Pre-analysis plan

"The demand for and costs of supplying grid connections in Kenya"

AEA RCT Title: "Evaluation of Mass Electricity Connections in Kenya"

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Summary: This document outlines the plan for analyzing the demand for and costs of supplying household electricity connections in rural Kenya. The proposed analysis will take advantage of a field experiment in which randomly selected clusters of rural households were offered an opportunity to connect to the national grid at subsidized prices. This pre-analysis plan outlines the regression specifications, outcome variables, and covariates that will be considered as part of this analysis. We anticipate that we will carry out additional analyses beyond those included in this plan. This document is therefore not meant to be comprehensive. The overall research project will also include an impact evaluation of electricity connections that will be carried out in 2015 or 2016, upon completion of the endline survey round. For this portion of the project, we will register an additional pre-analysis plan at a later date, in either 2015 or 2016.

Appendix: Living Standards Kenya (LSK) Survey (Baseline Survey)

I. Introduction

Electrification has long been a benchmark of development, yet over two-thirds of the population of Sub-Saharan Africa lives without access to electricity. In June 2013, President Obama announced the Power Africa initiative, making energy access a top priority among six partner countries in Africa, including Kenya. In light of this initiative, and others being implemented by the World Bank and the UN General Assembly, there is considerable need for rigorous research to inform the effective scale-up of energy access programs in developing countries.

In this project, we have identified a unique opportunity to increase access to on-grid energy in Kenya. Since 2007, Kenya's Rural Electrification Authority (REA) has rapidly expanded the national grid, installing electricity distribution lines and transformers across many of the country's rural areas. Connectivity, however, remains low. While roughly three-quarters of the population is believed to live within 1.2 kilometers of a low voltage line, the official electrification rate is under 30%. In related work, we find that in regions that are technically covered by the grid, half of the unconnected households are no more than 200 meters from a low-voltage line.

We believe that the primary barrier to connecting these "under grid" households is the prohibitively high connection fee faced by rural households. The current connection price of KSh 35,000 ($412) may not be affordable for poor, rural households in a country where the GNI per capita (PPP) is $1,730. Despite this fact, Kenya's monopoly distribution company, Kenya Power, has recently proposed increasing the price to KSh 75,000 due to cost considerations.[1]

In general, little is known about the demand for electricity in rural areas, both initially and over time. Specifically, how many more households would opt to connect if the fee were, for

[1] In March 2014, Kenya Power, the national utility, stated that it will continue to charge eligible customers KSh 35,000 for single-phase power connections, as long as the cost of connection does not exceed KSh 135,000 ($1,588), inclusive of VAT.

example, KSh 25,000 ($294), KSh 15,000 ($176), or even KSh 0? How much power would households consume if they did connect, now and in the future? And once households are connected, do the social and economic benefits of access to modern energy in rural areas outweigh the costs?

In the coming years, REA will explore the feasibility of initiating a long-term, last-mile household connection program involving discounted connection fees for households and small businesses located close to existing REA electricity transformers. In order to evaluate this potential program, we have partnered with REA to conduct a randomized evaluation of grid connections involving roughly 2,500 households in rural Western Kenya.

The principal objectives of this study are twofold:

1. To trace out the demand curve for electricity connections, and in addition, to estimate the economies of scale in costs associated with spatially grouping connections together.
2. To measure the social and economic impacts of electrification, including schooling outcomes for children, energy use, income and employment, among other outcomes.

This pre-analysis plan outlines our strategy to address the first objective. The analysis on the impacts of the intervention will be carried out in 2015 and 2016, upon completion of the midline and endline survey rounds. The pre-analysis plan for the second stage of this project will therefore be registered at a later date, in either 2015 or 2016.

The remainder of this document is organized as follows. Section II provides a brief background on the existing literature on the demand for electricity connections. Section III provides a brief overview of the experimental design. Finally, Sections IV and V outline the main estimating equations that will be used in our analysis of both the demand for and costs of supplying electricity connections.

II. Brief literature review

In recent years, there has been a growing literature examining the demand for electricity connections in developing countries. The methods utilized in these studies range from contingent valuation approaches (see, e.g., Abdullah and Jeanty 2011) to randomized encouragement designs, where households are offered vouchers or subsidies to connect to the electricity network at a discounted price. Bernard and Torero (2013), for example, distribute two levels of randomized vouchers (10% and 20% discounts) to encourage household grid connections in Ethiopia, where the connection price ranges from $50 to $100, depending on the household's distance to the nearest electrical pole. Similarly, Barron and Torero (2014) utilize two levels of randomized vouchers (20% and 50% discounts) in El Salvador, where the connection price (in the study setting) is $100.

There is also an engineering literature simulating the costs of extending the grid to rural areas in developing countries. Parshall et al. (2009), for example, apply a spatial electricity planning model to Kenya and find that "under most geographic conditions, extension of the national grid is less costly than off-grid options." Zvoleff et al. (2009) examine the costs associated with extending the grid across various types of settlement patterns, demonstrating the potential for non-linearities in costs.

While our study is closely related to the earlier randomized encouragement designs, our objective is to evaluate the demand for electricity connections at randomized prices, as well as provide experimental evidence on the cost economies of scale associated with grouping connections together spatially.

III. Overview of project

1. Experimental design

Our experiment takes place across 150 "transformer communities" in Western Kenya. Each transformer community is defined as the group of all households located within 600 meters of a central electricity distribution transformer. In Kenya, all households within 600 meters

of a transformer are eligible to apply for an electricity connection. In each transformer community, we have enrolled roughly 15 randomly selected unconnected households. In total, our study will involve roughly 2,250 unconnected households.

On 23 April 2014, our sample of transformer communities was randomly divided into treatment and control groups of equal size (75 treatment, 75 control). Each of the 75 treatment communities were then randomly assigned to one of three treatment arms (i.e. subsidy groups). These subsidies were designed to allow households to connect to the national power grid at relatively low prices (compared to the current connection price of KSh 35,000 or $412). In addition, each household accepting an offer to be connected as part of the study would receive a basic household wiring solution ("ready-board") at no additional cost. Each ready-board provides a single light bulb socket, two power outlets, and two miniature circuit breakers (MCBs).

The treatment and control groups are characterized as follows:

A. High-value treatment arm

25 communities. KSh 35,000 ($412) subsidy and KSh 0 ($0) effective price. This represents a 100% discount on the current price.

B. Medium-value treatment arm:

25 communities. KSh 20,000 ($235) subsidy and KSh 15,000 ($176) effective price. This represents a 57% discount on the current price.

C. Low-value treatment arm:

25 communities. KSh 10,000 ($118) subsidy and KSh 25,000 ($294) effective price. This represents a 29% discount on the current price.

