Pre-Analysis Plan:

Recruitment Strategies for Community Animal Health Workers in Sierra Leone

24 January 2019

PIs: Maarten Voors, Kevin Grieco, Macartan Humphreys, Salif Jaiteh, Niccolo Meriggi, Carlo Prato, Peter van der Windt

* corresponding author: maarten.voors@wur.nl

1. Overview

We evaluate the impact of recruitment strategies for community-level service providers on their performance and characteristics. We randomly manipulate the degree of community involvement in selecting village-level animal health workers in a sample of 300 communities in Sierra Leone. This pre-analysis plan (PAP) is part of a larger study on the role of community engagement in the *recruitment* and *monitoring* of village-level service providers. This PAP details the hypotheses, randomization procedure, estimation strategy, data and outcomes for recruitment strategies alone. Details relating to monitoring of service providers will be included in a separate PAP.

2. Registration timeline

Registration prior to PI access to outcome data. PIs will not have access to any outcome data until this PAP is registered. Fieldwork for this study commenced on 1 August 2017, and only the study's field managers had access to the data. The data are kept on a secure server, and the PIs will be invited as soon as the PAP is lodged.

We have received IRB clearance from the Government of Sierra Leone, Office of the Sierra Leone Ethics and Scientific Review Committee (SLERC 16102017), the University of Columbia (IRB-AAAR5175) and New York University Abu Dhabi (124-2018) for this trial.

3. Introduction

Recruiting frontline service providers (eg nurses, teachers, etc) remains a central challenge for many developing country governments. In the wake of the Ebola Virus Disease the government of Sierra Leone is implementing strategies to increase health outcomes by installing community-level human *and* animal health workers that provide basic health services and execute health surveillance activities to detect suspicious events timely. This fits within the government strategy around One Health – an integrated human and animal public health approach.[1]

We collaborate with the Ministries of Health and Sanitation (MoHS) and the Ministry of Agriculture, Forestry and Food Security (MAFFS) in Sierra Leone, and randomly manipulate the recruitment strategy of community animal health workers (CAHW). In particular, we focus on the role of community engagement in selection and monitoring of service providers, comparing this to more government-led selection and incentivizing mechanisms.

4. Control and Treatment Conditions

Common elements across treatment arms. From each study community, we aim to recruit a CAHW. Eligibility criteria include English literacy, mathematical skills, animal rearing experience, strong ties with community members and long-term plans to remain in the community, being a trusted

---

[1] https://www.cdc.gov/onehealth

member of the community, of good health and in fit physical condition, and available to attend all CAHW training sessions (21 days) that are part of the *Community One Health* program.

Double listing. We invite both the Paramount Chief (PC) and communities directly to nominate a CAHW. Specifically, in separate meetings, we asked the PC (in private) and village residents (during a community meeting) to submit an ordered list of up to three CAHW candidates that met the eligibility criteria. This creates a double listing, where for each village we observe preferred candidate.

Once candidate-lists were submitted, the top nominees from both the Community and Paramount Chief were invited to an eligibility exam where basic reading, writing, and mathematics skills were assessed. CAHW candidates also completed a short survey, which did not factor into determining eligibility. If the top candidate did not pass the exam, the next candidate would be invited to take the exam (and so on).

Control condition. The control condition, represents the status quo recruitment strategy where CAHWs are recruited from the Paramount Chief's nominees. In many developing countries, due to limited state capacity, local government often rely on traditional political institutions to recruit village-level service providers. Discussion with local National and District politicians revealed that, absent of external interventions, in Sierra Leone, selection of village-level Community Animal Health Workers (CAHW) would be delegated to Paramount Chiefs.[2]

Treatment condition. For treatment villages, we select candidates from the community nominees, where CAHWs are recruited from the community nominees during the community selection meeting.

More Details on Participatory Selection can be found in Annex 1 "Training Manual Selection of CAHW".

