Losing Prosociality in the Quest for Talent? Sorting, Selection, and Productivity in the Delivery of Public Services

Online Appendix

By Nava Ashraf, Oriana Bandiera, Edward Davenport, and Scott S. Lee*

A. Randomization Balance

Table A1 describes three sets of variables that can affect the supply of health workers, the demand for their services, and their working conditions. For each variable, the table reports the means and standard deviations in treatment and control, as well as the p-value of the test of means equality, with standard errors clustered at the level of randomization, the district. The table also reports p-values based on the effective degrees of freedom (EDF) correction procedure in Young (2016) and a randomization inference procedure (Young 2019). Table A1 shows that the randomization yielded a balanced sample, as all p-values of the tests of equality are greater than 0.05. As treatment and control means are very close throughout, we comment on treatment group values in the rest of this section.

Panel A reports statistics on the eligible population drawn from the 2010 Census. This shows that the eligibles—namely, 18-45 year-old Zambian citizens with at least grade 12 education—account for 4.4 percent of the district population, and that among them, 37 percent are female. Just over half of the eligible were either out of work or in unpaid employment over the past twelve months.[1] Among the 45 percent engaged in income-generating

* Ashraf: Department of Economics, LSE, Houghton Street, London WC2A 2AE, UK, n.ashraf1@lse.ac.uk. Bandiera: Department of Economics and STICERD, LSE, Houghton Street, London WC2A 2AE, UK, o.bandiera@lse.ac.uk. Davenport: Department of Economics, MIT, 50 Memorial Drive, Cambridge, MA 02142, edav@mit.edu. Lee: Department of Medicine and Institute for Global Health, Vanderbilt University, 2525 West End Avenue, Suite 450, Nashville, TN 37203, ssl@mail.harvard.edu. We thank the Ministry of Health of Zambia and especially Mrs. Mutinta Musonda for partnership on this project. We thank the IGC, JPAL Governance Initiative, USAID and HBS DFRD for financial support. We also thank Robert Akerlof, Charles Angelucci, Tim Besley, Robin Burgess, Paul Gertler, Edward Glaeser, Kelsey Jack, Giacomo Ponzetto, Imran Rasul, Jonah Rockoff and seminar participants at several institutions for useful comments. Adam Grant, Amy Wrzesniewski, and Patricia Satterstrom kindly provided guidance on psychological measurement. We thank Kristin Johnson, Conceptor Chilopa, Mardieh Dennis, Madeleen Husselman, Alister Kandyata, Allan Lalisan, Mashekwa Maboshe, Elena Moroz, Shotaro Nakamura, Sara Lowes, and Sandy Tsai for the excellent research assistance and the Clinton Health Access Initiative in Zambia for their collaboration. IRB approval was obtained from Harvard University, Committee on the Use of Human Subjects in Research, and University of Zambia, Biomedical Research Ethics Committee. This study is registered in the AEA RCT Registry and the unique identifying number is AEARCTR-0000064. The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

[1] The 28 percent who were out of work are either unemployed (13 percent), housewives (7.5 percent), or full-time students (8.5 percent). Most (65 percent) of the unpaid jobs are in agriculture. These are balanced across treatments.

activities (either as employees or self-employed), fewer than one-third are employed in high-skill occupations (such as teachers, who account for 9 percent of the eligible population), and about half are employed in low-skill occupations, mostly in agriculture which accounts for 18 percent of the eligible population. Taken together, the evidence suggests that, despite their educational achievements, the majority of the eligible population is either out of work or employed in occupations below their skill level.

Panel B illustrates the characteristics of the catchment areas. These variables are drawn from surveys administered to district officials and the health workers themselves. Three points are of note. First, health posts are poorly staffed in both the treatment and control groups; the average number of staff (not including the new health workers) is 1.5. Given that the aim is to assign two health workers to each health post, the program more than doubles the number of health staff in these communities. Second, the areas vary in the extent to which households live on their farms or in villages, but the frequency of either type is similar in the treatment and control groups. This is relevant as travel times between households depend on population density and are higher when households are scattered over a large area, as opposed to being concentrated in a village. Third, over 90 percent of the catchment areas in both groups have at least some cell network coverage, which is relevant for our analysis, as some performance measures are collected via SMS messages.

Panel C illustrates the characteristics of the target population that are relevant for the demand for health worker services. First, children under 5, who (together with pregnant women) are the main targets of the health workers, account for 19 percent of the population. Second, Panel C shows that access to latrines and—most noticeably—protected water supply is limited in these areas. Lack of latrines and protected water supply favors the spread of waterborne infections, to which pregnant women and children are particularly vulnerable and, through this, affects the demand for health workers' services.

B. Model

Solution

In Stage 3, we have an interior $e^*(a,s)$ defined by $sH_e(a,e^*) - d'(e^*) = 0$ which is a global maximium as $U_{ee} = sH_{ee}(a,e) - d''(e) < 0$ for all $e > 0$. For the comparative statics of $e^*(a,s)$ with respect to a and s, we have $\frac{de^*}{da} = \frac{-sH_{ea}}{sH_{ee}-d''(e^*)} \geq 0$ and $\frac{de^*}{ds} = \frac{-sH(a,e^*)}{sH_{ee}-d''(e^*)} > 0$ as both numerator and denominator are negative in both cases. Defining $H^*(a,s) \equiv H(a,e^*(a,s))$, we have $\frac{dH^*}{da} = \frac{\partial H}{\partial a} + \frac{\partial H}{\partial e} \cdot \frac{de^*}{da} > 0$ and $\frac{dH^*}{ds} = \frac{\partial H}{\partial e} \cdot \frac{de^*}{ds} > 0$. A straightforward application of the Envelope Theorem shows that $U_a^* > 0$ and $U_s^* > 0$, and, finally, it is clear that $U_M^* = 1 > 0$.