D. Control group:

75 communities. No subsidy and KSh 35,000 ($412) effective price. There is no discount offered to households in the control group.

Within each treatment community, all enrolled and unconnected households would receive the same subsidy offer. After receiving the subsidy offer, treatment households would be given eight weeks to accept the offer and deliver the required payment to REA. At the end of this eight-week period, field enumerators would visit each household to verify that the required payment has been made to REA. Electricity connections are delivered once these verifications are complete. The collection of take-up responses comprises the main data set for the analyses outlined in this pre-analysis plan.

Once payments are verified, REA would hire its own contractors to deliver the connections within a period of four to six weeks. In order to economize on its own delivery costs, REA would connect all of the required connections in each community at the same time. REA would also group anywhere from two to four neighboring communities together, in order to further economize on transportation costs.

The first set of randomized offers were delivered in early-May and expired in early-July. The second set of randomized offers will be delivered in late-July and will expire in late-September. Our field enumerators began collecting take-up data on 4 July 2014. The full round of data collection will continue through the end of October 2014. As a result, it is expected that the final version of the data set for this analysis will be available in November 2014.

Data collection began before this document was uploaded to the AEA RCT registry website. In anticipation of this delay, we posted a document to our registered trial on 2 July 2014 titled "A note on pre-analysis plans" in order to describe how the investigators would be prohibited from accessing any data until a pre-analysis plan had been uploaded to the registry website.

2. Power calculations

At the beginning of this project, we knew little about the demand for electricity connections at various prices. We therefore made a set of assumptions on how take-up would vary at four different levels of prices. Taking into account our budgetary constraints, we designed

the study to detect differences in take-up at these pricing levels, based on our set of ex-ante assumptions. In addition, we took into consideration the level of take-up that we would need in our future analysis on the social and economic impacts of electrification. These assumptions are outlined in Table 1.

Table 1: Ex-ante take-up assumptions

	Communities	Households (n)	Assumed take-up range
A. High-value arm ("High")	25	375	90 - 95%
B. Medium-value arm ("Medium")	25	375	40 - 50%
C. Low-value arm ("Low")	25	375	15 - 25%
D. Control group ("Control")	75	1,125	0 - 5%
Total	150	2,250	

Table 2: Communities required in each arm to detect differences with 80% power

Comparison	Description	Required size of each arm	Actual size of each arm
A vs. B	High vs. Med.	3 - 5	25
A vs. C	High vs. Low	2	25
A vs. D	High vs. Control	1 - 2	25 (High), 75 (Control)
B vs. C	Med. vs. Low	6 - 27	25
B vs. D	Med. vs. Control	3 - 5	25 (Med), 75 (Control)
C vs. D	Low vs. Control	6 - 26	25 (Low), 75 (Control)

In Table 2, we report the total number of communities required to detect differences ($\alpha = 0.05$) between groups with 80% power. For example, in the comparison of groups B (medium-value treatment arm) and C (low-value treatment arm), we expect that we will need 6 to 27 communities in each treatment arm (the actual size of each arm is 25 communities).[2] We assume an intracluster correlation coefficient of 0.1 within communities. In our design, we included a large number of high-value treatment communities in order to increase our statistical power to estimate the social and economic impacts of electrification (our second objective). Based on these assumptions, we expect that we are sufficiently powered, based on our ex-ante assumptions on take-up.

3. Data

This analysis will utilize four data sets: (1) Data on household take-up decisions; (2) Data on

[2]Since we had assumed a range of values for our assumptions on take-up, we report a range of values for the required size of each arm. For example, if take-up is 50% and 15% for groups B and C, respectively, we would require only 6 communities in each arm. However, if take-up is 40% and 25% for groups B and C, respectively, we would require 27 communities.

actual costs of supplying household connections; (3) Data on community-level characteristics; and (4) Household-level baseline survey data from the Living Standards Kenya (LSK) survey. The survey instrument is included in the Appendix.

IV. Analysis plan - Demand

The primary objective of this analysis is to estimate the demand for electricity connections, or in other words, the willingness of individual households to pay for a quoted price of an electricity connection. We will follow the procedure: (1) Estimate a non-parametric regression of household take-up on various subsidy levels. (2) Test for linearity: If we cannot reject linearity, we will estimate a linear regression of take-up on the effective connection price. If we can reject linearity, we will focus on the non-parametric estimation for the remainder of the analysis. (3) Estimate heterogeneous effects. (4) Plot the demand curve and compare these results to our contingent valuation results.

1. Non-parametric regression

We will begin by estimating the main equation:

$$y_{ic} = \alpha_0 + \alpha_1 T_c^{low} + \alpha_2 T_c^{mid} + \alpha_3 T_c^{high} + X_c'\gamma + \epsilon_{ic} \quad (1)$$

where y_{ic} is a binary variable reflecting the take-up decision for household i in transformer community c.[3] The binary variables T_c^{low}, T_c^{mid}, and T_c^{high} indicate whether community c was randomly assigned into the low-value, medium-value, or high-value treatment arms, respectively. Following Bruhn and McKenzie (2009), we include a vector of community-level characteristics, X_c, containing the variables used for stratification during randomization.[4] Standard errors will be clustered at the community level.

Equation (1) will be the primary equation that we estimate in our demand-side analysis. As

[3]Refer to Section IV Part 3 for further details on the dependent variable.

[4]Refer to Section IV Part 4 for further details on the components of X_c.

a robustness check, we will also estimate the equation:

$$y_{ic} = \alpha_0 + \alpha_1 T_c^{low} + \alpha_2 T_c^{mid} + \alpha_3 T_c^{high} + X_c'\gamma + X_{ic}'\lambda + \epsilon_{ic} \tag{2}$$

where X_{ic} is a vector of household-level characteristics.[5] X_{ic} will include standard control variables that not only have predictive effects but may also serve as sources of heterogeneity in take-up.

We will also assess whether treatment and control households are balanced at baseline in terms of household characteristics. In addition to X_{ic}, we may also choose to control for any covariates that are both unbalanced at baseline and relevant for electricity take-up.

In equations (1) and (2), the baseline (i.e. $T_c^{low} = T_c^{mid} = T_c^{high} = 0$) estimates household take-up under the status-quo pricing policy (i.e. take-up when the price of an electricity connection faced by the rural household is KSh 35,000). α_1, α_2, and α_3 capture the incremental effects (over the baseline) on take-up of the low-value, medium-value and high-value subsidies, respectively. Since the randomized subsidies will lower the effective price of an electricity connection, we expect that our experiment will result in positive and statistically significant α-coefficients.