5. Hypotheses

The type of recruitment strategy can affect bureaucratic performance by selecting workers with different individual characteristics or with different socio-political relations. Dal Bo Finan, and Rossi (2013) find that higher wage offers attract more qualified and competent candidates during a government recruitment process in Mexico. Ashraf, Bandiera and Lee (2015) and Deserranno (2019) assess recruitment strategies aimed at attracting applicants with different personal motivations: materially motivated workers and socially motivated workers. Callen et al (2018a) demonstrate a correlational link between personalities of officials in government and public sector performance in Pakistan.

As direct beneficiaries of village-level service delivery, community members may have greater incentive (compared to the Paramount Chief) to select CAHWs with personal characteristics that improve performance. Moreover, community members may have better information about the competence, pro-social preferences, and personality traits of potential CAHWs.

Our primary hypothesis is:
- *H1: Participatory selection improves CAHW surveillance performance.*

Secondary hypotheses include those related to two families: *CAHW characteristics* and *CAHW*

---

[2] In addition, during a pilot project in November of 2016 in nine villages, District Ministry of Agriculture recruited CAHWs exclusively through Paramount Chiefs.

embeddedness:

Family 1: CAHW personal characteristics:
- *H2: Participatory selection increases the likelihood of selecting a CAHW with higher pro-social preferences*
- *H3: Participatory selection increases the likelihood of selecting a competent CAHW*
- *H4: Participatory selection recruits CAHWs with higher levels of Big Five personality characteristics: extraversion, agreeableness, conscientiousness, emotional stability, and openness.*

Recruitment strategies may also affect what types of service providers are selected in terms of social and political relations, which may in turn effect job performance. However, we are not aware of experimental studies that study the effects of public sector recruitment strategies on political connections of service provides and subsequent performance. Recruitment strategies that select workers with deeper social ties may matter because socially connected worker may be more responsive to social incentives.[3] Callen et al (2018b) demonstrate a correlation between political connection with local politicians and public sector job performance in Pakistan. Furthermore, the business-as-usual case, where CAHWs are selected by the ministry indirectly through the chieftaincy system, may suffer from nepotistic / political considerations, selecting workers with weaker ties to and support of communities.

Family 2: CAHW embeddedness:
- *H5: Participatory selection increases the likelihood to select CAHWs with higher embeddedness in the community*
- *H6: Participatory selection increases CAHW susceptibility to community pressure*
- *H7: Participatory selection decreases the likelihood that CAHW candidate has political connections to Chiefdom authorities*

In addition to testing these hypotheses, descriptively we investigate the characteristics of applicants (in terms of age, gender etc.).

6. Randomization strategy
We block randomize villages into treatment using the following ten pre-treatment variables to block. Block randomization is done within each chiefdom.
1. Village population
2. Village-level Ethno-Linguistic Fractionalization (ELF)
3. Distance to local health center (PHUs) in kilometers
4. Minutes walked to obtain cell coverage
5. Inclusiveness of CAHW community selection process[4]
6. Community wealth – relative measure based on enumerator perception[5]
7. PC candidate was proposed for village
8. Whether village chief contacted PC or his representatives in last 7 days
9. Number of households with livestock
10. Time in days since community first received Community Health Worker (CHW)

---

[3] Social incentives underpin the literature on "community monitoring" (see Björkman and Svensson 2009 amongst others).
[4] Survey question: "Which best describes how the group came to a conclusion about the candidate?" Scale 0. it was already decided, 1. chief and/or elders decide without other input), 2. chief and/or elders decide with input mostly from other opinion leaders, 3. chief and/or elders decide with input from many people including non-opinion leaders), 4. open discussion followed by general consensus.
[5] Survey question: "Based on your own personal experience and observations. When answering this question, think about all of the villages that you have visited in this area. Think about the quality of the buildings, the number of children that look malnourished (are there children with hair falling out?) and other signs of poverty. In your experience, how does this community compare to other communities that you have been to in this area?" Scale 5. Much better off than other communities, 4. A little better off than other communities, 3. About the same as other communities, 2. A little worse off than other communities, 1. A lot worse off than other communities