In Stage 1, with $E(0,s,M) < V(0)$ an interior solution requires $V_a < E_a$ for some range of a large enough to ensure a crossing. This is the case of interest, since empirically we do observe that people apply. There is then a threshold of ability where the two functions cross, $\underline{a}$, such that $E(\underline{a},s,M) = V(\underline{a})$ and $E_a(\underline{a},s,M) > V_a(\underline{a})$ so that all i with $a_i < \underline{a}$ do not apply. This threshold, as well as the upper threshold defined below, depends on s

and thus varies by individual, but for notational simplicity we suppress the i subscript. If $E(a,s,M) > V(a)$ for all $a_i > \underline{a}$ everybody with $a_i > \underline{a}$ will apply. If however there is a value of a such that $E(\overline{a},s,M) = V(\bar{a})$, it must be that $E_a(\bar{a},s,M) < V_a(\bar{a})$ and such that only i with $\underline{a} < a_i < \overline{a}$ apply.

Comparative statics with respect to M

Result 1: *Increasing material benefits M attracts higher-ability applicants who would not apply otherwise ($\frac{\partial \bar{a}}{\partial M} > 0$) and either (i) lowers the ability of the lowest-ranked applicant ($\frac{\partial \underline{a}}{\partial M} < 0$) and increases the total number of applicants or (ii) discourages low-ability applicants ($\frac{\partial \underline{a}}{\partial M} > 0$) and has an ambiguous impact on the total number.*

To prove the first statement, note that the total differential of $E(\overline{a},s,M) = V(\bar{a})$ implies $\frac{d\bar{a}}{dM} = \frac{E_M}{(V_a - E_a)}$. The denominator is positive since $E_a(\bar{a},s,M) < V_a(\bar{a})$; the numerator is equal to $E_M = p_M(\bar{a},s,M)U(.) + pU_M$. The first term captures the effect of M on the probability of being selected, which depends on the relative ability of the applicant vs. the other applicants; from $\frac{d^2p}{dMda} > 0$, we assume for simplicity that the marginal applicant's value of a is sufficiently large that this effect is negligible. The second term is positive as shown above. Thus $E_M > 0$ and $\frac{d\bar{a}}{dM} = \frac{E_M}{(V_a - E_a)} > 0$. Likewise, $\frac{d\underline{a}}{dM} = \frac{E_M}{(V_a - E_a)}$. The denominator is negative since $E_a(\underline{a},s,M) > V_a(\underline{a})$, and again the numerator is equal to $E_M = p_M(\underline{a},s,M)U(.) + pU_M$. The first term is negative because an applicant with skill a is less likely to be selected under high M since, as seen above, this attracts higher-ability applicants. The second term is positive as discussed above. Thus, if the increase in payoff U^* is larger than the discouragement due to lower probability of being selected, then $E_M = p_M U(.) + pU_M > 0$ which implies that the lower threshold decreases and overall more people apply. In contrast, if $E_M = p_M U(.) + pU_M < 0$, then the lower threshold increases, and the effect on the number of applicants depends on the distribution of a in the population that, in turn, determines whether the number of low-ability applicants who no longer apply is larger than the number of high-ability applicants who only apply with high M.

Result 2: *Under any M, the most able applicant is also the most prosocial. An increase in M leaves the prosociality of the marginal applicant unchanged and has an ambiguous effect on the prosociality of the average applicant.*

Taking the total differential of $E(\bar{a},s,M) - V(\bar{a})$ with respect to a and s gives $E_s ds + E_a da = V_a da$. Hence $ds/da = \frac{V_a - E_a}{E_s}$. Given that $E_a(\bar{a},s,M) < V_a(\bar{a})$ we have $ds/da > 0$, and the applicant with the highest a, i.e. with the highest $\bar{a}$, has $s = 1$. This shows that *for any M, the most able applicant is also the most prosocial.* As M increases, and we have $\frac{d\bar{a}}{dM} = \frac{E_M}{(V_a - E_a)} > 0$, the marginal applicant has higher $\bar{a}$ and the same $s = 1$, *which proves that an increase in M leaves the prosociality of the marginal applicant unchanged.* Now consider two levels of M, $M_T > M_C$. The marginal candidate when $M = M_T$ has ability $\overline{a}(1, M_T)$ while when $M = M_C$ the marginal candidate has ability $\overline{a}(1, M_C) < \overline{a}(1, M_T)$. Both candidates have $s = 1$. Define $\hat{s}$ the level of s such that $E(\overline{a}(1, M_C),\ \hat{s},\ M_T) = V(\overline{a}(1, M_C))$ that is the applicant with ability $\overline{a}(1, M_C)$ is indifferent between applying at

the higher level of M or not. Then all the candidates who do not apply when M is low and apply when M is high must have $s > \hat{s}$, whilst those who apply when M is low have $0 \leq s \leq 1$. Thus the new applicants increase the mean prosociality. However all applicants with $a < \overline{a}(s, M_C)$, whose prosociality was such that they were indifferent between applying and not when $M = M_C$ will be strictly better off when $M = M_T$. This implies that for any $a < \overline{a}(s, M_C)$, raising M will attract lower prosociality applicants. The net effect depends on the relative strength of these two channels and is therefore ambiguous.