2. Testing for linearity

We are interested in testing for linearity in equation (1). We will use an F-test to assess the null hypothesis:

$$H_0\text{: } \frac{(\alpha_3 - \alpha_2)}{15} = \frac{(\alpha_2 - \alpha_1)}{10} = \frac{(\alpha_1 - \alpha_0)}{10}$$

against the alternative hypothesis that the slope in between the various take-up points is unequal. If we cannot reject linearity in an F-test, we will also estimate the equation:

$$y_{ic} = \beta_0 + \beta_1 p_c + X_c'\gamma + \epsilon_{ic} \tag{3}$$

[5]Refer to Section IV Part 4 for further details on the components of X_{ic}.

where p_c is the effective price of an electricity connection faced by households in community c.[6]. Standard errors will again be clustered at the community level. As in equation (2), we will similarly check robustness by including the vector X_{ic}.

If we can reject linearity in an F-test, it will be of interest to understand how take-up changes when moving across different subsidy levels. In a similar experiment conducted in El Salvador, Barron and Torero (2014) find that the effects of a relatively low subsidy (20%) and a relatively high subsidy (50%) are similar. This is taken to suggest that either the demand for connections is inelastic (in the price range offered), or that the subsidies affect take-up through alternative channels.[7] Given this unusual result, we will focus on equation (1) and test the hypothesis that:

$$H_0\text{: } \alpha_1 = \alpha_2$$

against the alternative that the higher-value subsidy has a larger effect on take-up compared to the lower-value subsidy (i.e. H_1: $\alpha_2 > \alpha_1$). We will conduct a similar test for each of the pairwise combinations listed in Table 2.

3. Two measures of take-up

We may find that some of the treatment households decided that they would like to accept the offer, but are unable to complete the full payment within the eight-week period. We may therefore have two measures of take-up:

1. Actual take-up (y^1_{ic}): Binary variable indicating whether treatment household ic accepted the offer and completed the required payment within eight weeks.

2. Intended take-up (y^2_{ic}): Binary variable indicating whether treatment household ic intended to accept the offer, and began to make payments, but was unable to complete the full payment within eight weeks.

[6]For example, in a high-subsidy treatment community, the subsidy amount is equal to the current price of an electricity connection and the effective price faced by households is 0 KSh (i.e. $p_c = 0$)

[7]For example, Barron and Torero propose that a subsidy may raise awareness that electrification is possible, resulting in higher take-up.

Our primary outcome of interest, however, will be the actual take-up captured by y_{ic}^1.

4. Covariate vectors X_c and X_{ic}

There are two sets of covariates in equations (1), (2), and (3). X_c is a vector of community-level characteristics and X_{ic}, which will mainly be used in robustness checks, is a vector of household-level characteristics. X_c will primarily include the stratification variables that were used during randomization.[8] The list of X_c variables will include:

1. County indicator: Binary variable indicating whether community c is in Busia or Siaya. This was used as a stratification variable during randomization.

2. Market status: Binary variable indicating whether the total number of businesses in community c is strictly greater than the community-level mean across the entire sample. We use this definition to define which communities could be classified as "markets" relative to the others. This was used as a stratification variable during randomization.

3. Transformer funding year: Binary variable indicating whether the electricity transformer in community c was funded "early" (i.e. in either 2008-09 or 2009-10). This was used as a stratification variable during randomization.

4. Electrification rate: Residential electrification rate in community c.

5. Community population: Estimated number of people living in community c.

X_{ic} will include a set of household-level variables that not only have predictive effects but may also serve as sources of heterogeneity in take-up. The survey from which we will obtain this data is attached in the Appendix. For example, it is possible that take-up will vary depending on household size, household wealth, or the education level and employment type of the survey respondent. In the majority of cases, the survey respondent is either the household head or the spouse of the household head. The list of X_{ic} variables will include (*LSK question numbers in parentheses*):

1. Household size ($a1$): Number of people living in household ic.

[8] The collection of this data is described in further detail in Lee et al. (2014).

2. Household wealth indicator - Walling material ($c1c$): Binary variable indicating whether the walls of household ic can be considered "high quality" (i.e. made of brick, cement, or stone).

3. Household wealth indicator - Chickens ($d9a$): Number of chickens owned by household ic.

4. Age of respondent in years ($a4c$)

5. Education of respondent ($a5b$): Binary variable indicating whether respondent ic has completed some level of secondary education.

6. Farming as primary occupation of respondent ($a5c$): Binary variable indicating whether the primary occupation of respondent ic is farming.

7. Access to financial services of respondent ($g1a$): Binary variable indicating whether respondent ic uses a bank account.

8. Business or self employment activity of respondent ($e1$): Binary variable indicating whether the respondent (or the respondent's spouse) in household ic engages in any business or self-employment activities.

9. Senior household ($a4c$): Binary variable indicating whether respondent ic is over 65 years old.

5. Heterogeneous effects

We are interested in understanding how take-up varies across several important socio-economic dimensions. For example, will take-up depend on community characteristics? Will it be higher for households that are located in more electrified communities or in market centers? Alternatively, will take-up depend on individual characteristics? Will it be higher for the more educated households, or those that are engaged in more "entrepreneurial activities"? In order to answer these questions, we will estimate heterogeneous effects along a number of dimensions, captured in the vectors X_c and W_{ic} (which is a subset of X_{ic}):

1. County indicator (X_c)

2. Market status (X_c)

3. Transformer funding year (X_c)

4. Electrification rate (X_c)

5. Community population (X_c)
6. Household wealth indicator - Walls (W_{ic})
7. Education of respondent (W_{ic})
8. Farming as primary occupation of respondent (W_{ic})
9. Access to financial services of respondent (W_{ic})
10. Business or self employment activity of respondent (W_{ic})
11. Senior household (W_{ic})

We will estimate heterogeneous effects by adding interactions between the treatment variables and the vectors X_c and W_{ic} to equations (1), (2), and (3). We will also carry out additional analyses, depending on the types of heterogeneous effects that we estimate. For example, if we find that take-up is higher in communities with higher electrification rates, we may explore whether there are any "bandwagon" effects, as in Bernard and Torero (2013), by focusing on the interaction between the treatment and community electrification variables. Since we do not know the nature of these heterogeneous treatment effects, it is not possible to fully specify all of the potential analyses in this document.