Table 1 shows that the randomization achieves balance across these ten variables.[6]

Table 1. Balance Table

```
summary(lm(T2_pc_candidate ~ elf + wealth_community + n_pop_total + distance_phu_miles + distance_coverage_min +
deliberation_process +wealth_community + pc_candidate + chief_contacted_pc + n_hh_with_livestock + days_since_chw
, data = blocking[blocking$primary_stratum ==1, ]))
```

```
##
## Call:
## lm(formula = T2_pc_candidate ~ elf + wealth_community + n_pop_total +
##     distance_phu_miles + distance_coverage_min + deliberation_process +
##     wealth_community + pc_candidate + chief_contacted_pc + n_hh_with_livestock +
##     days_since_chw, data = blocking[blocking$primary_stratum ==
##     1, ])
##
## Residuals:
##      Min      1Q  Median      3Q     Max
## -0.70373 -0.46865  0.07974  0.47437  0.70971
##
## Coefficients: (1 not defined because of singularities)
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             3.101e-01  2.819e-01   1.100   0.2742
## elf                    -4.447e-02  2.189e-01  -0.203   0.8394
## wealth_community       -4.238e-03  5.065e-02  -0.084   0.9335
## n_pop_total             1.548e-04  3.310e-04   0.468   0.6412
## distance_phu_miles      2.391e-02  1.397e-02   1.711   0.0905 .
## distance_coverage_min  -1.011e-03  8.711e-04  -1.160   0.2490
## deliberation_process    9.999e-03  4.924e-02   0.203   0.8395
## pc_candidate                   NA         NA      NA       NA
## chief_contacted_pc     -6.084e-02  1.431e-01  -0.425   0.6717
## n_hh_with_livestock    -7.204e-04  1.688e-03  -0.427   0.6706
## days_since_chw          3.337e-05  3.475e-05   0.960   0.3395
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5094 on 91 degrees of freedom
##   (7 observations deleted due to missingness)
## Multiple R-squared:  0.06457,    Adjusted R-squared:  -0.02794
## F-statistic: 0.698 on 9 and 91 DF,  p-value: 0.7091
```

Full randomization procedure can be found in Annex 2.

The starting sample consisted of 300 villages.

For all communities, the Paramount Chief and village residents were asked to submit an ordered list of three candidates for Community Animal Health Worker in each village. However, not all communities and not all Paramount Chiefs submitted their candidate list. As a result, there are four types of lotteries.
1. Pure lottery: Two unique eligible candidates were nominated by the Community *and* Paramount Chief. In this case, both candidates entered into a lottery and randomly one candidate was chosen as CAHW.
2. Simple lottery: The same eligible candidate was nominated by both the Community and Paramount Chief. In this case, the candidate was announced as having been nominate by either Community or Paramount Chief.
3. No lottery: Communities with an eligible candidate on only one side (Community or Paramount Chief), they were automatically selected to train as a CAHW.
4. Excluded: neither the community nor the Paramount Chiefs submitted any eligible candidates.

Table 2 provides an overview.

---

[6] Based on data from 104 villages that entered the "pure lottery" (see below)

Table 2. Village Level Breakdown of by Lottery Type

	Pure Lottery – Distinct Eligible Candidates on Both Sides	Simple Lottery – Same Eligible Candidate on Both Sides	No Lottery – Only Eligible Community Candidate	No Lottery – Only Eligible Paramount Chief Candidate	Excluded – No eligible candidate
Number of villages (candidates)	104 (208)	91 (91)	78 (78)	16 (16)	11 (11)

7. Planned Analysis

Our primary estimand is the ATE of *selection*, comparing locations for which the chief and the community selected <u>different</u> candidates, ie those that went in to the "pure lottery".