In the graphical illustration, we use $H = 2\sqrt{\xi}e + a$, where $\xi > 0$ is a parameter, and $c(e) = e^2$. A selected applicant thus chooses e to maximise $s(2\sqrt{\xi}e+a)-e^2+M$, which yields $e^* = \sqrt{\xi}s$, $H^* = 2\xi s + a$, and $U^* = \xi s^2 + as + M$. The probability of selection must satisfy the following: (i) increasing and concave in a and s, (ii) decreasing in M, (iii) $\frac{\partial^2 p}{\partial a \partial M} > 0$. As explained in the main body, we use the functional form $p(a, s, M) = \frac{\gamma a s^\beta + \mu(M_T - M)}{1+\mu(M_T - M)}$, where $\gamma > 0$ is set to guarantee that $p \in [0, 1]$, $\beta > 0$ captures the weight that the panel puts on prosociality, and $\mu > 0$ scales the decrease in probability that arises from more (high-ability) people applying in equilibrium when M rises. For interpretation purposes, it is useful to note that the probability is 1 when $\gamma a s^\beta = 1$. This function satisfies all three criteria: (i) is straightforward from inspection, (ii) can be seen in $\frac{dp}{dM} = -\frac{\mu(1-p)}{1+\mu(M_T-M)} < 0$, (iii) can be seen in $\frac{d^2p}{dMda} = \frac{\mu}{1+\mu(M_T-M)} \cdot \frac{dp}{da} > 0$. Morever, for (iii), we see that $\frac{dp}{dM}$ goes to zero as the probability goes to one. We set $V = va^2 + a$, where we assume $v > \gamma$ which ensures that $V_a > U_a^* > 0$ everywhere as $V_a \geq 1 \geq s^2 = U_a^*$. This also ensures that $V_a > E_a > 0$ for all a sufficiently large, as this ensures that the quadratic term in the polynomial below is positive for any s and M. Combining these, an applicant in Stage 1 thus applies if $\frac{\gamma a s^\beta + \mu(M_T - M)}{1+\mu(M_T-M)}(\xi s^2 + as + M) - c > va^2 + a$. This defines a polynomial of degree 2 given by $\phi(a) \equiv [v(1 + \mu(M_T - M)) - \gamma s^{\beta+1}]a^2 + [1 + \mu(1 - s)(M_T - M) - \gamma s^\beta(M + \xi s^2)]a + [c + \mu(M_T - M)(c - \xi s^2 - M)]$. The two thresholds are thus given by $\phi(a) = 0$. The upper root is plotted for a range of s in Figure 2b. It can be shown that $\frac{d\bar{a}}{ds} > 0$, which reflects the fact that the curve is upward sloping, while $\frac{d\bar{a}}{dM}$ is ambiguous. In the Figure, we have $\frac{d\bar{a}}{dM} > 0$ for all s, although this is not necessary for the main results: the important aspect for the panel's selection mechanism is the set of candidates with high a and high s (i.e., in the north-east section of the graph) who will have high probability of being selected and thus will have $\frac{d\bar{a}}{dM} > 0$.

C. Time Use

We surveyed the health workers in May 2013, nine months after they started working.[2] The survey asked the health workers to report the frequency of emergency visits typically done outside of working hours. The median health worker does one emergency call per week, and column 8 of Table 5 shows that this holds true for health workers in both

[2]To implement this survey, we took advantage of a refresher course organized by the Government in the health worker school in Ndola. Of the 307 health workers, 298 (97 percent, equally split by treatment group) came to training and took part in the survey.

groups.

The time use survey is designed to collect information on hours worked and the time allocated to different activities. This allows us to assess whether the differences in performance documented above are due to differences in time allocation across tasks—namely, whether treatment health workers do more visits because they devote more time to that task. To collect information on the latter, health workers were given 50 beans and asked to allocate the beans in proportion to the time devoted to each activity within each task. Besides household visits, community meetings, and time at the health post, we allow for two further activities: traveling and meeting with supervisors. For each activity, we calculate the share of time devoted to each activity by dividing the number of beans allocated to that activity by the total number of beans allocated to all activities. The share of time allocated to these five activities is 0.32, 0.22, 0.16, 0.22 and 0.09, respectively. We then estimate a system of equations for hours worked and share of time devoted to each task, omitting traveling. Table A4 reports our findings.

Column 1 shows that the average health worker reports working 43 hours per week in the typical week and that there is no difference in reported working hours by treatment. This suggests that health workers in the control group do not compensate for visiting fewer households by devoting more hours to other, possibly informal, tasks. It also provides further assurance that health workers in the career treatment do not have differential incentives to overstate their contribution, as self-reported hours are unverifiable and hence easy to "game."

Columns 2-5 show that health workers in the two groups allocate their time in a similar manner; thus, observed performance differences are not driven by differences in time allocation. Two potentially complementary explanations are possible. First, treatment health workers might work more effective hours—e.g., by taking shorter breaks over the 43 weekly hours. Second, treatment health workers might be more efficient at their jobs. These effects might be strengthened by peer externalities because each health worker works alongside another health worker hired through the same treatment. Thus, health workers in the treatment group are more likely to have a highly productive peer than health workers in the control group. Peer effects might be driven by imitation, social comparison, or a perception that the other health worker competes for the same promotion.