6. Comparison of contingent valuation to revealed preference results

During the LSK survey round, conducted between February and July 2014, we asked respondents from unconnected households whether they would be hypothetically willing to connect to the national grid at a randomly selected price (see questions $f16b$ and $f16c$ in Appendix). These amounts were randomly drawn from the following set of prices:

$$\text{Hypothetical Price} \in \{0, 10000, 15000, 20000, 25000, 35000, 75000\}$$

This question was followed by an additional hypothetical question asking the respondent whether they would accept an offer at this price if they were given six weeks to complete the

payment.[9]

In comparison, there were four effective prices (randomized at the community-level) in our experimental design:

$$\text{Effective Price} \in \{0, 15000, 25000, 35000\}$$

By making comparisons between these two measures of take-up at similar levels of prices, we will test whether we could reject equal demand (in terms of contingent valuation and revealed preferences). In addition, we will plot various demand curves, with take-up plotted along one axis and the effective (or hypothetical) price plotted along the other. Finally, we will run contingent valuation regressions using the same specifications and covariates as those described in Section IV, Parts 1, 2, and 6.

V. Analysis plan - Costs

The secondary objective of this analysis is to characterize how connection costs decrease with the number of neighboring households that choose to connect at the same time.[10]

1. Potential for economies of scale in costs

Given that rural households are often located in remote areas, the cost of supplying an electricity connection to an individual household can be very high. This is due to the high cost of transportation and the necessity of building additional low-voltage lines. However, significant economies of scale could be achieved by connecting multiple households at the same time. In a related paper, we use the current costs of materials to estimate that the incremental cost of supplying an electricity connection to a single household 200 and 100 meters away from a low-voltage line is $1,940 and $1,058, respectively, inclusive of material

[9] In our experimental design, treatment households were given eight weeks to complete the payment. This change was made at the request of REA, after we had already launched our baseline survey round. In this hypothetical question, we do not believe that providing an additional two weeks would have influenced the responses.

[10] We make a distinction between the *price* of an electricity connection, which is the fixed price of an electricity connection faced by households, and the *cost* of an electricity connection, which is the physical cost of supplying the electricity connection faced by the utilities.

and transportation costs, as well as a 25% contractor markup (Lee et al. 2014).

While this cost is extremely high, it is desirable from the perspective of the supplier to connect spatially-clustered groups of households at the same time. For example, when two neighboring households are connected along the same length of line, the above per household costs are projected to fall by roughly 47%, to $1,021 and $580, respectively.

2. IV approach to estimating economies of scale in costs

In our experimental design, randomized subsidies are assigned at the community level. In addition, there are three levels of subsidies. We expect that different levels of subsidies—low, medium, and high—will create variation in the number of households that choose to apply for electricity at the same time. For example, larger numbers of applicants should be observed in the high-subsidy communities (where households pay 0 KSh), and smaller numbers of applicants should be observed in the low-subsidy communities (where households pay 25,000 KSh).

We can therefore estimate the community-level construction cost, Γ_c, as a function of the number of connected households in the community, M_c, using the randomized community-level subsidy amounts, Z_c^{low}, Z_c^{mid}, and Z_c^{high}, as instruments for M_c.[11] In order to allow for the possibility of non-linearities in costs, we will include higher-order polynomials in our estimation of Γ_c. Specifically, we will estimate an instrumental variables regression using the equations:

$$M_c = \delta_0 + \delta_1 Z_c^{low} + \delta_2 Z_c^{mid} + \delta_3 Z_c^{high} + V_c'\mu + \nu_c \tag{4}$$

$$M_c^2 = \delta_0 + \delta_1 Z_c^{low} + \delta_2 Z_c^{mid} + \delta_3 Z_c^{high} + V_c'\mu + \nu_c \tag{5}$$

$$M_c^3 = \delta_0 + \delta_1 Z_c^{low} + \delta_2 Z_c^{mid} + \delta_3 Z_c^{high} + V_c'\mu + \nu_c \tag{6}$$

$$\Gamma_c = \pi_0 + \pi_1 M_c + \pi_2 M_c^2 + \pi_3 M_c^3 + V_c'\mu + \eta_c \tag{7}$$

[11] Refer to Section V Part 3 for additional information on how we plan to construct the variable Γ_c.

where the first-stage equations (4), (5), and (6) estimate the effects of the treatment variables on the number of applicants, and the second-stage equation (7) estimates the effect of higher-order polynomials of the number of connected households on the community-level cost. Since there are multiple endogeneous variables in this framework, equations (4), (5), and (6) will be estimated jointly. V_c is a vector of community-level characteristics that will be relevant in this regression.[12] ν_c and η_c are error terms.

We will take the derivative of our estimates in equation (7) in order to uncover different points along the marginal cost curve. We will plot these points to sketch out a marginal cost curve, with the number of connected households on the horizontal axis and the marginal cost on the vertical axis. We will also expand equations (4) through (7) by interacting the Z_c and M_c variables with the V_c vector to explore any potential heterogeneous effects.

We should note that this analysis is highly speculative. We have not carried out any power calculations because we do not have baseline data on the community-level costs of household electrification. Furthermore, our ability to identify the desired effects will depend on the specified functional forms. If we estimate linear relationships in both stages, we will focus only on estimating equation (4) in the first-stage and substitute equation (7) with the equation:

$$\Gamma_c = \pi_0 + \pi_1 M_c + V_c'\mu + \eta_c \tag{8}$$

In addition, we may pursue additional analyses, depending on the nature of the cost data that we eventually receive.

3. Constructing the variable Γ_c

Through our partnership with REA, we will collect actual cost invoices related to the connections that are delivered as a part of this study. Specifically, we will be provided with an itemized list of costs (e.g. cost of low-voltage lines, cost of service lines, cost of transporta-

[12] Refer to Section V Part 4 for further details on the components of V_c.

tion etc.), as well as the design drawings detailing the planned locations of electricity poles. Using these data, we will work with REA to determine the total construction cost for each community.

4. Covariate vector V_c

V_c will include variables that should have an impact on construction costs, including all of the community-level variables in X_c, in addition to a community distance and land gradient variables. The list of V_c variables will include:

1. County indicator
2. Market status: This may approximate community density or the pre-existing coverage of the local low-voltage network.
3. Transformer funding year
4. Electrification rate: This should approximate the pre-existing coverage of the local low-voltage network. Higher electrification rates (and more local low-voltage network coverage) should decrease construction costs.
5. Community population
6. Distance from REA warehouse: Travel distance (in kilometers) between community c and the primary REA warehouse located in Kisumu where the construction materials are stored. Longer travel distances should increase construction costs.
7. Terrain or land gradient: We will use two different measures of terrain or land gradient. Dinkelman (2011) identifies land gradient as a major factor contributing to the costs of electrification. In flatter areas, the soil tends to be softer, making it cheaper to lay power lines and erect transmission poles. Our primary community-level land gradient variable will therefore be constructed using the same methodology as Dinkelman (2011). Specifically, we will use the 90-meter Shuttle Radar Topography Mission (SRTM) Global Digital Elevation Model (available at www.landcover.org) to access elevation data and then construct measures of the average land gradient for each transformer community.[13] Our secondary community-level land gradient variable will be the variance in the distribution of altitudes collected across the entire population of geo-tagged buildings for each transformer community.[14]

[13]Each transformer community is defined as all of the buildings within a 600 meter radius of a central electricity distribution transformer, as defined in Lee et al. (2014).