Our sample comprises the 104 villages.
We estimate, using a simple OLS regression:

$$Y_c = \beta_0 + \beta_1 CS_c + B_c \Pi + \varepsilon_c \qquad (1)$$

where Y_c is the outcome, discussed in more detail below, for community c; CS_c is a dummy, 1 if the CAHW was selected by the community and 0 if selected by the chief; B_c contains a vector of our balancing variables; and ε_c is the usual idiosyncratic error term (clustered at community level for household level outcomes). The parameter of interest is β_1. We will construct mean effects indices following Kling, Liebman and Katz (2007).

For Hypothesis 2-7, we can make use of the double listing approach and use the information on CAHWs within each village that were <u>not</u> selected. Our sample then comprises 208 CAHWs and we estimate:

$$Y_c = \delta_c + \delta_1 CS_c + \delta_c \Pi + \pi_c \qquad (2)$$

Where β_c is a village fixed effect. In expectation β_1 and δ_1 should be the same. A key benefit is that model (2) has more statistical power than Model (1)

A secondary estimand is the ATE of *recruitment*, to estimate this we combine the sample for CAHWs from the "pure lottery" (n = 104) with CAHWs from villages with "simple lotteries" where chiefs and communities selected the same candidate (n = 91). This estimand is only relevant for Hypothesis 1 since the characteristics of those in the "simple lottery" are by definition the same.

Throughout our analysis, we will adjust for the fact that we are running more than one test on the same dataset by implementing false discovery rate (FDR) corrections. [7] These adjustments run across the two families (Family 1 and Family 2) or 6 hypotheses (H2 – H7) as relevant. For all tests, we will also report the "naïve" or "per comparison" p-value.

8. Survey Instruments and Outcomes

---

[7] See Benjamini et al (2006) and Anderson (2008). Research practice appears to be moving towards FDR and away from the more conservative familywise error rate (FWER) corrections where there are several tests of interest.

Data for this study comes from two instruments:

1. CAHW Candidate Survey - In fall 2017 we conducted a survey with 632 CAHW candidates (Table 3).

    See Annex 3 ["Instrument CAHW"].

2. CAHW Validation Score – During spring 2018, CAHW underwent a series of evaluation exercises to assess their job performance.

The CAHW Validation Score assesses the quality of CAHW job performance by testing their level of technical expertise and effectiveness as a CAHW. The validation exercise consists of two components: 1) Field Practical and 2) Field Visits. More details can be found in Appendix X: "Validation Scoring Guide".

    See Annex 5 ["Validation Scoring Guide"].

The Field Practical consist of two exercises:
    a) Animal Station Exam - CAHWs observe sick animals, diagnose health problems, and fill in a disease reporting form.
    b) Form Review – Five disease surveillance forms that the CAHW has submitted are randomly selected. CAHWs are required to explain to evaluators why forms are filled out the way they are. Through this process CAHWs are assessed on their understanding of the disease surveillance form.

Field Visit
Field Visits captures a CAHW's disease surveillance effectives in their village. Field visits consist of two sub-components:
    c) Sick Animal Observation - Evaluators verify if sick animals found in a village have been reported by CAHWs.
    d) Monitoring Form Follow-Up – Using previously filed disease reporting forms, Evaluators interview owners of animals that the CAHW reported as sick. This exercise verifies if CAHWs are accurately reporting sick animals.

Validation Scoring

To create our validation score we:

    1) Collapse Sick Animal Observation and Monitoring Form Follow-up into a single measure called "Field Visit".
    2) Create final Validation score by combine Field Visit score with scores from Animal Station Exam and Form Review.

Next, we describe the indicators that measure each outcome category. See Annex 4 for full description of variables.