Finally, Table A5 tests whether health workers in the two groups allocate their time differently within each activity, namely whether they have different work "styles." Panel A shows that health workers in the treatment group devote more time to counseling, inspections, and visiting sick household members, but, taken one-by-one, these differences are small and not precisely estimated. Health workers in the treatment group devote 1.6 percent less time to filling in forms and receipts and submitting SMSs, but the difference is not precisely estimated at conventional levels. Because the quality of reports is the same, this implies that career health workers are more productive at this task. Panel B shows a similar pattern for time allocation during work at the health post: collecting data and filling in reports is an important component of the job, which takes 23 percent of the health workers' time in the control group, but only 18 percent in the career treatment. As with

household visits, there is no evidence that health workers in the career treatment collect less data at the health post level or that these data are of worse quality. Health workers in the two groups are equally likely to submit HMIS reports in a given month, and these are equally accurate. Thus, the evidence suggests that health workers in the career treatment are more productive, and this frees time for other tasks.

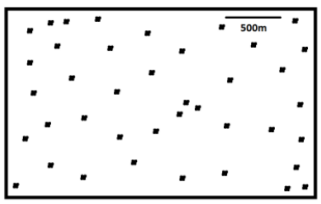
D. Data Appendix

In this section, we describe each of the variables used in our analysis, including its source and unit of measurement. We collect data at each stage of the program: application, selection, training, and performance in the field. A description of each source, including the sample, can be found in Section A.E.

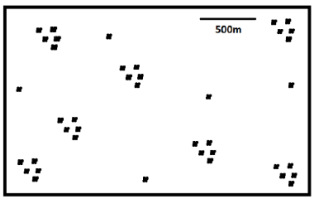
Eligible population and catchment area characteristics

- *Number of staff in health post* (source: district health officials survey, by phone) - Total number of nurses, environmental health technicians, and clinical officers assigned to the health post, as reported by district health officials we surveyed by phone.

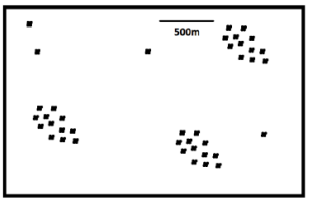
- *Geographical distribution of households in catchment area* (source: health worker survey, in person, at refresher training) - Health workers were shown stylized maps and asked to choose the one that most closely resembled the catchment area of their health post. Questions were asked to each health worker individually so that two health workers from the same health post could give different answers. For the 5 out of 161 cases in which the two health workers gave different answers, we used information provided by supervisors to break the tie.



MAP 1: Almost all people live on their farms. There are few or no real villages with concentrated households.



MAP 2. Villages are made up of a few (5-10) households, and there are many of such small villages. Some households live on their farms.



MAP 3. Most people live in medium to large villages (>10 households). There are several of these larger villages in the catchment area. Some households live on their farms.

- *Poor cell network coverage* (source: attempted phone calls) - We attempted to call all health workers after deployment. We made daily calls for 118 consecutive days. The health post was classified as having poor coverage if we did not manage to reach either of its two health workers during this period.

Experiment Validation

- *Relative weight variables* (source: health worker survey, in person, at training) - These were derived from survey questions that asked the trainees to allocate 50 beans between different potential reasons for applying to the health worker position: "good future career," "allows me to serve the community," "earns respect and high status in the community," "pays well," "interesting job," "allows me to acquire useful skills," and "offers stable income."
- *Expects to be employed in Ministry of Health in 5-10 years* (source: interviewee questionnaire, in person, at interview) - Circled any combination of being a "community health worker," "nurse," "environmental health technician," "clinical officer," or "doctor" in response to the question, "When you envision yourself in 5-10 years' time, what do you envision yourself doing?"

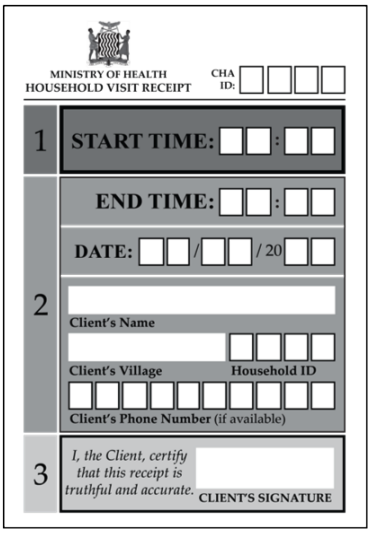
Performance in Service Delivery

Household Visits

Source: SMS Receipts

Each variable is constructed from SMS messages sent by CHAs in which each message corresponds to a single household visit. The household visit receipt is reproduced below.

- *Unique households visited*
- *Number of visits per household*
- *Average visit duration, in minutes*



Source: HMIS (monthly reports)

Each reported variable is the sum of each indicator's monthly values from September 2012 to January 2014.

- *Number of households visited*
- *Number of women and children visited per household visit*
- *Number of patients seen at health post*
- *Number of community mobilization meetings*

Time use

Source: health worker survey, in person, at refresher training

- *Number of hours worked in a typical week* - Health workers were asked "In a typical week, how many total hours do you spend doing health worker work? Please count work that you do at the health post and in the village, including moving from household to household."
- *Frequency of out-of-hours calls in a typical week* - Health workers were asked "In a typical week, how often do you have to leave your house at night and do CHA work due to emergencies like pregnancies or accidents?" Possible responses were "5-7 days per week," "3-4 days per week," "1-2 days per week," "2-3 times per month," "Once per month," "Sometimes, but less than once per month," and "Never."
- *Share of time allocated to* - To obtain time allocations, health workers were asked to allocate 50 beans between different activities. The instructions were as follows:

  Please use the beans to show how much time you spend doing each activity. If you spend more time in an activity, you should place more beans on the card. If you never do an activity, you should place no beans on the card. Place the beans any way you would like. For instance, you can place all beans on one card, or 0 beans on any card.