[14]Usage of this secondary definition of land gradient will depend on whether we can verify that our altitude records (taken using the GPS application on Android tablets) are relatively accurate.

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Survey information
Greetings! You are about to begin "Living Standards Kenya 2014". Please fill in the following questions before engaging the respondent.
1. Please select your name:
2. Please enter your IPA ID number:
3. Elder/ guide name:
4. Transformer ID:
5. Household ID:
Great! We are set to go. When you are ready, please approach the respondent, introduce yourself, and begin the interview. Good luck!
Informed consent
READ: Hello. How are you? I am [your name] from IPA, a research organization based in Busia town. We are conducting research on living standards in the rural parts of Kenya. We visited this area a while back, accompanied by village elder [village elder name] in order to know who lives in this area.
You have been randomly selected into our survey today. I trust that [village elder name] informed you of our visit today on [respondent contact/ tracking sheet]. I would like to ask you questions to help us understand the living standards of the people in this area.
I will keep everything that you tell me entirely private and will not talk to other people about what you say. I ask that you speak honestly, since we are only interested in collecting information at this point. There are no "right" or "wrong" answers. You can choose to stop this survey at any point in time or refuse to answer certain questions. If you have any questions, you can contact the person in charge of this survey at IPA.
Would you be willing to volunteer roughly 90 minutes of your time to speak with me?
NOTE: Please ensure that you give a copy of the consent form to the respondent.
Informed consent not obtained
READ: Thank you for your time and I hope that you have a wonderful day.
NOTE: Kindly exit the householdso that you can take the GPS coordinates and finalize this survey.
Record your location.
Please enter any additional comments.

Section A - Roster
Main household
READ: Thank you. To begin, I would like to understand how many people live with you in your household and in this wider compound. Let us begin by thinking of only the people who live in this particular household.
1a. How many people in total live in your household and eat from the same pot?
1b. How many other people usually sleep or eat in your household that you have not counted?
1c. How many people that you have already counted use another home as their primary residence?
READ: For the remainder of this survey, when I ask you about your household, I would like you to only think of the ${hhsize} people that we have just identified as living in your household.
Compound
READ: I would now like you to think about the wider compound (not just your household).
2a. How many people in total live in this compound (including yourself)?
2b. How many separate households (i.e. "pots") are in this compound (including your own)?
Paper section
READ: Can you please list the names of the ${hhsize} people that are the core members of this household?
NOTE: Please write down the names of each household member on the unique roster sheet, beginning with the respondent, followed by the spouse, and then other household members beginning with the eldest. Do not foget to record the Site ID and HH ID.
NOTE: For each of the roster names that you have written down, please enter the following information, beginning with the respondent.
Roster sheet number
Birth
4a. Gender:
4b. Month of birth:
4c. Year of birth:
4d. Is this an estimated date of birth?
READ: So this person is ${dob} years old? (Note: If this is incorrect, go back and correct the date.)
Occupation and education
5a. Relationship to respondent:
5b. Highest level of education completed:
5c. Primary occupation(s):
5d. If highest education completed is other, please specify.
5e. If primary occupation is other, please specify.
Contact details
READ: I would now like to ask you for some basic contact information.
6a. Do you have a phone number available so that we can contact you in future interview rounds?
6b. Respondent phone number:
6c. Who's phone number is this?
6d. Relationship to respondent:
6e. Do you have a spouse?
6f. Does your spouse live in this household?
6g. Even though your spouse does not live here, is he/she involved in your day-to-day household decisions?
6h. Please enter the roster number of the spouse.
6i. Contact phone number of spouse:
7a. Alternate contact common name:
7c. Alternate contact phone number:

Living Standards Kenya (LSK) - Paper Roster Sheet

Transformer ID: | | | | | DD/MM/YY: | | | / | | | / | | |

Household ID: | | |

Field Officer ID: | | | | |

Please write down the names of each household member, beginning with the respondent.

ID	Name (FIRST MIDDLE LAST)
Record name of respondent first:	
1	
Now, record names of other household members:	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	

Section B - Children's education
Introduction
READ: I would now like to ask you about the education levels of the children living in this household.
NOTE: The following section should be completed for up to two school-age child closest to Class 8. You should only record details for two children.
Child
School type
1a. Please enter the roster number for this child.
1b. What type of school does this child attend?
1c. Why doesn't this child attend school?
1d. If other, please specify.
Schooling participation
2a. During the current academic year, what class/ form is this student enrolled in?
2b. Last term, did this student fully complete the first week of school?
2c. Last term, did this student fully complete the last week of school?
2d. Last term, did this student sit for the end of term exams?
2e. Last term, how many total marks did this student earn?
2f. Did this student pass the last term?
2g. Are you planning to send this student to school during the next academic year?
2h. Why not?
Study habits
NOTE: For the following questions, please try to ask the student directly. Enter 12:34 if don't know.
3a. What time does this student go to sleep when there is class the following morning?
3b. What time does this student wake up when there is class in the morning?
3c. Over the past 3 days, how many hours has this student spent studying?
3d. Over the past 3 days, how many hours has this student spent doing household chores?
3e. Over the past 3 days, how many hours has this student spent playing?

Section C - Household characteristics
Building materials
NOTE: Please observe the materials of the floors, roof and walls, and record your observations in the following
1a. What materials are the floors made of?
1b. What materials is the roof made of?
1c. What materials are the walls made of?
READ: I would now like to ask you a few questions about your home. Please think of your current residence only (i.e. the main house of the compound or the building where you eat). We are only interested in the current residence, not (necessarily) ancestral land (even if the current residence is a rental).
1d. How many separate rooms do you have in your household?
1e. What kind of toilet facilities does your household use most often?
1f. If floor material is other, please specify.
1g. If roof material is other, please specify.
1h. If wall material is other, please specify.
1i. If toilet is other, please specify.
Sources of water
2a. Over the past 7 days, what was your household's main source of drinking water?
2b. Over the past 7 days, what was your main source of water for other household activities?
2c. Have you ever done anything to your drinking water to make it safe to drink? If yes, what did you do?
2d. If drinking water is other, please specify.
2e. If other activities water is other, please specify.
2f. If treatment is other, please specify.
READ: How many of the following assets does your household own?
Household assets
3a. Bed
3b. Bednet
3c. Sofa pieces
3d. Kerosene stove
3e. Clock/watch
3f. Hoe
3g. Kerosene lamp
3h. Sewing machine
3i. Bicycle
3j. Motorcycle
3k. Car/truck