Hyp.	Outcome	Description	Source
H1	Surveillance performance	See description above and Annex 5	Validation Exercise
H2	Pro-social preferences	We measure pro-sociality with two versions of a dictator game. In all versions, the respondent is asked what portion of their endowment they would like to give to a	CAHW Survey

		receiver.	
H3	Competence	We measure CAHW competence using an index of animal rearing experience / knowledge and educational background. These characteristics are appropriate measures of competence as the job of a CAHW requires the practical skill of handling various domestic animals, knowledge to identify diseases, and English reading and writing skills to absorb CAHW training (training materials are in English) and complete disease surveillance forms.	CAHW Survey
H4	Performance-improving personality characteristics	To measure personality, we use an abbreviated version of the Big Five Inventory (BFI) personality test (Rammstedt and John, 2007).[8] We translated this original version into Krio. The respondent is asked 10 total questions, and from this scores are constructed for: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness.	CAHW Survey
H5	Embeddedness	We measure community social embeddedness through an index of survey responses First, we collect information on a) the number of years the respondent has lived in the village, b) the number of nights of week they sleep in the village, c) number of family members in community d) plans to stay in the village in the future. Second, we also use two survey vignettes to capture the strength of the social relationship between the CAHW candidate and their community by asking CAHW who they can count on in times of emergency. Specifically, we elicit a) the number of people in the village the CAHW candidate could turn to for an interest free loan in an emergency and b) the number of people in the village to whom the CAHW candidate would feel comfortable extending an interesting free loan in an emergency.	CAHW Survey
H6	Susceptibility to community pressure	Difference between amount shared in a dictator game played in private vs one played in public	Survey
H7	Political connections	We measure political connections as a dummy variable for if the CAHW or his/her biological relatives are related to any	Survey

---

[8] The original version is John et al 1991.

		important chiefdom authority: Town Chief, Deputy Town Chief, Chiefdom Speaker, Section Speaker, Paramount Chief, Ward Councilor.	

References

- Anderson, M (2008) 'Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedaian, Perry Preschool, and Early Training Projects,' Journal of the American Statistical Association, 103 (484): 1481-1495.
- Ashraf, N., Bandiera, O., & Lee, S. S. (2014). Do-gooders and go-getters: career incentives, selection, and performance in public service delivery. STICERD-Economic Organisation and Public Policy Discussion Papers Series, 27, 54.
- Björkman, Martina, and Jakob Svensson. "Power to the people: evidence from a randomized field experiment on community-based monitoring in Uganda." The Quarterly Journal of Economics 124.2 (2009): 735-769.
- Benjamini, Y., A. Krieger, and D. Yekutieli (2006) Adaptive Linear Step-Up Procedures That Control the False Discovery Rate, Biometrika, 93: 491–507.
- Callen, Michael, et al. 2018a. *Personalities and public sector performance: Evidence from a health experiment in Pakistan*. No. w21180. National Bureau of Economic Research, 2018.
- Callen, Michael, et al. 2018b. *The Political Economy of Public Sector Absence: Experimental Evidence from Pakistan*. No. w22340. National Bureau of Economic Research, 2018.
- Dal Bó, Ernesto, Frederico Finan, and Martin A. Rossi (2013). "Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service." The Quarterly Journal of Economics 128(3): 169-1218.
- Deserranno, E. (2019). "Financial Incentives as Signals: Experimental Evidence from the Recruitment of Village Promoters in Uganda," *American Economic Journal: Applied Economics*, forthcoming.
- Finan, F., B. Olken, R. Pande (2015) The Personnel Economics of the State, NBER Working Paper No. 21825
- John, O. P., Eileen M. Donahue, and Robert L. Kentle. 1991. "The big five inventory--Versions 4a and 54. Berkeley." *CA: University of California, Berkeley, Institute of Personality and Social Research* 54 (1991).
- Rammstedt, Beatrice, and Oliver P. John. "Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German." *Journal of research in Personality* 41.1 (2007): 203-212.