  Household visits - Now I would like you to think about household visits specifically. Here are some cards that list different activities you may do during household visits.

  - *greeting household members*
  - *assessing and referring sick household members*
  - *reviewing and discussing the household's health profile and goals*
  - *asking questions about household health behaviors and knowledge*
  - *providing health counseling*
  - *doing household inspections (waste disposal, latrines, etc.)*
  - *documentation (filling registers/books and sending visit receipts via SMS)*

Health Post - Now here are some cards that list different activities you may do at the HEALTH POST OR RURAL HEALTH CENTER.

- *seeing sick patients at the OPD*
- *dispensing medications from the pharmacy*
- *helping with ANC visits*
- *cleaning and maintaining the facility*
- *assisting with deliveries and other procedures when needed*
- *documentation (filling registers/books and sending monthly reports through HMIS)*

In the Community - Now here are some cards that list different activities you may do as a health worker.

- *campaigns for polio, measles, child health, and other health issues*
- *health talks and other community mobilization activities*
- *school health talks and other school activities*
- *meeting with NHC and volunteer CHWs for planning*

Household health practices and outcomes

Source: Endline household survey

All questions, with the exception of the knowledge test, are drawn from the Zambia Demographic and Health Survey (DHS) questionnaire.

- *Percentage of correct answers on health literacy test* - Households were asked to complete a health literacy test containing 14 questions on topics that CHAs are supposed to cover; these questions were drafted by the researchers in consultation with CHA program officials and the CHA curriculum. Examples of these questions include "Can a person get HIV/AIDS from a mosquito bite?" and "For preventing diarrhea, is it better to use the bush or a pit latrine to defecate?"
- *Currently breastfeeding* - Households were asked whether their youngest child is currently being breastfed. The variable was then recoded to missing if the youngest child was older than two years old, in line with WHO recommendations.
- *Stool safely disposed* - Households were asked what was done to dispose the stool the last time their youngest child passed stool. Following UNICEF and WHO (2017), we define stools as safely disposed if flushed in a toilet/latrine.
- *Number of deworming treatments* - From the youngest child's health card, the enumerator recorded the number of times that the child has received deworming (1, 2, ..., 10 or more). If the respondent did not have the child's health card, then the enumerator asked if the respondent could provide this information from memory, and, if yes, this was used instead.

- *On track with immunizations* - From the youngest child's health card, the enumerator recorded which, among a large list of immunizations, the child had received. If the respondent did not have the child's health card, then the enumerator asked if the respondent could provide this information from memory, and, if so, this was used instead. A child is defined as on track if they have completed all immunizations required for their age in months (the sample used for this variable is restricted to children aged under 3 months at the time that the CHA started working). At age 3 months, this includes BCG, OPV 0-2, PCV 1-2, DPT-HepB-Hib 1-2, and rotavirus 1-2. At 4 months, this includes, additionally, OPV 3, PCV 3, and DPT-HepB-Hib 3. At 9 months, this includes OPV 4 if OPV 0 was not given, and measles 1. The immunization series is complete at age 18 months with measles 2. Finally, we consider a child to be on track for vitamin A supplementation if she has ever been supplemented.

- *Incidence of illnesses* - Households were asked whether their youngest child had experienced symptoms from a list of illnesses, including fever, diarrhea, and cough in the last two weeks.

- *Anthropometrics* - The enumerator measured the weight (and asked the age) of the youngest child and the mean upper arm circumference. Thresholds are calculated according to WHO guidelines. Analysis using these variables is restricted to children between 6-59 months old.

- *Household and child controls* - As part of the survey, households were asked (i) how many people are in the household (subsequently winsorized at the top and bottom 2.5 percent) (ii) highest level of education earned by the respondent (iii) whether the household owns assets read out from a list (the variable used in analysis counts how many times the household responds yes, and excludes livestock) (iv) the youngest child's age and gender.

Health workers' observable traits

Skills

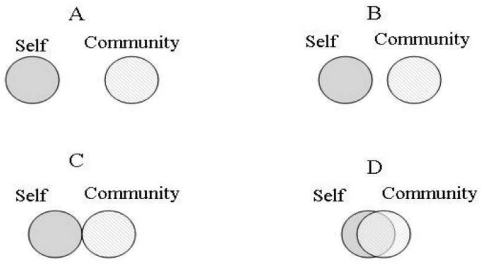
- *Average test score at training [0-100]* - Average score in 11 tests on basic medical practices taken during the training program.

- *O-levels total exam score* (source: MOH application files) - This variable is constructed as the sum of inverted O-levels scores (1=9, 2=8, and so on) from all subjects in which the applicant wrote the exam, so that larger values correspond to better performance.

- *O-levels passed in biology and other natural sciences* (source: MOH application files) - Includes biology, chemistry, physics, science, and agricultural science.