Section D - Land and agriculture
Introduction
READ: Thank you. I would now like to ask you about your land and agricultural activities.
1a. Does your household own any land?
1b. Does your household rent-in any land?
1c. Does your household own or rent the house where you live?
1d. Over the past 7 days, have you or any member of your household performed any agricultural or pastoral activities for your household?
1e. Does your household own any livestock?
Landowner
READ: Thank you. I would now like to ask you a few details about the land that you own.
2a. How much land does your household own?
2b. How much of this land is used for agricultural purposes?
2c. Over the past 12 months, did you rent out any of your land to people outside your household?
2d. How much of your land did you rent out?
2e. How much money do you receive each month for renting out this land?
Land renter
READ: You mentioned that you rent land. I would like to learn more about your rental activities.
3a. Over the past 12 months, how much land did you rent from others?
3b. How much of this land is used for agricultural purposes?
3c. Over the past 12 months, for which months did you rent this land?
3d. On average, how much did you pay each month to rent this land?
Home renter
4a. How much must you pay each month to rent this house?
4b. What is the name of your landlord?
4c. Relationship to respondent:
Activities
5a. What are the agricultural or pastoralist activities that members of your household perform?
5b. If other, please specify.
5c. What is the total size of the land that you use for all of these activities?
5d. For which activities are you the main decision maker?
Agriculture
READ: Thank you. I would now like to ask you a few details about your agricultural activities.
6a. What crops do you grow?
6b. Over the past 12 months, did you use any of the following?
Agricultural labor
READ: Thank you. I would now like to ask you how much time you and members of your household spend on these agricultural activities. Over the past 7 days...
7a. ...how many hours did you work in total on these activities?
7b. ...how many hours did your spouse work in total on these activities?
READ: Over the past 6 months...
7c. ...how many members of your own household worked on these activities?
7d. ...how many workers from outside your household did you hire in total for these activities?
Income from land-related activities
READ: Over the past 12 months, how much did you receive in total sales from...
8a. ...selling crops?
8b. ...selling livestock/ livestock products?
8c. ...selling poultry/ poultry products?
8d. ...selling fish?
8e. ...selling your "other" activity?
Livestock
READ: How many of the following livestock does your household own?
9a. Chickens
9b. Cattle
9c. Goats
9d. Pigs
9e. Sheep

Section E - Employment and income-generating activities
Introduction
READ: Thank you. I'd now like to ask you about your employment and income-generating activities.
1a. Other than farming, are you currently self-employed or running a business to earn a living?
1b. What about your spouse?
1c. Are you currently employed with a business/ organization? If so, what is your position?
1d. What about your spouse?
Business or self-employment activity
READ: I'd now like to learn about each of the businesses (or the activities that are performed while self-employed) in this household. Let's start with the business/ self-employment position that is the most important to you. Afterwards, we will continue on to any others.
Note: Collect information about the businesses or self-employment activities of the spouse as well, if
History
2a. Who performs this business/ self-employment activity?
2b. What is this occupation/ business?
2c. Does this occupation/ business use electricity?
2d. If other, please specify.
2e. In what year was this business/ self-employment activity started?
2f. How much had to be invested in order to start, purchase or gain control of this business?
2g. What was the main source of investment funds for this business?
2h. If other, please specify.
Labor
3a. How many workers in total are currently employed in this activity?
READ: Over the past 7 days, how many hours in total...
3b. ...did you work in this business?
3c. ...did your spouse work in this business?
READ: Over the past year, in which months...
3d. ...did you work in this business?
3e. ...did your spouse work in this business?
Revenue and profit
READ: I'd like to ask you a few more details about this particular business/ self-employment activity. Please remember that any data we collect will be kept entirely confidential.
4a. Over the past month, what was your total revenue (money-in only)?
4b. Over the past month, what was your total profit?
Entrepreneurship aspirations
READ: I'd now like to ask you about your future business ambitions.
5a. Would your household want to start its own (or another) business in the next five years?
5b. What kind of business would you start?
5c. If other, please specify.
5d. Can you tell me why your household hasn't been able to start this business?
5e. If other, please specify.
5f. In your opinion, what is the biggest constraint(s) for people who own their own businesses?
5g. If other, please specify.
Employment activity
READ: Earlier, you mentioned that you were currently employed (for income) with a business/ organization. I'd now like to ask you some details about these positions.
Note: Be sure to collect information about the activities of the spouse as well, if applicable.
History and job description
6a. Who holds this position?
6b. What type of position is this?
6c. In what occupation/ business is this work?
6d. If other, please specify.
6e. In what year did this person start this position?
Working hours
7a. This position's working patterns could be best described as:

7b. Over the past 12 months, in which months did this person work in this position?
7c. Over the past 7 days, how many hours did this person work in this position?
Compensation
READ: I'd like to ask you a few more details about this particular position. Please remember that any data we collect will be kept entirely confidential.
READ: In the last month that this person was working, what was the total value...
8a. ...of your gross cash salary?
8b. ...of your benefits?

Section F - Energy
Sources of energy
READ: I would like to begin this section by asking you some questions about your energy use.
1a. Is this household connected to the national grid?
1b. What is your main source of lighting energy?
1c. What are your other (secondary) sources of lighting energy?
1d. What is your main source of cooking energy?
1e. What are your other (secondary) sources of cooking energy?
1f. Do you use any additional sources of energy?
1g. What are these sources of energy?
1h. If main source of lighting energy is other, please specify.
1i. If secondary source of lighting energy is other, please specify.
1j. If main source of cooking energy is other, please specify.
1k. If other source of cooking energy is other, please specify.
1l. If additional sources of energy is other, please specify.
Unconnected household
READ: Thank you. I would now like to ask you about your history with electricity. What are the reasons why your household does not have electricity?
NOTE: Allow respondent to respond naturally. When he/she has finished, select all of the reasons that apply.
2. Please select all that apply.
Past experience and history
3a. Have you ever lived in a building with electricity?
3b. For how many years of your life did you spend living in a building with electricity?
4a. Has anyone in this household ever applied for a connection with Kenya Power (KPLC) or Rural Electrification Authority (REA)?
4b. When did your household apply for this connection?
4c. What is the current status of your application?
4d. If other, please specify.
4e. Why was your application rejected?
Connected households
5a. Over the past 7 days, has this connection delivered any power to your home?
When was this household first connected to electricity?
5b. Month of connection:
5c. Year of connection:
5d. Did you experience any challenges obtaining wayleaves from your neighbors to connect your home?
5e. How many households within your compound are connected to electricity?
5f. Is there an electricity meter installed in your household?
5g. How many unique households (i.e. "pots"), including your own, are connected to your electricity meter?
5h. If you do not have an electricity meter in your household, from whom do you receive electricity service?
5i. Last month, how did you pay for your electricity service?
5j. Last month, how much did your household pay on its electricity bill?
5k. Do you use any devices to protect your appliances from power surges?
6a. Did you experience any power blackouts in the past three days?
Blackouts and power quality
6b. For roughly how many hours was the power not working in the past 3 days?
6c. At what point of the day was the power not working?
6d. Do these types of blackouts occur regularly?
6e. Do you expect that the reliability of your electricity supply will improve in the future?
READ: Thank you. I would now like to ask you details about your energy sources.
Kerosene usage

