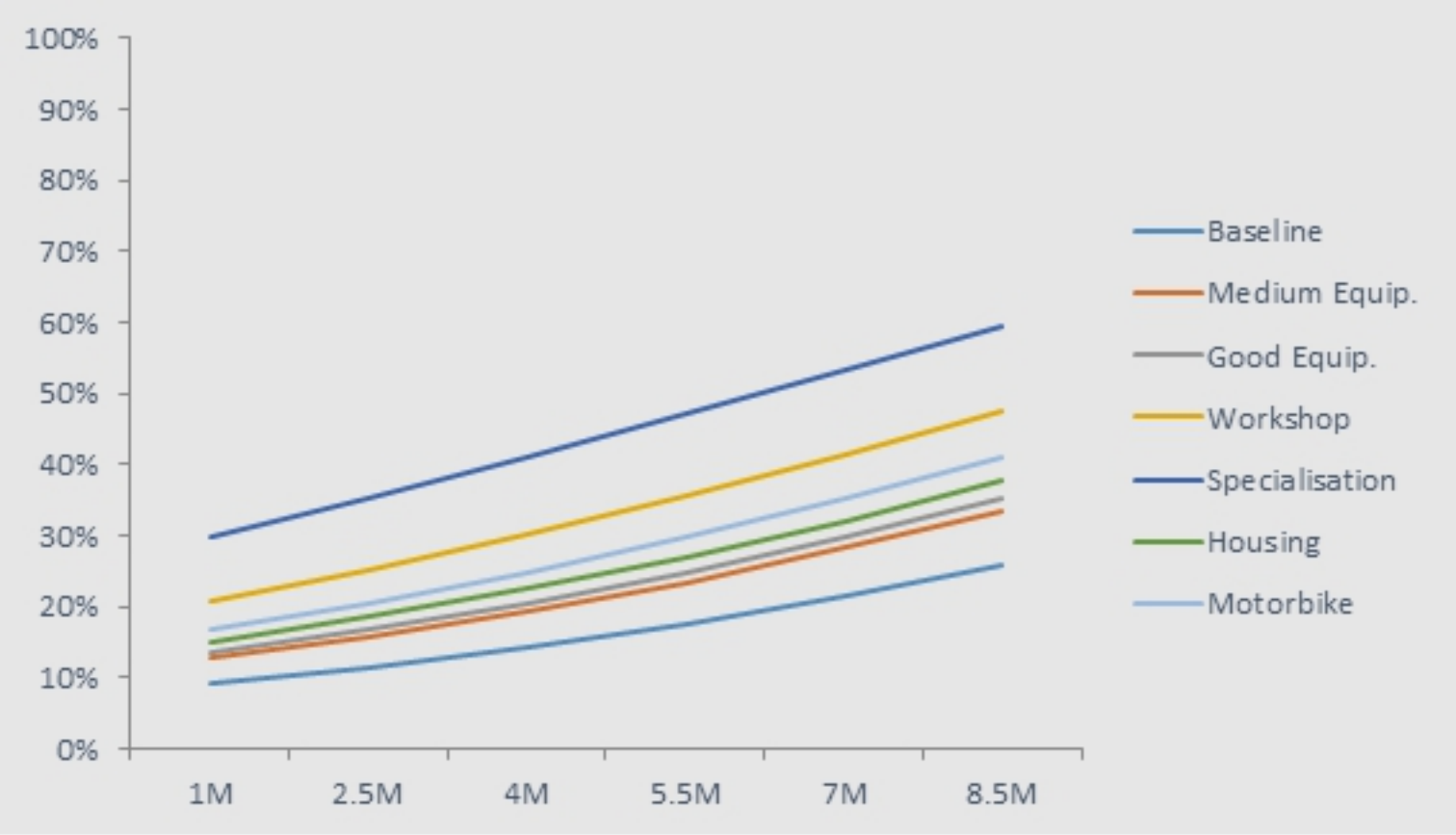

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4M
5.5M
7M
8.5M
Baseline
Medium Equip.
Good Equip.
Workshop
Specialisation
Housing
Motorbike

Figure 7