Preferences

- *Envisions remaining in the community in 5-10 years* (source: interviewee questionnaire, written, at interview) - Answered affirmatively in response to the question, "Do you see yourself in the community in 5-10 years?"
- *Perceives community interests and self-interest as overlapping* (source: interviewee questionnaire, written, at interview) - Based on the "Adapted Inclusion of Others in Self (IOS) scale" (Aron et al. 2004), which measures the extent to which individuals perceive community- and self-interest as overlapping. The Inclusion of Other in the Self scale was originally designed by Dr. Art Aron and colleagues (Aron, Aron and Smollan 1992) as a measure of self-other inclusion and relationship closeness. The Continuous IOS makes use of the basic design of the original IOS,[3] but allows for (a) the measure to be embedded within a web-based questionnaire, (b) the output values to be continuously scaled, and (c) modifications in the appearance and behavior of the measure. IOS has been validated across a wide variety of contexts, and adapted versions are found to be strongly correlated with environmental behavior (Schultz 2012) and connectedness to the community (Mashek, Cannaday and Tangney 2007). The measure is coded as 0-1, where 1 implies highest overlap. Applicants are asked to choose between sets of pictures, each showing two circles (labeled "self" and "community") with varying degrees of overlap, from non-overlapping to almost completely overlapping. This variable equals 1 if the respondent chooses the almost completely overlapping picture (D), 0 otherwise.



- *Aims to be a higher-rank health professional in 5-10 years* (source: interviewee questionnaire, written, at interview) - Circled any combination of being an "environmental health technician," "clinical officer," or "doctor" in response to the question, "When you envision yourself in 5-10 years' time, what do you envision yourself doing?"

Other traits

- *Social connections* (source: interviewee questionnaire, written, at interview) - For connectedness to a village leader, circled "political leader" or "village committee member," and for connectedness to health center staff, circled "formally trained health

[3] http://www.haverford.edu/psych/ble/continuous_ios/originalios.html

worker (e.g. nurse aid, nurse, clinical officer)", in response to the question, "Are any of your relatives or members of your household in the following positions?"

E. Data Sources

- **Application** (sample: all applicants) - Applications were submitted in August-September 2010. The initial application stage was comprised of the initial application form, which includes fields for gender, date of birth, village of residence, and educational qualifications. The application form also included a question asking through what means the applicant first learned of the health worker job opportunity: recruitment poster, facility health worker, community health worker, government official, word-of-mouth, or "other."

- **Interviewee Questionnaire** (sample: subset of applicants called for an interview) - Written questionnaires were completed by interview candidates at the time of their interviews in September-October 2010. The questionnaire (written in English) included a series of questions about the interviewee's demographic background, community health experience, social capital, and work preferences and motivations. Notably, we included a measure employed by social psychologists, "Inclusion of Others in Self" (Aron et al. 2004) to measure connection with the community. The questionnaire stated that the answers would not be used for selection purposes but rather as part of a research project, although we cannot rule out that panelists could have seen the questionnaire or referred to it when making their decisions.

- **Ranking Sheet** (sample: members of interview panels) Ranking sheets were filled and collected in September-October 2010. Each panel consisted of five members: the district health officer, a representative from the health center, and three neighborhood health committee members. Once all interviews were completed, every member of the selection panel completed a private and individual ranking sheet by ranking their top ten candidates. This ranking exercise occurred *before* panel members formally deliberated and discussed the candidates. After interviewing all candidates and deliberating, interview panels were requested to complete and submit a consensus-based "Selection Panel Report" that included fields for the two nominated candidates as well as three alternates.

- **Baseline Survey** (sample: all trainees) - The baseline survey was conducted in June 2011 and consisted of two main components:

  1) Questionnaire - Conducted one-on-one by an enumerator and collected information on the trainees' socioeconomic background and livelihood, motivations and preferences, and expectations of the program.
  2) Self-assessment - A three-hour exam with multiple choice questions to determine the baseline knowledge of health matters that each student had prior to the training.

- **Catchment Area Survey** (sample: all deployed CHAs and supervisors) - Just prior to graduation in July 2012, all CHAs and supervisors were given a short survey that asked about characteristics of their health posts, including population density, rainy-season information, and general community health measures.
- **Time Use Survey** (sample: all deployed CHAs) - This survey was conducted in April-May 2013 in Ndola, Zambia. The respondents were pilot health workers who reported to Ndola for a supplemental in-service training to introduce new tasks as part of a revised health worker scope of work. The survey was administered by Innovations for Poverty Action, in partnership with the Ministry of Health, the Health Worker Training School, and the Clinton Health Access Initiative.
- **SMS messages** (sample: all deployed health workers) - All health workers carry with them receipt books for each visit, which require the signature of the client visited. The information on these receipts—consisting of the date, start time, and end time of the visit, as well as the client's phone number—is then sent via SMS in real time to the Ministry of Health and our central data-processing facility.
- **Health Management and Information System** (sample: all Ministry of Health facilities staffed by CHAs) - On a monthly basis, all MOH health facilities are required to submit a monthly report tallying delivery of health services such as number of households visited, number of patients seen at the health facility, and number of child deliveries. These are submitted electronically via a mobile platform managed by MOH.
- **Endline household survey** (sample: households with at least one child under age 5 within CHA catchment areas) - From November 2014 to February 2015, we administered a nationwide household survey across all 47 districts in the study sample. A clustered sampling procedure first randomly selected one community with deployed CHAs within each district (leading to 47 total communities), and then 16 households with at least one child under age 5 within each sampled community. In each sampled household, the primary caregiver for the child(ren) under 5 was interviewed by a trained enumerator in the local language using a tablet-based survey instrument.

F. District Instruction Appendix

The health worker program was introduced differently to health centers depending on the treatment group. In each district, the district health official was given a package that contained a script, a memo from the Permanent Secretary, and detailed instructions about the health worker recruitment process. In addition, district health officials received "health center packages" for each participating health center in the district, which contained a set of posters and application forms and instructions for the health center representative on how to post posters and collect applications. The district health officials were to visit each health center and meet with the staff and neighborhood health committee members to introduce the program and distribute the health center packages, using the script provided

to them in their packages. The script was only provided to the district health officials, and was addressed directly to them. It is unlikely that the applicants or health center staff were able to read this script themselves.