7. In the past 7 days, how much money in total did your household spend on kerosene?
Solar lanterns
8a. How many solar lanterns does your household use?
READ: I'd like you to think only about the main solar lantern that you use.
8b. Do you own, rent or hire purchase this solar lantern?
8c. How much did you pay for this solar lantern?
8d. In the past month, how much did you pay to rent or hire purchase this solar lantern?
8f. Does your solar lantern allow you to charge mobile phones?
Solar home systems
9a. How many solar home systems does your household use?
READ: I'd like you to think only about the main solar home system that you use.
9b. Do you own, rent or hire purchase this solar home system?
9c. How much did you pay for this solar home system?
9d. In the past month, how much did you pay to rent or hire purchase this solar home system?
9e. Does your solar home system allow you to charge mobile phones?
Batteries (dry cells) & car batteries (wet cells)
10a. How much did you pay to purchase your wet cell (i.e. car) batteries?
10b. In the past 7 days, how much did you spend recharging your wet cell (i.e. car) batteries?
10c. In the past 7 days, how much did you spend on your dry cell batteries?
10d. Is this because your batteries are rechargeable?
Generator
11a. When did your household first begin using a generator?
11b. How much did you pay for this generator?
11c. In the past 7 days, how much did you spend on fuel for this generator?
11d. For what activities do you use this generator?
11e. If other, please specify.
Other sources of energy
12a. In the past 7 days, how much did you spend on purchased firewood?
12b. In the past 7 days, how much did you spend on charcoal?
12c. In the past 7 days, how much did you spend on LPG?
12d. In the past 7 days, how much did you spend on sawdust?
READ: Earlier, you mentioned that you use another source of energy. In the past 7 days, how much did you
12e. ...on this other source of lighting fuel?
12f. ...on this other source of cooking fuel?
12g. ...on this other source of additional energy?
Additional energy costs
13. In the past 7 days, how much money was spent to recharge all of your household's mobile phones?
READ: Thank you. Now I'd like to ask you about your indirect energy costs.
NOTE: Try naming the various energy sources to aid the respondent. For example, do you use a boda boda to pick up kerosene etc.? This should include the cost of associated with taking a phone to be recharged as well.
14a. In the past 7 days, have you spent any additional money in order to collect/ acquire your energy
14b. In the past 7 days, how much additional money did you spend to acquire all of your energy sources?
Lighting hours
READ: Thank you. I'd now like to ask you about your lighting hours. What time did you...
15a. ...Begin using your lighting last night?
15b. ...Stop using your lighting last night?
15c. Did you use your lighting this morning as well?

What time did you...
15d. ...Begin using your lighting this morning?
15e. ...Stop using your lighting this morning?
Willingness to pay
READ: As you know, electricity requires two types of payments: First, you must pay for the connection cost. Second, you must pay for the monthly service fee (i.e. bill). I'd like you to first think about only the connection
16a. How much do you think it costs to obtain an electricity connection?
READ: I would now like you to think about a situation that is not real. This is just a hypothetical situation. Imagine that you could pay a "lump sum" price for an electricity connection. In other words, you are offered a price and you have a period of time to decide whether to take this price. If you decide to take the price, you have to pay all at once, after which you are immediately connected.
16b. Would you be willing to pay ${aa6} Ksh for an electricity connection?
16c. Imagine that you were offered an electricity connection at this price today, and you were given 6 weeks to complete the payment. Would you accept the offer?
16d. Why not?
16e. If other, please specify.
READ: Now, I would like to ask you about another situation that is not real. Suppose that you are able to "hire purchase" an electricity connection. If you choose to accept this plan, you will have to pay a deposit at the beginning, after which you will be required to pay a fixed amount each month for a certain number of months.
16f. Suppose that the full price of an electricity connection is ${aa11}. Would you be willing to pay ${aa7} Ksh as a deposit, followed by monthly payments of ${aa8} Ksh for a period of ${aa9} years for an electricity connection? Note: In total, you would be paying ${aa10} Ksh over the lifetime of the plan.
16g. Imagine that you were offered an electricity connection under this plan today, and you were given 6 weeks to pay the deposit. Would you accept the offer?
16h. Why not?
16i. If other, please specify.
16j. Would a different payment frequency change your previous decision to refuse the hire purchase offer?
16k. In the plan that I have just described, you would be required to make payments on a monthly basis. If you could choose whether to make payments on a daily, weekly, or monthly basis, what would you choose?
16l. Please enter any additional comments.
READ: Now suppose that the full price of an electricity connection is 35,000 Ksh. You are still able to "hire purchase" an electricity connection. However, a deposit is no longer required. You will only have to pay a fixed amount each month until you have fully paid the 35,000 Ksh in total. Example: If the fixed amount is 1,000 Ksh, you would have to pay this amount for 35 months.
16m. How much would you be willing to pay each month for an electricity connection until the 35,000 Ksh has been fully paid?
16n. Imagine that you were offered an electricity connection under this plan today. Would you accept the
16o. Why not?
16p. If other, please specify.
READ: Now, I would like you to think about only the monthly service fee (i.e. bill).
16q. How much of your income could you afford to pay per month for electricity service?
Electrical appliances
READ: Thank you. Now I'd like to ask you about electrical appliances.
17a. Does your household own any electrical appliances?
17b. What electrical appliances do you own?
17c. If other, please specify.
17d. What will be the next electrical appliance(s) that you will purchase?
17e. If other, please specify.
17f. If you had an electricity connection, what would be the next electrical appliance(s) that you would purchase?
17g. If other, please specify.

Section G - Miscellaneous
Savings activities
READ: I would like to begin this section by asking you some questions about your savings activities.
1a. Do you have a bank account?
1b. Do you use any mobile banking services?
1c. Do you participate in a SACCO, merry-go-round, or ROSCA?
READ: In the past 12 months...
1d. ...have you ever borrowed money from a commercial bank/ lender, moneylender, or someone else outside your household?
1e. ...did you ever try to borrow money but were refused? If so, from who did you try to borrow money?
Awareness
READ: Thank you. Over the past 7 days, on how many days did you...
2a. ...listen to the radio?
2b. ...read the newspaper?
2c. ...watch the television?
Please name the...
3a. ...current President of Tanzania for me.
3b. ...current President of Uganda for me.
3c. ...immediate former President of the United States for me.
Safety
4. With regards to safety, would you describe this area as somewhat secure, very secure or insecure?

Section H - Time use
READ: I would now like to ask about your activities during the past 24 hours starting with yesterday at 6am up until this morning at 6am. For each half hour, you should tell me what you did during that half hour. If you had several activities, please let me know the main activity.
A. Morning activities
6:00 - 6:30
6:30 - 7:00
7:00 - 7:30
7:30 - 8:00
8:00 - 8:30
8:30 - 9:00
9:00 - 9:30
9:30 - 10:00
10:00 - 10:30
10:30 - 11:00
11:00 - 11:30
11:30 - 12:00
B. Afternoon activities
12:00 - 12:30
12:30 - 13:00
13:00 - 13:30
13:30 - 14:00
14:00 - 14:30
14:30 - 15:00
15:00 - 15:30
15:30 - 16:00
C. Evening activities
16:00 - 16:30
16:30 - 17:00
17:00 - 17:30
17:30 - 18:00
18:00 - 18:30
18:30 - 19:00
D. Night activities
19:00 - 19:30
19:30 - 20:00
20:00 - 20:30
20:30 - 21:00
21:00 - 21:30
21:30 - 22:00
22:00 - 22:30
22:30 - 23:00
23:00 - 23:30
23:30 - 00:00
00:00 - 00:30
00:30 - 1:00
1:00 - 1:30
1:30 - 2:00
2:00 - 2:30
2:30 - 3:00
3:00 - 3:30
3:30 - 4:00
4:00 - 4:30
4:30 - 5:00
5:00 - 5:30
5:30 - 6:00

Section I - Health
Consumption and habits
READ: I'd now like to ask you some questions about your own health and nutrition.
1a. How many meals did you eat yesterday?
1b. Over the past 7 days, have you smoked any cigarettes?
1c. Do you consume alcohol? If yes, over the past 7 days, how many alcoholic drinks have you had?
Over the past 4 weeks...
2a. ...have you slept under a mosquito net?
2b. ...have all of your children slept under a mosquito net?
Subjective health...
Over the past month...
3a. ...how much of the time have you been a very nervous person?
3b. ...how much of the time have you felt calm and peaceful?
3c. ...how much of the time have you been a happy person?
3d. ...how much of the time have you felt very sad?
3e. Would you describe your general health as somewhat good, very good or not good?
Illnesses and hospitals
4a. Over the past 4 weeks, which symptoms or illnesses have you experienced?
4b. If someone in the household were in labor, where would they go for services?
Over the past 4 weeks...
4c. ...how many days of work, housework, or school did you miss due to poor health?
4d. ...how many days of school did your child/ children miss due to a health related issue?
4e. ...how many days of work, housework or school did your spouse miss due to poor health?
4f. ...how many days of work, housework or school did other members of your household miss due to poor
Over the past 4 weeks, how much did your household spend in total (in cash or in-kind) on...
5a. ...hospital/ clinic medical care (not including medicine)?
5b. ...modern medicine to treat a health problem?
5c. ...traditional medicine to treat a health problem?

Section K - Markets
Posho mills
READ: We have now come to the final section of this survey. In this section, I'd like to ask you about the grain and flour purchases in your household.
NOTE: In this section, "you" refers to the person in the respondent's household who typically visits a posho mill. For example, if it is the respondent's spouse who typically visits the posho mill, ask the respondent to try to remember the details about his/her spouse's last visit to a posho mill.
1a. Over the past 4 weeks, has anyone from your household visited a posho mill?
1b. Over the past 4 weeks, which grains were either purchased or ground at a posho mill?
1c. If nobody visited a posho mill, where do you obtain your grain and/or flour?
1d. If other, please specify.
1e. If other, please specify.
Local posho mill
READ: I'd like you to think about the posho mill that your household visits most often.
2a. Where is this posho mill?
2b. Is this an electric or diesel posho mill?
2c. What are the main reasons why your household frequents this posho mill?
2d. If other, please specify.
2e. How many times did members of your household visit this particular posho mill in the past month?
2f. Are there any other businesses/ shops located close to this posho mill?
Last visit to local posho mill
READ: I'd like you to now think about the last time your household visited this posho mill, regardless of the person who made the visit.
3a. When was this visit?
3b. Which member(s) of your household made this visit?
3c. Did you bring your own grains during this visit?
3d. How many minutes did it take you to travel there (one-way)?
3e. ...By what method?
3f. What did you purchase at the posho mill?
Purchases during last visit
READ: Thank you. I'd like you to continue thinking about the last time you visited this posho mill.
4a. How much did you spend in total on grinding services?
4b. For how many units?
4c. Specify unit.
4d. How much did you spend in total on vegetables and groceries?
4e. How much did you spend in total on grains?
4f. For how many units?
4g. Specify unit.
4h. How much did you spend in total on flour?
4i. For how many units?
4j. Specify unit.
4k. How much did you spend in total on livestock feed?
4l. How much did you spend in total on all other goods and services purchased from neighboring shops?
4m. Did you fetch any other basic, free necessities during this trip? If so, what did you fetch?
4n. How long did you wait at the posho mill?
Grain/ flour consumption
READ: I would now like you to think about the total amount of grains/ flour that your household has consumed over the past month.

5a. How many units did your household consume in total?
5b. Specify unit.
5c. Of this amount, how many units were either purchased or milled at this particular posho mill?
5d. Specify unit.

Section Z
Living Standards in Kenya (LSK) Survey - End time
READ: Thank you very much for your time, all of this information will be kept strictly confidential. We will follow up with you in a year or so. You will receive no direct benefits for having participated in this survey.
Comprehension and cooperation
NOTE: Thank you for your hard work! You have reached the end of the survey. Please fill in the remaining questions after you have exited the house.
1a. Rate the comprehension level of the respondent:
1b. Rate the cooperation level of the respondent:
Presence of others
2a. Was anyone else present during the interview?
2b. What is the name of this person?
2c. Did this person assist the respondent with his/her answers?
Location
3. Record your location.
Comments
4. Please enter any additional comments.