The following script was given to district health officials in the treatment group:

> *To Health Center and Neighborhood Health Committee: I would like to you let you know about a new government program to strengthen the country's health workforce. Applications are currently being accepted for a new Community Health Worker position. This is an opportunity for qualified Zambians to obtain employment and to advance their health careers. Opportunities for training to advance to positions such as Nurse and Clinical Officer may be available in the future. Successful applicants will receive 1 year of training, both theoretical and practical. All training costs, including transportation, meals and accommodation during the one-year training program, will be covered by the Ministry of Health. Please encourage all qualified persons to apply so that they can benefit from this promising career opportunity.*

The district health officials in the control group received the following script:

> *To Health Center and Neighborhood Health Committee: I would like to you let you know about a new government program to improve health care services in your community. Applications are currently being accepted for a new Community Health Worker position. This is an opportunity for local community members to become trained and serve the health needs of their community. The new CHWs will work at the Health Post and community level in coordination with an affiliated Health center. Successful applicants will receive 1 year of training, both theoretical and practical. All training costs, including transportation, meals and accommodation during the one-year training program, will be covered by the Ministry of Health. Please encourage all qualified persons to apply so that they can benefit from this promising community service opportunity.*

TABLE A4—THE EFFECT OF CAREER OPPORTUNITIES ON TIME USE

		Share of time spent in:			
Dependent variable	Hours worked	HH visits	Health Post	Community meetings	Meeting with supervisor
	(1)	(2)	(3)	(4)	(5)
Treatment	-0.580	0.007	-0.021	0.011	-0.001
	(1.01)	(0.014)	(0.013)	(0.011)	(0.008)
Area characteristics	Yes	Yes	Yes	Yes	Yes
Mean of dependent variable in control	42.8	0.312	0.171	0.213	0.085
Adjusted R-squared	0.031	0.056	0.081	0.031	0.064
N	298	298	298	298	298
EDF p-value	0.609	0.560	0.085	0.297	0.892
RI p-value	0.583	0.622	0.140	0.259	0.887

Note: Column 1: OLS estimates, standard errors clustered at the district level. Columns 2-5: SURE Estimates, standard errors clustered at the district level bootstrapped with 1500 replications. EDF p-value refers to the p-value from a null hypothesis that the treatment effect is zero with OLS estimates, using the Young (2016) effective degrees of freedom correction. RI p-value refers to the equivalent p-value using a Randomization Inference procedure (specifically, the randomization-t p-value from Young (2019)). Treatment=1 if the health worker is recruited in a district where career opportunities were made salient. Data source is the Time Use Survey that was administered in May 2013 during a refresher training program. Hours worked is defined as the number of hours worked in a typical week as reported by the CHAs. To measure the "Share of time spent in," CHAs were given 50 beans and asked to allocate them on cards listing the different activities listed above plus travel. The cards were scattered on a table in no particular order. All regressions include the stratification variables (province dummies and share of high school graduates in the district). Area characteristics include: number of staff in the health post, geographical distribution of households in the catchment area, and an indicator variable that equals 1 if the CHA reports to have good cell network coverage most of the time or all the time.

TABLE A5—THE EFFECT OF CAREER OPPORTUNITIES ON TIME ALLOCATION

Panel A: Time allocation during household visits

Share of time allocated to:	Counseling	Inspections	Filling in receipts and forms	Asking questions about health behaviours and knowledge	Discussing health profile and goals	Visiting sick household members
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.006	0.007	-0.016	-0.011	-0.003	0.010
	(0.012)	(0.015)	(0.010)	(0.009)	(0.012)	(0.009)
Mean of dependent variable in control	0.207	0.196	0.146	0.137	0.122	0.100
Area characteristics	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.030	0.041	0.049	0.026	0.014	0.027
N	292	292	292	292	292	292
EDF p-value	0.580	0.627	0.108	0.197	0.759	0.268
RI p-value	0.594	0.633	0.068	0.198	0.795	0.314

Panel B: Time allocation during work at the health post

Share of time allocated to:	Seeing sick patients	Filling in forms	Dispensing medications	Helping with antenatal care visits	Cleaning and maintaining the health post
	(7)	(8)	(9)	(10)	(11)
Treatment	-0.002	-0.050	0.006	0.019	0.019
	(0.011)	(0.020)	(0.013)	(0.019)	(0.013)
Mean of dependent variable in control	0.262	0.228	0.207	0.160	0.104
Area characteristics	Yes	Yes	Yes	Yes	Yes
R-squared	0.051	0.104	0.091	0.094	0.133
N	271	271	271	271	271
EDF p-value	0.827	0.009	0.634	0.293	0.112
RI p-value	0.783	0.008	0.636	0.231	0.133

Note: System estimates (SURE), bootstrapped standard errors clustered at the district level in parentheses. All regressions include the stratification variables (province dummies and share of high school graduates in the district). EDF p-value refers to the p-value from a null hypothesis that the treatment effect is zero with OLS estimates, using the Young (2016) effective degrees of freedom correction. RI p-value refers to the equivalent p-value using a Randomization Inference procedure (specifically, the randomization-t p-value from Young (2016)). Treatment=1 if the health worker is recruited in a district where career opportunities were made salient. All 298 participants in the refresher training program were given 50 beans and asked to allocate the beans to show how much time they spent doing each activity within each task. They were instructed to place more beans on a card if they spent more time on an activity, to place no beans if they never do an activity, and to place the beans any way they would like, including placing all beans on one card, or 0 beans on any card. Panel A activities are: greeting household members, assessing and referring sick household members, reviewing and discussing the households health profile and goals, asking questions about health behaviors and knowledge, providing health education and counseling, doing household inspections (waste disposal, latrines, etc.), and documentation (filling registers/books and sending SMS visits). The omitted category in Panel A is "greetings." The sample in Panel A covers the 292 out of 298 CHAs who reported spending time doing visits. Panel B activities are: seeing sick patients in the health post, dispensing medications from the pharmacy, helping with ANC visits, cleaning and maintaining the facility, assisting with deliveries and other procedures when needed, and documentation (filling registers/books and sending monthly reports through DHIS2). The omitted category in Panel B is "assisting with deliveries." The sample in Panel B covers the 271 out of 298 CHAs who reported spending time at the health post. Area characteristics include: number of staff in the health post, geographical distribution of households in the catchment area, and an indicator variable that equals 1 if the CHA reports to have good cell network coverage most of the time or all the time.

TABLE A6—THE EFFECT OF CAREER OPPORTUNITIES ON FACILITY UTILIZATION - ROBUSTNESS CHECKS

Dependent variable	Women giving birth at the health center	Postnatal (0-6 weeks) visits	Children under 5 visited	Children under 5 weighed	Children under 1 receiving BCBG vaccinations	Children under 1 receiving polio vaccinations	Children under 1 receiving measles vaccinations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Placebo test							
Treatment	-3.750	-12.17	-6.500	-6.454	12.03	-3.404	3.318
	(12.18)	(9.392)	(179.5)	(161.1)	(13.54)	(10.59)	(10.28)
After	0.864	15.43	92.22	153.5	2.659	3.843	-2.952
	(3.887)	(4.433)	(78.04)	(74.10)	(5.177)	(3.941)	(3.808)
Treatment*After	12.29	8.409	363.8	335.3	7.949	11.77	12.66
	(5.349)	(9.553)	(116.9)	(137.4)	(10.06)	(5.232)	(8.383)
Placebo After	7.267	0.138	-64.76	-94.40	-8.341	-10.45	3.728
	(2.347)	(4.528)	(81.76)	(66.74)	(4.548)	(5.173)	(4.271)
Treatment* Placebo After	2.944	-1.329	-111.0	-123.8	-1.828	5.992	-3.072
	(5.834)	(5.206)	(141.6)	(137.9)	(7.704)	(7.841)	(8.431)
Area characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of dependent variable in control (year 1)	45.3	55.4	1285.7	1236.1	83.0	72.4	70.4
Adjusted R-squared	0.350	0.214	0.254	0.255	0.152	0.152	0.117
Number of facilities	89	119	123	123	120	121	120
Number of observations	1301	1543	1618	1610	1518	1531	1535
EDF p-value of Treatment* Placebo After	0.622	0.803	0.444	0.381	0.816	0.456	0.721
RI p-value of Treatment* Placebo After	0.599	0.808	0.418	0.381	0.810	0.474	0.728

Note: Continued on next page

Table A6—The effect of career opportunities on facility utilization - robustness checks

Dependent variable	Women giving birth at the health center	Postnatal (0-6 weeks) visits	Children under 5 visited	Children under 5 weighed	Children under 1 receiving BCBG vaccinations	Children under 1 receiving polio vaccinations	Children under 1 receiving measles vaccinations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel B: Health post fixed effects							
After	4.975	15.46	63.77	106.9	-1.094	-1.273	-1.024
	(4.167)	(5.217)	(66.27)	(65.97)	(4.790)	(3.887)	(3.856)
Treatment*After	13.02	8.665	306.3	278.4	8.409	15.38	11.59
	(6.411)	(9.840)	(107.4)	(119.1)	(8.842)	(5.321)	(7.825)
Area characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of dependent variable in control (year 1)	45.3	55.4	1285.7	1236.1	83.0	72.4	70.4
Adjusted R-squared	0.822	0.664	0.618	0.591	0.496	0.565	0.445
Number of facilities	89	119	123	123	120	121	120
Number of observations	1301	1543	1618	1610	1518	1531	1535
EDF p-value of Treatment* After	0.047	0.374	0.006	0.022	0.337	0.006	0.139
RI p-value of Treatment* After	0.024	0.412	0.017	0.043	0.352	0.003	0.140

Note: OLS estimates, standard errors clustered at the district level. Treatment=1 if the health worker is recruited in a district where career opportunities were made salient. Data source is the Health Management and Information System (HMIS) available monthly from January 2011 until June 2014. Health center and health post staff are required to submit monthly reports that summarize their activities at the health post/community level. These are aggregated at the quarter level in the regressions. The variable in column 1 is defined at the health center level because health centers are equipped for child births and health posts are not. The variables in columns 2-7 are defined at the health post level if this reports data, at the health center otherwise. After=1 after September 2012 (from 2012:4 onwards), when CHAs started working. Placebo After=1 after September 2011, halfway through the period before the CHAs started working. All regressions include the stratification variables (province dummies and share of high school graduates in the district). Area characteristics include: number of staff in the health post, geographical distribution of households in the catchment area, and an indicator variable that equals 1 if the CHA reports to have good cell network coverage most of the time or all the time. EDF p-value refers to the p-value from a null hypothesis that the treatment interaction, as specified in the tables, is zero (in the same regression), using the Young (2016) effective degrees of freedom correction. RI p-value refers to the equivalent p-value using a Randomization Inference procedure (specifically, the randomization-t p-value from Young (2019)).

*

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